



Short communication

Moral decision-making in polysubstance dependent individuals

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ABSTRACT

Background: Moral judgments depend on the integration of complex cognitive and emotional processes. Addiction is associated with core deficits in both cognitive and emotional processing, which may jointly lead to utilitarian biases in moral decision-making.

Methods: We assessed 32 polysubstance dependent males and 32 non-drug using controls using a previously validated moral judgment task, including non-moral scenarios, and moral dilemmas that were either high in emotional salience (“personal scenarios”) or low in emotional salience (“impersonal scenarios”).

Results: Polysubstance dependent individuals endorsed more utilitarian choices for personal dilemmas (e.g., smothering a baby to save a group of hidden people during wartime). These choices were also perceived as less difficult. Severity of alcohol use correlated with the proportion of utilitarian judgments.

Conclusion: Polysubstance dependent individuals show a more utilitarian pattern of moral decision-making for personal moral scenarios.

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1. Introduction

Moral judgments depend on the integration of complex cognitive and emotional processes (Cushman et al., 2006; Young et al., 2007). Recent work in moral psychology and neuroscience suggests that impairments in these processes lead to systematic biases in moral judgments (Méndez et al., 2005; Koenigs et al., 2007). For example, patients with focal lesions to the ventromedial prefrontal cortex are more likely to deliver utilitarian moral judgments for moral scenarios that are high in emotional content (e.g., it is morally permissible to smother a baby to save a group of hidden people during wartime; Koenigs et al., 2007; Moretto et al., 2010). According to dual-process models of moral cognition (e.g., Greene et al., 2008), a prepotent emotional aversion to harming an innocent individual (the deontological response) competes with a utilitarian cost-benefit analysis to maximize aggregate welfare. When scenarios elicit a sufficiently robust emotional response, deontological moral judgment tends to prevail. In the current study, we test the hypothesis that, in polysubstance dependent individuals, the

inability to integrate cognitive and emotional inputs for appropriate decision-making (Bechara et al., 2000) lead to systematic biases in moral judgments.

Addiction, and, in particular, polysubstance dependence, is associated with core deficits in higher cognitive processes and emotional skills, and with real-life difficulties related to social interaction (Leeman et al., 2009; Volkow et al., 2011) and illegal behavior (Verdejo-García et al., 2006, 2007; Yechiam et al., 2008). Recent research has revealed deficits in emotional processing, including in emotion regulation and emotion perception, in polysubstance abusers (Aguilar de Arcos et al., 2005, 2007; Fernández-Serrano et al., 2010). For example, polysubstance abusers tend to outweigh immediate rewards over negative future outcomes and to act impulsively (Verdejo-García et al., 2007, 2008). Polysubstance dependent individuals also show defective decoding of moral emotions like anger or disgust (Fernández-Serrano et al., 2010), reduced reactivity to emotionally competent stimuli (Aguilar de Arcos et al., 2005), and poor affective-based decision making, due to a failure to trigger bodily markers signaling negative outcomes (Bechara et al., 2002).

Recent research on polysubstance dependence has also revealed enduring anatomical abnormalities in a key region for social and moral cognition, the medial prefrontal cortex (Tanabe et al., 2009). Polysubstance abusers show long-term reductions of gray matter volume in the medial prefrontal cortex (Franklin et al., 2002;

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Tanabe et al., 2009), and abnormal activation of this region during the extraction of empathic information from social vignettes (Kim et al., 2010).

Do polysubstance dependent individuals show utilitarian biases in moral judgments? We predicted that polysubstance dependent individuals would deliver more utilitarian moral judgments as a direct result of their cognitive-emotional deficits in decision-making.

2. Methods

2.1. Participants

We tested 32 polysubstance dependent individuals and 32 control participants. Polysubstance dependent individuals were recruited during residential treatment in a therapeutic community. Selection criteria for polysubstance dependent individuals consisted for the following: (i) meeting the DSM-IV criteria for substance dependence (see Table 1 for descriptive scores on substance dependence diagnoses and drug use parameters); (ii) minimum abstinence duration of 30 days before testing, confirmed by weekly urine analyses; (iii) not having history of head injury or neurological disorders; and (iv) the absence of clinical diagnosis of comorbid Axis I or Axis II disorders – as assessed by clinical interviews conducted by the treatment center staff (four participants were excluded due to diagnosis of personality disorders, and one participant due to comorbid mood disorder). Selection criteria for control participants consisted of the following: (i) the absence of current or past diagnoses of substance abuse or dependence; (ii) not having history of head injury or neurological disorders; and (iii) the absence of history of psychiatric disorders. To minimize the impact of any alcohol or drug use in the control group, we included only control participants who reported having used any illegal drugs no more than 5 times during their lifetime; furthermore, we allowed current alcohol consumption only at levels below 10 standard units per week (mean alcohol use in the control group: 9.34 units per month).

The polysubstance dependent and control groups were matched on sex and ethnicity; all participants were European-Caucasian males. The groups also showed similar distributions for handedness (four left-handed subjects in the polysubstance group and one left-handed subject in the control group, $\chi^2 = 2.58$, $p > 0.1$), socioeconomic status (70.4% of polysubstance dependents and 81.3% of controls had middle socioeconomic status, $\chi^2 = 2.58$, $p > 0.1$), and levels of religiosity (89% of polysubstance dependents and 79% of controls were religious – all Catholics, $\chi^2 = 1.21$, $p > 0.1$), which is known to impact moral judgment (Pysiäinen and Hauser, 2010). The groups did differ in age; mean ages for the polysubstance dependent and control group were 33.56 years (SD = 6.81) and 26.03 years (SD = 10.05), respectively ($t = 3.30$, $p < 0.002$). However, age did not significantly correlated with moral decision-making and therefore it was not further considered in subsequent analyses. The groups also differed in education; mean education for the polysubstance dependent and control group were 14.31 years (SD = 1.57), and 16.06 years (SD = 1.76), respectively ($t = 3.96$, $p < 0.001$). Education significantly correlated with moral decision-making, and was therefore used as a covariate in all subsequent analyses.

2.2. Instruments

2.2.1. Interview for research on addictive behavior (Verdejo-García et al., 2005). This semi-structured interview focuses on patterns of use for different classes of drugs, including typical amount per month and duration of use.

2.2.2. Structured clinical interview for DSM-IV (SCID; First et al., 1994). We used the substance abuse and dependence subscale to obtain diagnoses related to substance use.

2.2.3. Moral judgment task (Greene et al., 2001). Participants read and responded to 60 hypothetical scenarios. Participants' responses consisted of reporting whether they would perform ("yes") or refuse to perform ("no") an action. Participants also reported the subjective difficulty of the decision. As in prior work, scenarios were categorized as either impersonal (not emotionally salient) or personal (emotionally salient). In addition, personal scenarios were classified as either low-conflict (easy) versus high-conflict (difficult; Koenigs et al., 2007). Thus, scenarios fell into four categories: (1) non-moral scenarios, (2) impersonal moral scenarios, (3) personal moral low-conflict scenarios, and (4) personal moral high-conflict scenarios.

For all moral scenarios, Affirmative Answers represent utilitarian judgments: the participant endorses an emotionally aversive action (e.g., to kill someone) in order to maximize aggregate welfare (e.g., to save more people). For example, a utilitarian choice could involve throwing a dying into the sea to keep a lifeboat full of people afloat. By contrast, negative answers represent non-utilitarian or deontological judgments: the participant rejects the harmful action at the expense of the greater good.

The main dependent measures were the proportion of *Affirmative Answers* and the perceived level of *Difficulty* for each of the four categories of scenarios. In the case of moral scenarios, Affirmative Answers represent utilitarian moral judgments, i.e.,

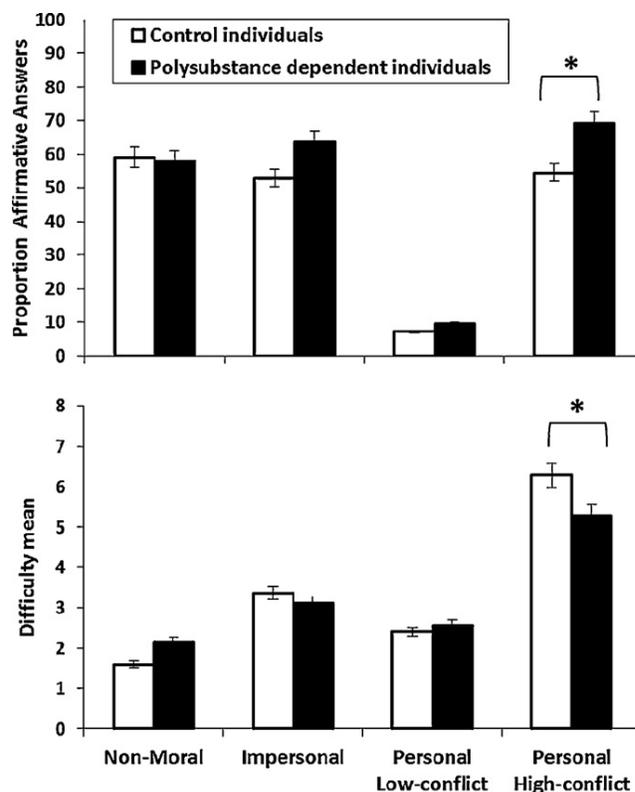


Fig. 1. Proportion of Affirmative Answers and Difficulty across scenario categories, for polysubstance dependent individuals and controls.

endorsing an emotionally aversive action to maximize aggregate welfare. Difficulty reflects the mean score of difficulty ratings, ranging from 1 (low difficulty) to 10 (high difficulty).

We used a Spanish version of this instrument, adapted through back-translation procedure, which holds adequate psychometric properties (Cronbach's alpha = 0.71; Carmona-Perera et al., 2009).

2.3. Procedure

The study was approved by the Ethical Committee for Research in Humans of the University of Granada. All participants read the research protocol and signed an informed consent form before inclusion in the study. Polysubstance dependent individuals were initially screened by the clinical staff for fulfillment of inclusion criteria, including urine tests to confirm abstinence, and then assessed in a single session including the toxicological interview and the moral dilemmas battery. Controls were recruited through advertisements placed in community centers in the same geographical area.

3. Results

The main hypothesis was tested, using a 2 (Group: Polysubstance dependent individuals vs. Control) \times 4 (Category of dilemma) mixed-effects ANCOVAs of the two dependent variables (Affirmative Answers and Difficulty). Years of education were entered as covariate in these analyses. Results showed a significant Group \times Category interaction on the index of Affirmative Answers [$F(3, 2.328) = 3.441$, $p < 0.018$].

Planned t -tests showed that this interaction was driven by significant differences between polysubstance users and controls on personal moral high-conflict dilemmas [$t = -2.555$, $p < 0.013$]; polysubstance dependent individuals endorsed a higher proportion of Affirmative Answers (Fig. 1). We found no significant differences between groups on the other three categories (all $p > 0.05$).

For Difficulty, a Group \times Category interaction emerged as well [$F(3, 1.962) = 3.510$, $p < 0.017$]. Planned t -tests revealed that

Table 1

Descriptive scores of substance dependent diagnoses, and amount and duration of use of each drug, in polysubstance dependent individuals.

Substance	Ever used (proportion)	DSM-IV diagnosis (proportion)	Drug use parameters, mean (SD)	
			Quantity	Duration (years)
Alcohol	96.34%	44.46%	140.26 (185.01) units/month	15.03 (5.56)
Cocaine	85.28%	65.63%	42.69 (65.13) g/month	9.03 (6.97)
Cannabis	77.83%	15.63%	17.03 (22.65) g/month	8.25 (6.91)
Ecstasy	52.91%	3.13%	586.96 (1107.29) mg/month	2.80 (5.27)
Heroin	40.73%	25%	208.24 (527.12) mg/month	3 (5.21)

Note: g, grams; mg, milligrams.

polysubstance dependent individuals trended toward judging personal moral high-conflict dilemmas as less difficult [$t = 1.920$, $p < 0.059$] (see Fig. 1). We found no significant differences between groups on the other three categories (all $p > 0.05$).

We also conducted Spearman correlation analyses to test the association between patterns of drug use and the dependent variables. A significant correlation emerged between the severity of alcohol use and Affirmative Answers for personal moral high-conflict dilemmas ($r = 0.408$; $p = 0.043$).

4. Discussion

The current study demonstrates that polysubstance dependent individuals deliver more utilitarian moral judgments in response to personal moral scenarios, which are high in emotional content. Polysubstance dependent individuals not only delivered a greater proportion of utilitarian judgments but also perceived these decisions as less difficult.

According to dual-process models of moral cognition, utilitarian choices are more readily endorsed by individuals who show reduced ability to integrate social-emotional inputs (Greene, 2007; Greene et al., 2008). Polysubstance dependent individuals are characterized by emotional blunting, abnormal triggering of emotional signals during outcome anticipation, and poor affective regulation (Aguilar de Arcos et al., 2005; Bechara et al., 2002; Payer et al., 2011). These deficits may therefore underlie the utilitarian pattern of their moral judgments. Nonetheless, future work should explore other explanatory accounts including impaired inhibition and impulsivity (Leeman et al., 2009) or degraded representations of social values (Moll et al., 2005).

The current analyses revealed a correlation between utilitarian moral judgments and severity of alcohol use. Previous studies have shown that alcohol use (compared to other drug classes) disproportionately damages emotion perception (Foisy et al., 2005; Korneich et al., 2003). Chronic alcohol dependent individuals show deficits in emotional processing, including impaired appraisal of facial emotions and affective prosody (Maurage et al., 2011a; Uekermann et al., 2005, 2007) and impaired emotional but not cognitive empathy (Maurage et al., 2011b). Notably, these affective deficits are predictive of real-life interpersonal problems (Korneich et al., 2002). We note, however, that the specificity of the link between alcohol use and utilitarian moral judgment should be interpreted with caution, given the mixed sample of polysubstance abusers in the current study.

We also note that the current conclusions apply specifically to a sample of polysubstance dependent individuals who were referred to residential treatment due to inability to achieve treatment goals in a naturalistic setting. Therefore, the patients in the current study may have been more likely to show emotional blunting and decision-making deficits that impact moral judgment. Although the consumption patterns of the sample are representative of users demanding addiction treatment in the European Union (EMCDDA Annual Report, 2010), future work should target broader groups of substance abusers. It is also important to note that future studies

should control for important confounders or moderators of moral judgment in this population, including IQ, impulsivity or depression levels, which were not assessed and stand as a limitation of our study.

The utilitarian pattern observed in the current sample of polysubstance dependent individuals deviated from standard response patterns in not only the current control sample (Carmona-Perera et al., 2009) but also the control groups from two previous studies (Koenigs et al., 2007; Ciaramelli et al., 2007). Polysubstance dependent individuals scored more than 1 standard deviation above the means reported by these previous studies. Future research should investigate whether this utilitarian response pattern reflects a premorbid trait or a consequence of drug dependence. In any case, the current finding may yield important clinical implications. For example, novel interventions directed to improve cognition–emotion integration may contribute to correct the utilitarian biases of these individuals, thus fostering prosocial behavior (Crockett et al., 2010).

The present study provides initial clues about moral decision-making in polysubstance dependent individuals from a cognitive neuroscience perspective. In sum, the current findings indicate that polysubstance dependent individuals are more prone to deliver utilitarian choices when confronted with moral dilemmas, and find these decisions easier to make.

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Contributors

M. Pérez-García, A. Verdejo-García and M. Carmona-Perera designed the study and conducted statistical analysis. A. Molina-Fernández and M. Carmona-Perera collected the data. A. Verdejo-García, L. Young and M. Carmona-Perera wrote the first draft. All the authors contributed to the main content and provide critical comments on the final draft.

Conflict of interest

None declared.

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