

## Format for ANSWERING REVIEWERS

June 12, 2015



Dear Editor,

Please find enclosed the edited manuscript in Word format (ESPS Manuscript NO: 17486).

**Title:** On the role of impulsivity and decision-making in suicidal behavior

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**Name of Journal:** *World Journal of Psychiatry*

**ESPS Manuscript NO:** 17486

Many revisions have been incorporated and the editorial has been revised in line with the reviewers' suggestions

Most specifically:

First reviewer's comments:

1. The reviewer suggested that we include the term impulsivity in the title.

**Answer:** In line with the reviewer's comment, we corrected the title.

2. The reviewer emphasized the need to elaborate on the complexity of impulsivity and its various dimensions.

**Answer:** We want to thank the reviewer for this comment. We certainly agree with that and thus we added some paragraphs regarding the complexity of the term and the various aspects of it.

Please see the following paragraphs:

Impulsivity, is a multidimensional concept that encompasses a broad range of behaviors that reflect poor planning, premature responding before considering consequences, sensation-seeking, risk-taking, an inability to inhibit responses, and preference for immediate over delayed rewards [6]. The difficulty to control one's behavior is thought to stem from deficits in the self-regulation of affect, motivation arousal and deficits in working memory and higher order cognitive functions. This failure is connected to brain systems modulating behavioral inhibition [7].

Some studies have suggested aggressive-impulsive behavior as the underlying link between family history of suicide and new attempts by probands especially in youth [8] [9] [10]. The inheritance of suicidal behavior is probably linked to the predisposition to psychiatric disorders combined with the tendency an individual has towards aggressive-impulsive behaviors [11]. (See p.2)

And

Thus, an important distinction is between the state and trait dimensions of the impulsivity-suicide relationship, that is, impulsivity of the attempt (state) and impulsivity of the attempter (trait). These may not completely overlap or be equivalent. It may thus be crucial to distinguish between a suicidal act that is impulsive (or not) and a person who can be impulsive or not [14]. Different studies have shown that although people who attempt suicide tend to be more impulsive than those who do not, the actual act of completed suicide is often not made impulsively [15] [16]. Impulsive suicide attempts involve little or no preparation or premeditation while preparation and forethought precede non-impulsive suicide attempts [17]. Suicidal planning is related to, but not synonymous with, suicidal intent. Planned suicide is a more complicated construct that involves a more subjective element drawn from the desired outcome and perceived lethality of the act of self-harm [18]. (See p.3)

3. The reviewer also commented on the need to clarify whether deficits in decision-making thought to be associated with suicide attempts are trait or state characteristics.

In line with this comment, we added the sentences as follows:

**Answer:** We agree with the reviewer about the importance of understanding how state vs

trait dependent decision-making may affect suicidality, unfortunately, there isn't much research addressing this specific question. We do however mention on page 5, the conclusions of Westheide (2008), which promote a state-dependent effect, and also describe a possible mechanism by which trait-characteristics of decision-making may affect suicidality (also page 5). The sentences have been re-written for clarification. As follows:

Westheide et al. (2008) [40] found that suicidal ideation was associated with impaired decision-making on several executive tasks including the IGT and a go/no-go task. They also indicated that depressive suicide attempters had a state-dependent component of decision-making, derived from the fact that former suicide attempters who did not have suicide ideations at the time of the study performed noticeably better [40]. This state dependent process may also be related to cognitive load, in the same way as somatic pain affects performance on decision-making tasks [41] the impact of continuous emotionally negative thoughts or psychological pain, may preoccupy cognitive resources, and thus lead to inferior judgments and decisions. (See p. 6)

And also

Trait like deficits in decision-making may impair people's ability to resolve problems and dilemmas and thus create an accumulation of stressors leading to further pain. (See p.7).

4. The reviewer suggested some mention of the genetics and neurochemistry of impulsivity and suicidal behaviour.

In line with this comment, we added the following paragraph.

Some studies have suggested aggressive-impulsive behavior as the underlying link between family history of suicide and new attempts by probands especially in youth [8] [9] [10]. The inheritance of suicidal behavior is probably linked to the predisposition to psychiatric disorders combined with the tendency an individual has towards aggressive-impulsive behaviors [11]. (See p.2). See also answer to comment 2.

5. The reviewer commented on the need to be clearer about the various terms incorporated in suicidal behaviour.

**Answer:** We agree with that comment and therefore added a paragraph that specify the

various terms and the difference between them:

The term suicidal behavior is a continuum with various terms incorporated in it, including deliberate self-harm, suicide attempts and eventually completed suicide. Moreover, there is also diversity in suicide attempts, mainly between violent and nonviolent failed attempts. However, the main difference in the literature is the one between suicide ideation from one hand and suicide attempts from the other hand ( see p.1)

6. The reviewer asks does suicide always imply a deficit in decision making ('bad decisions'), or can they be a rational choice ('right decisions' in a way) in the face of a seemingly insurmountable problem? He further suggests that the latter is implied in some of the theories quoted by the authors.

**Answer:** Our interpretation of the question is as follows: the reviewer is asking whether we or rather, the originators of the theories in the manuscript, consider it to be possible for suicide to be the result of rational choice. The answer to that question depends on how one defines or measures "good" and "bad decisions". In the field of decision-making, it is usually done by creating a scenario in which decisions need to be taken in order to achieve a defined objective (eg. make as much money as possible). Then, the results generated by human decisions are compared to normative models. For example in the IGT, the strategy with the greatest expected value (given by normative model) is compared to a participants' strategy. The greater the deviation, the "worse" the participant's strategy is considered to be.

The answer to the reviewers question depends on the objective in the scenario. If the objective is to stay alive, a suicide will always be considered a "bad choice" by definition, because it's the opposite of the objective and more importantly it deviates significantly from the normative model for reaching this objective. However, when the objective is defined as the reduction of suffering or overcoming a problem, the act may be considered rational in theory, but not in practice. This is because there are no normative models to which we could compare the human choice. It is difficult if not impossible to objectively quantify suffering, and the outcome of death.

Second reviewer comments:

1. The reviewer comments at the need to better discuss the link between suicide and heuristics. As an example he suggests that, suicide attempter may have limited mental capacity (as their thought was occupied by negative information) to perform systematic process, that may stop the suicide attempt.

**Answer:** We would like to thank the reviewer for this excellent comment. There are a number of studies demonstrating the negative effects of somatic or physical pain on performance on decision-making tasks. This is probably, as the reviewer suggests, due to limited resources (or attention etc). We've added a paragraph about this on p 5. As follows:

Westheide et al. (2008) [40] found that suicidal ideation was associated with impaired decision-making on several executive tasks including the IGT and a go/no-go task. They also indicated that depressive suicide attempters had a state-dependent component of decision-making, derived from the fact that former suicide attempters who did not have suicide ideations at the time of the study performed noticeably better [40]. This state dependent process may also be related to cognitive load, in the same way as somatic pain affects performance on decision-making tasks (41), the impact of continuous emotionally negative thoughts or psychological pain, may preoccupy cognitive resources, and thus lead to inferior judgments and decisions.(see p.6)

2. The reviewer suggests that neuro pathway and brain areas that are associated with the decision making of suicide areas are associated more with hot executive function, but not the cool executive function. He suggests that we provide a theory that clarified the role of hot and cool executive functions on suicide.

**Answer:** The main reason why "hot cognition" is focused on in detail in this manuscript is that the majority of the decision-making studies in suicide employ reward-based tasks, such as the IGT. We agree that providing a theory on the role of hot and cool executive functions on suicide is important, but feel that it may be more useful to develop such a theory after the effects of "cool cognition" on suicide have been studied to a greater extent.

3. The reviewer asks us to clarify some issues as follows: the differences of executive

function and decision-making, the relationship inhibition ability and the globe executive function, inhibition vs. Impulsivity trait, etc. He adds that due to those tasks are involved in those abilities as above, doing inference should be cautious. Especially when the authors try to draw the conclusion about relationships among the brain regions, tasks performance, and suicide behaviors.

**Answer:** We agree with the reviewer in that caution needs to be taken when making causal inferences regarding specific brain regions, task performance and suicidal behaviors. For this reason we have tried to be careful with focusing only on the description of observed differences in brain regions specific to suicide attempters in relation to task performance. We are trying to make the point that many of the brain regions that have been shown to be associated to suicidality regions have also been associated to different facets of decision-making and impulsivity. Although this does not mean causality, and it doesn't tell us much about the underlying processes, it does support the idea that decision-making and impulsivity are important candidates for further research.

4. The reviewer commented that the figure was unclear and needs more illustration. Besides, the author mentioned 'Deficits in decision-making may impair people's ability to resolve problems and dilemmas and thus create an accumulation of stressors leading to further pain' which did not match to previous viewpoint.

**Answer:** In accordance with the reviewer's comment we explained all the pathways and clarified the figure as follows:

Figure 1 depicts this theoretical model of associating decision -making and suicidal behavior. The model is built on the well-known path that leads from unbearable mental pain to suicide trough suicide ideation with different actors (demographic, biological, psychological and interpersonal) contribute to this path [45]. However, According to our model, unbearable mental pain also facilitates suicide attempts trough changing decision making features, suggesting that at least some people who engage in suicidal behavior tend to overestimate the value of certain future outcomes and see suicide as attractive relative to other alternatives [34]. Yet other direction of influence in our model is the effect of deficit in decision making and the inability to accurately resolve problems on the levels of mental pain and as a results - on the higher risk to engage in suicide behavior.(see p. 6).

