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Doctoral Thesis

**Risk-taking behaviour in people diagnosed with Bipolar Disorder**

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The candidate confirms that the work submitted is his/her own and that appropriate credit has been given where reference has been made to the work of others

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Critical Appraisal	4000	1125	5125
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## *Abstract*

This thesis was designed to explore the nature of risk-taking behaviour in people diagnosed with Bipolar Disorder (BD). Research has traditionally attributed risk-taking behaviour in BD to difficulties in impulse control. Nonetheless, impulsivity remains predominantly measured using self-report questionnaires, with dubious validity. The links between impulsivity and risk-taking have also been challenged by new research in the field of decision-making suggesting a different conceptualisation of this often misunderstood set of behaviours. In particular, Fuzzy Trace Theory (FTT) offers an interesting framework to understand risk-taking as a “rational/deliberate” act, rather than an impulsive one, providing evidence for a “reasoned route” to risk-taking.

This piece of research comprised of a systematic review, an empirical paper and a critical appraisal. The aim of the systematic review was to clarify whether there is consistent evidence to suggest that risk-taking behaviours are more prevalent in people diagnosed with BD compared to controls. Clinical and demographic predictors of risk-taking in BD were also explored. The research paper aimed at characterising a group of people with BD in the context of FTT and to explore whether measures of FTT were predictive of higher risk-taking tendencies after controlling for impulsivity and mood. Finally, the critical appraisal aimed at discussing the dilemma of conducting quantitative research as a trainee clinical psychologist.

The review suggested that people diagnosed with BD are more likely to engage in risk-taking behaviour, but that this is dependent on mood state and mainly prevalent during states of mania. Some evidence in support of clinical and demographic predictors of risk-taking in BD was also found. The empirical paper also supported the hypothesis that FTT predicts risk-taking behaviour, even after accounting for the effects of mood and impulsivity. The findings were discussed in relation to previous research on the topic.

## **Declaration**

This thesis reports research undertaken in partial fulfilment of the Doctorate in Clinical Psychology at Lancaster University. I confirm that the work presented is my independent work, except where otherwise referenced. The work has not been submitted for any other academic award.

Anna Chiara Sicilia

Signed:

Date:

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Running head: RISK TAKING IN BIPOLAR DISORDER

Section 1: Literature Review

**Risk-Taking in Bipolar Disorder: A systematic review**

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Disorders.

### Abstract

**Objectives.** This systematic review aimed at clarifying the links between risk-taking behaviours and the different mood states of bipolar disorder. It also aimed at identifying any demographic and clinical predictors of elevated risk-taking in people diagnosed with bipolar disorder.

**Methods.** A systematic computerised search of the main bibliographical databases (PsycINFO, CINAHL and Medline) was conducted. Electronic searches were supplemented by hand-searching and articles that met inclusion criteria were included for consideration. A total of 23 studies were identified, which consisted of cross-sectional and case-control studies investigating risk-taking behaviours in bipolar disorder through behavioural tasks and self-report questionnaires. Both clinical and non-clinical samples were included.

**Results.** Higher rates of risk-taking behaviours during manic states of bipolar disorder were consistently reported in 12 out of 13 studies involving self-report measures, but not in studies involving behavioural tasks. Only one study found evidence for higher risk-taking during depressive states and no study during euthymia. There was also preliminary evidence in support of demographic and clinical predictors of risk-taking behaviours in bipolar disorder.

**Limitations.** This review had several limitations. There were many studies adopting a cross-sectional design and not including a control group, which made it challenging to interpret results and comment on generalisability. Finally, it was not possible to establish causality between variables as only correlations were reported.

**Conclusions.** This review found evidence in support of the idea that risk-taking behaviours are limited to the (hypo)manic states of bipolar disorder. Nonetheless, there were some limitations in the studies included for review, thus results need to be interpreted cautiously. Further research is needed to help clarify the nuances behind risk-taking in this population.

**Keywords.** Bipolar disorder, (hypo)mania, risk-taking behaviour

## Risk-taking in bipolar disorder: A systematic review

### 1. Introduction

Bipolar disorder (BD) is defined as a cyclical condition involving episodes of significant impairment of mood and behaviour, intermixed with periods of full or partial recovery and improved functioning (National Collaborating Centre for Mental Health, 2014). Due to its cyclical and heterogeneous nature, BD is often difficult to characterise (Angst, 2013). The main criteria of the Diagnostic and Statistical Manual of Mental Disorders 5<sup>th</sup> Edition diagnosis of BD include “presence of five out of nine diagnostic symptoms with a minimum duration of 2 weeks” and a “change from previous functioning” (DSM-5; American Psychiatric Association, 2013).

The publication of the DSM-5 saw several changes to the way BD is characterised in diagnostic terms. These changes were mainly a response to a main critique brought forward for the DSM-4, which identified a trend towards under-diagnosis of BD (e.g., Ghaemi et al., 1999). One of the main changes in the DSM-5 was the introduction of new subcategories of BD diagnosis and the introduction of the idea of a “bipolar spectrum” in an attempt to increase its diagnostic validity (Angst, 2013). Nonetheless, the validity of BD diagnosis has been put under scrutiny in recent years, particularly following the publication of the DSM-5, which was criticised for potentially blurring the boundaries between psychiatric diagnosis and “normal human experiences” (e.g., Phillips & Kupfer, 2013).

Despite its shortcomings, psychiatric diagnosis remains the most utilised characterisation of mental health difficulties, particularly within quantitative research. Therefore, for the purpose of this paper DSM-5 diagnosis of BD will be utilised as a criterion to categorise the papers included.

BD is considered one of the most disabling health conditions, ranked 4<sup>th</sup> for disability-adjusted life-years in people aged 10-24 (Gore et al., 2011). One of the contributing

problems associated with this disability, are the negative consequences associated with engagement in risk-taking behaviours, such as impulsive overspending and risky sexual practices (Blanco et al., 2008; Chamorro et al., 2012; Christopher et al., 2012).

Risk-taking behaviours can have devastating consequences for people diagnosed with BD in several domains, both in the short term and in the longer term. There is a strong association between drugs/alcohol abuse and BD (Nesvåg et al., 2015). BD has also been linked with pathological gambling (Kim et al., 2006), which could be understood as the result of a higher likelihood to engage in excessive spending sprees, typical of the manic stages of the condition. BD has also been found to be related to impulsive suicide (Clements et al., 2013), which is of high relevance when conceptualising risk-taking behaviours in this clinical population.

In addition to the immediate negative impact of risk-taking, these behaviours have also been associated with long-term negative consequences. Engagement in risk-taking activities can lead to damage in relationships, contributing to a lack of social support, which has been linked to worse outcome in BD (Altman et al., 2006). Finally, psychological theories of BD suggest that risk-taking behaviours are often regretted when the mania subsides, leading to intense feelings of guilt and shame that can in turn contribute to the start of a depressive episode (Lam et al., 2010).

There has been an increased interest in risk-taking behaviours in BD in the recent years. Studies in the field have attributed risk-taking to impairments in decision making, involving executive function, memory, attention and cognitive flexibility, which have been observed in neuroimaging studies of people diagnosed with BD (Martínez-Arán et al., 2004; Robinson et al., 2006; Robinson and Ferrier, 2006). However, although there is evidence for decision-making impairments across mood states of BD, the ways in which risk-taking

behaviours change between the manic, depressed and euthymic states of the condition remain poorly understood.

### *1.1. Decision making and risk-taking in bipolar disorder*

Decision-making is essential to daily functioning; during their lives individuals are faced with contrasting alternatives to choose from in order to reach a certain outcome (Ibanez et al., 2012). Selecting between two or more, often contrasting, choices is a process that involves some degree of risk-taking. In fact, making decisions usually involves a careful trade-off of risks and benefits to select the option with the most benefit for a particular person (Mishra, 2014).

Decision-making is a complex cognitive ability that involves a close interaction between different areas of the brain responsible for attention, learning, memory, motivation and emotion (Bechara et al., 2000; Brand et al., 2006). As people progress from childhood to adulthood, these neurological circuits undergo a process of maturation that leads to an improvement in decision making abilities with age (Reyna et al., 2015; Reyna and Farley, 2006; Tymula et al., 2013), up to the stages of later life (65+ years), where there is a rapid decline in general cognitive functioning and decision-making (Tymula et al., 2013). Therefore, it can be inferred that a disruption in this maturation can contribute to impairments in decision making.

There is evidence that BD progression is associated with impairments in memory, attention and executive function (Robinson et al., 2006). Difficulties in decision making abilities, in particular decisions involving risk, are now included in clinical descriptions of both bipolar depression and mania (American Psychiatric Association, 2013) and supported by research in the field. Euthymic clients with BD have also been shown to present with neurocognitive impairments related to attention, executive processing and memory (Glahn et al., 2006), which have been linked with an increased focus on potential gains rather than

losses (Yechiam et al., 2008). Also, BD has been characterised by an increased tendency to work towards a reward, often without sufficient planning (Johnson and Carver, 2012; Mason et al., 2014), and has been associated with impairments in emotional regulation and executive functioning (Green et al., 2007), all instrumental factors that when not working appropriately, have been linked to risk-taking in non-clinical populations (Magar et al., 2008), leading to risk-taking behaviours in people with BD too (Yechiam et al., 2008).

Clients diagnosed with BD have also been found to score higher than people diagnosed with schizophrenia and unipolar depression on measures of extraversion and openness to experience (Bagby et al., 1997), which have been associated to high levels of risk-taking behaviours in non-clinical populations (Lauriola and Levin, 2001; Nicholson et al., 2005).

These findings provide evidence to show a tendency towards risky behaviour in BD, which has been associated with different levels of impairment in multiple brain systems, which could be some of the mechanisms behind risk-taking behaviours in both non-clinical populations and in people diagnosed with BD. Nonetheless, research in the field is still conflicting regarding possible changes in decision-making abilities across different mood episodes and euthymic stages of BD. Whilst some studies report impaired performance in neurocognitive tests of risk-taking, such as the Iowa Gambling Task (IGT; Christodoulou et al., 2006; Martino et al., 2011) in euthymic clients with BD, other studies found that there was no difference in scores on decision-making tasks between euthymic clients with BD and healthy controls (Clark et al., 2002; Rubinsztein et al., 2006).

Studies conducted with non-clinical populations at risk for (hypo)mania are also of high relevance. There is evidence to show that a higher tendency to engage in risk-taking behaviours is not limited to people with an established diagnosis of BD, but it may also be

present in people at risk for (hypo)mania who do not have a formal diagnosis (e.g., Richardson and Garavan, 2010).

There has been some progress in the study of decision making and risk-taking in BD, however there are aspects that require further study. For example, despite some studies proposing impairments in different areas involved in decision-making involving risk in BD, it remains unclear whether increased risk-taking is a stable feature of BD or whether the observed impairments vary across the manic, depressive and euthymic mood states of the condition.

Studying risk-taking behaviour in BD, particularly during states of mania, poses a significant challenge; research found that people experiencing (hypo)mania may enjoy the positive emotions associated with it and may covet the initial stages of a manic episode (Lam et al., 2005; Lobban et al., 2012). The positive experiences reported during states of mania can contribute to the ambivalence to treatment, which is often observed in people experiencing (hypo)mania (Lobban et al., 2012). People in (hypo)manic states of BD often describe mania as a “welcome holiday” from the frequent periods of depression, thus experiencing a conflict around the management of (hypo)mania (Fletcher et al., 2013)

Therefore, further increasing our understanding of risk-taking and the mechanisms behind this behaviour could be beneficial as it could contribute to the design of interventions that clients can engage with and that can build on clients’ strengths to increase positive experiences and reduce the negative impact of BD. In particular, exploring studies involving non-clinical populations is important to clarify the mechanisms behind the development of risk-taking behaviours in BD.

At present, there are no systematic reviews available that specifically investigate risk-taking in people diagnosed with BD. The aim of this paper is to systematically review the literature on risk-taking in BD. The following research questions will be addressed:



1. Is there evidence for a higher likelihood of risk-taking behaviours of BD compared to the general population?
2. Are there differences in type of risk-taking behaviours between mood states of BD?
3. Are there any identifiable demographic and clinical predictors of risk-taking in BD?

## **2. Method**

A systematic review of the literature was conducted of papers investigating risk taking in people diagnosed with bipolar disorder.

### *2.1. Search Strategy*

The following databases: PsycINFO, CINAHL and Medline were searched for relevant articles. The search terms used were: (“risk taking” OR “high-risk behaviour” OR “risky behaviour”) AND (“bipolar disorder” OR “mania”). Electronic searches were supplemented by hand searching the reference list of the articles deemed appropriate for inclusion as well as other key articles on the topic. Studies were selected by reading the titles and abstracts of the articles retrieved to assess for suitability. The opinion of a second reviewer was requested when in doubt.

### *2.2. Study Selection*

Studies were assessed for suitability based on the following inclusion criteria:

1. Quantitative studies including clinical samples with a diagnosis of Bipolar Disorder or non-clinical samples assessed for hypomania.
2. Studies investigating risk-taking behaviour through self-report questionnaires and/or behavioural measures.
3. Studies published in peer-reviewed journals in English.

Studies were excluded if one (or more) of the following conditions were met:

1. Qualitative studies; this was due to the difficulty in comparing qualitative reports with more objective measures of risk-taking.
2. Studies in a language other than English.
3. Review studies.
4. Studies utilising measures of decision-making which were not specifically related to risk-taking.
5. Studies including aggregated samples with more than one psychiatric diagnosis, where it would have been challenging to extract meaningful results specifically applying to the BD group.
6. Neuroimaging studies; it was beyond the scope of this review to analyse papers providing findings from neuroimaging tests.

A flowchart of the selection process, including the number of studies retrieved at each stage, is presented in Figure 1. A total of 23 studies were included for review.

### *2.3. Quality control*

Reporting bias was assessed using the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement tool for cross-sectional, cohort and case-report studies (von Elm et al., 2014). Studies were scored on individual items and the final total scores were commuted into percentages. Discrepancies were discussed with a second rater, GPA on a need basis. Studies were not excluded based on quality due to the paucity of papers in the field. A summary of findings is reported in the result section and in Table 1.

## **3. Results**

### *3.1. Study Characteristics*

An overview of the characteristics of the studies included in the current review (n=23) is presented in Table 2. Participants' mean age ranged from 15 to 45. Studies included both clinical (n=19) and non-clinical (n=4) samples. The design of the individual studies varied; 16 studies were case-control and 7 were cross-sectional. Sample sizes ranged significantly (34 to 720), with a trend towards larger samples in studies involving non-clinical groups.

### 3.2. *Reporting Quality*

The reporting quality of individual papers based on the STROBE tool for cross-sectional and case-control studies ranged from 29% to 76%, where high values means good quality. The quality of the papers was generally good across all sections ( $M = 62\%$ ,  $SD = 11.08$ ), with most papers reporting eligibility criteria, key findings, limitations and a balanced interpretation of the results. Most studies (n=19), also reported the role of funding sources and potential conflict of interests. Nonetheless, common issues were identified across them; no study included information on how potential sources of bias were addressed. Most studies also did not report details of how the participants sample was arrived at and how missing variables were handled. Power calculations were never reported.

### 3.3. *Key Findings*

The aim of the current review was to summarise findings from quantitative studies investigating risk-taking in people diagnosed with BD and non-clinical samples assessed for hypomania. Overall findings regarding higher risk-taking in BD were mixed, particularly due to the variety of different measures of risk-taking adopted by each study included in this review, and need to be interpreted cautiously. Results from individual studies offered some evidence for the presence of individual predictors of risk-taking behaviours in BD. More information is reported below.

To answer the three research questions, findings were organised using the following criteria: first, data providing evidence for and against the presence of risk-taking behaviours

in BD was presented. This initial section was divided into two subsections presenting findings from studies utilising behavioural measures and findings coming from self-report questionnaires. Information about differences in mood states was integrated in this section. Finally, data from studies reporting on predictors of risk-taking in BD was summarised.

### *3.4. Risk-Taking Behaviours in BD and mood states*

#### *3.4.1. Findings from behavioural measures*

In total, 47% (n=11) of the studies used behavioural measures of risk-taking; these included the Iowa Gambling Task (IGT; n=4), the Balloon Analogue Risk Taking Task (BART; n=4), the Cambridge Gambling Task (CGT; n=1), the Affective Go/No Go Test (AGNT; n=1), a Risky Choice Task (n=1) and a Framed Risky Choice Task (n=1).

Results from these studies were contrasting. Two studies (Adida et al., 2008; 2011) found people diagnosed with BD in manic, depressed and euthymic phases to perform significantly worse on the IGT than healthy controls. Nonetheless, one study (Edge et al., 2013) involving a sample of people in remission from BD-I reported no significant differences in scores between the BD-I and the control groups. Similarly, another study (Martino et al., 2011) involving a sample of people in a euthymic stage of BD found no significant differences between the BD and the control groups in the IGT.

Results for the BART showed a more consistent trend of results. The majority of studies adopting the BART (n=4) found no differences in overall BART performance between people diagnosed with BD and control groups. However, Hıdıroğlu et al. (2013) reported that the BD group and their first-degree relatives showed impaired learning trends in the BART, represented by lower adjustment scores after the loss of a temporary gain. Only two studies found a difference in BART scores between BD and control groups. Holmes et al. (2009) found that people with BD and a history of alcohol abuse performed significantly worse than both people with BD without a history of alcohol abuse and healthy controls.

Moreover, a study involving a non-clinical sample of adults from the community (Devlin et al., 2015), found that people with a higher hypomania score measured by the Hypomania Personality Scale (HPS) showed poorer performance in the BART than people with a lower hypomania risk.

Interestingly, Roisier et al. (2009) adopted a mood induction paradigm to test the hypothesis that decision-making impairments are limited to the manic stages of BD. Results showed that, following positive mood induction, which mimics (hypo)mania, people in remission from BD showed slower decision making on the CGT (measured by longer deliberation time), but no impairments in general CGT performance compared to controls. Finally, two studies involving a framed risky choice task based on a series of dilemmas involving two gambles (Chandler et al., 2009) and a risky choice task where participants were required to choose between two simultaneously presented gambles (Saunders et al., 2016), found no differences in general tendency for risk-taking between the BD and the healthy control group.

In summary, 8 out of 11 studies (73%) involving behavioural measures did not find differences in risk-taking between BD or (hypo)mania compared to controls when measures of risk-taking are taken into account.

#### *3.4.2. Self-report measures*

Thirteen studies (56%) used self-report measures to assess risk-taking. Among these, 9 (69%) involved clinical samples. Findings were consistent across studies, both in clinical and non-clinical samples, where BD mania and higher hypomania risk were found to be associated with more risk-taking behaviours.

Studies involving clinical samples found that BD people in a manic state scored higher than healthy controls and people diagnosed with a Major Depressive Episode on risk-taking self-report measures (Goldberg et al., 2005). Women in a euthymic state of BD also

reported to have been more frequently diagnosed with a sexually transmitted disease, have had sex with casual partners, non-monogamous partners and partners with HIV unknown condition than healthy controls, behaviours that are considered to be markers of risk-taking. Nonetheless, further analysis showed that higher risk-taking behaviours were associated with younger age at onset, longer diagnostic delay and higher number or (hypo)manic episodes (Marengo et al., 2015).

Hariri et al., (2011) found no significant differences between people diagnosed with BD and the control group on the likelihood to engage in risky sexual behaviours. One study (Fletcher et al., 2013) involving people in euthymic, manic and depressed states of BD found that this group reported a higher likelihood to overspend and engage in risky sexual behaviours than the control group. Nonetheless, further analysis showed that these differences were related to alcohol abuse, with participants reporting increased use of alcohol during manic stages to be one of the reasons behind the increase in risky sexual behaviours and overspending. Another study found that 46% of adolescents diagnosed with BD reported a positive history of sexual risk behaviour in the past year (Bakare et al., 2009). Nonetheless, there was no control group and the study involved a sample of adolescents, who are known to be a high-risk group for sexual risk behaviours, regardless of BD diagnosis (Potard et al., 2008).

Two studies involving a sample of people diagnosed with BD who were also HIV positive found that BD was associated with sex with commercial partners, sex outside the primary relationship, smoking and excessive drinking before the HIV diagnosis, illicit drug use before and after the HIV diagnosis (de Sousa Gurgel et al., 2013), unprotected sex with HIV negative partners in the past 6 months (Meade et al., 2012) compared to the US general population and people without a BD diagnosis respectively. BD was also found to be associated with a lower adherence to Antiretroviral (ARV) treatment, in particular in people

who reported having had unprotected intercourse with HIV negative partners and who had greater symptoms of mania and depression (Meade et al., 2012), compared to controls.

Finally, two studies involving a sample of people diagnosed with BD with comorbid substance use disorder (SUD) found that they reported high rates of having had unprotected sex, multiple sexual partners (Meade et al., 2008; 2011), sex with prostitutes and injection drug use (Meade et al., 2008). Meade and colleagues (2008) compared rates from their sample with available rates from the US general population and found that their sample had higher rates of risk-taking behaviours.

Similar trends were observed in non-clinical samples, where hypomania risk was found to be associated with increased expected involvement in risk-taking activities in the next 6 months (Devlin et al., 2015). There were significant correlations between higher overall scores on the Domain-Specific Risk-Taking (DOSPERT) scale and higher hypomania scores as measured by the HCL-32 (Richardson & Garavan, 2010). There was no relationship between DOSPERT subscales and hypomania risk, suggesting that hypomania is related with general risk-taking but not with a specific type of risk taking. Dvorak et al., (2013) found that high-risk for mania was only associated with a higher likelihood to engage in risky sexual events when there was low effortful control measured by the UPPS-P Impulsive Behaviour Scale, but not when effortful control was high. Finally, in one study (Stewart et al., 2012) adolescents with elevated symptoms of mania (ESM+; Mean Age 14.89, SD=1.31) were found to be more likely to have had vaginal/anal sex, have had two or more partners in the last 90 days, test positive for STIs, have had unprotected sex and exchange sex for money, drugs or shelter than adolescents who did not meet (sub)threshold criteria for mania.

In summary, studies using self-report measures showed a more consistent pattern of significant associations between BD and (hypo)mania than studies involving behavioural

measures. In total, 12 studies (92%) involving self-report measures found evidence of elevated risk-taking in people diagnosed with BD and non-clinical groups at risk of hypomania, whilst only one study found no differences between BD and control groups on risk-taking behaviours.

### *3.5. Predictors of risk-taking*

In total, 14 studies (61%) reported on predictors of risk-taking behaviours in BD. Some demographic predictors were found; older age was found to be a significant predictor of a higher likelihood of having engaged in risky sexual behaviours in the past six months in a non-clinical sample of university students assessed for (hypo)mania risk (Dvorak et al., 2013). Interestingly, no associations between age and risk-taking were found in a sample of people diagnosed with BD Type 1 (Edge et al., 2013). Low level of education was also reported as a significant predictor of higher risk-taking (Adida et al., 2011). However, Edge et al. (2013) found no relationship between level of education and risk-taking. In this study, marital status of the parents was found to be a significant predictor of higher-risk taking, with children of single parents reporting to be more likely to engage in sexual risk-taking.

The role of impulsivity in predicting risk-taking behaviours was also explored in individual studies. Three out of four studies reported impulsivity to be significantly correlated with higher risk-taking (Hidiroglu et al., 2013; Holmes et al., 2009; Richardson et al., 2010). One study found impulsivity not to be a significant predictor of higher risk-taking (Edge et al., 2013). Findings were mixed regarding the type of impulsive behaviour related to higher risk taking; Hidiroglu et al. (2013) found higher scores on the Barratt Impulsiveness Scale (BIS) Total, BIS-Attentional, BIS-Motor and BIS-Non Planning scales to be predictive of higher risk-taking, whilst Richardson et al. (2010) only found significant associations between the BIS-Attentional and BIS-Motor subscales with higher scores on the HCL-32 Risk-Taking/Irritable subscale. Similarly, Holmes et al. (2009) only found higher BIS-Motor



subscale scores to be associated with higher risk-taking, measured by more balloon popped on the BART, whilst they found no correlations between the BIS-Attentional and BIS-Non Planning subscales with scores on the BART. Finally, Edge et al. (2013) found no relationship between impulsivity scores and risk-taking in a sample of participants diagnosed with BD Type 1.

There were some significant associations between mood state and risk-taking. Adida et al. (2011) reported high depression ratings (as measured by HDRS scores) to be a significant predictor of higher risk-taking. Meade et al. (2012) also found greater symptoms of depression to be associated with a higher likelihood of having sex with HIV negative partners in a sample of participants with BD who were HIV positive. Meade et al. (2011) found depression to be unrelated to higher sexual risk behaviour. Marengo et al. (2015) found higher number of depressive and (hypo)manic episodes to be correlated with repeated STIs. A recent manic episode (Meade et al., 2008), more average weeks of mania (Meade et al., 2011) and greater severity of mania (Meade et al., 2012) were also associated with a higher likelihood to engage in sexual risk-behaviours. Edge et al. (2013) found mood state not to be a significant predictor of a higher likelihood to engage in risk-taking.

Several studies reported on clinical variables; longer duration of illness, higher number of previous episodes of BD, higher number of hospitalisations (Hidiroglu et al., 2013), younger age at onset of BD and longer diagnostic delay (Marengo et al., 2015) were all significant predictors of higher risk-taking. Interestingly, lower severity of BD symptoms was associated with higher HIV risk in a study involving people diagnosed with BD who tested positive for HIV (Meade et al., 2008). Edge et al. (2013) found illness severity (higher number of previous episodes of BD and hospitalisations) not to be a significant predictor of higher risk-taking. Suicide was also linked with risk-taking; one study found history of suicide attempts to be a significant predictor of a higher likelihood to engage in risk-taking

behaviours (Martino et al., 2011). Edge et al. (2013) found number of suicide attempts not to be significantly associated with rates of risk-taking and BD type not to be a significant predictor of risk-taking.

Individual studies reported a relationship between medication and risk-taking. Namely, use of benzodiazepine, non-use of SNRI antidepressants (Adida et al., 2011), poorer adherence to psychiatric medication (Meade et al., 2012) and taking antipsychotic medication (Reddy et al., 2014) were all significant predictors of higher rates of risk-taking. Use of mood stabilisers was not found to be related to higher risk-taking (Edge et al., 2013). Among other predictors reported in individual studies, lack of insight (Adida et al. 2008), sensation-seeking (Dvorak et al., 2013), family history of BD (Adida et al., 2011), presence of co-morbid disorders (Bakare et al., 2009), history of substance abuse (Marengo et al., 2015), greater drug severity (Meade et al., 2008) and cocaine use (Meade et al., 2011) were all associated with higher rates of risk-taking.

Some protective factors were also identified; Bakare et al. (2009) found that high/moderate levels of religious activities were protective against risk-taking. Dvorak et al. (2013) reported that effortful control was protective against risk-taking in a community sample of university students; however, this relationship was only observed for participants at high risk for mania.

#### **4. Discussion**

The papers included in the current review yielded interesting findings to help clarify the nuances of how heightened risk-taking manifests in the BD population and people with high levels of hypomania. The discussion section was divided into two main areas to address the three research questions of this review: first, findings on rates of risk-taking in BD and differences in risk-taking across mood states are discussed. Subsequently, an interpretation of the results about predictors of risk-taking is presented.

#### *4.1. Risk-taking in BD and differences across mood states*

Overall, the results of the current review were mixed regarding the idea that BD is characterised by higher risk-taking than the general population. Interestingly, some variability was observed when method of evaluation was considered; studies involving behavioural tasks showed less conclusive findings than those involving self-report measures, therefore results must be interpreted cautiously.

Studies involving behavioural tasks used a variety of measures to assess risk-taking, which makes it difficult to interpret their findings. Overall, studies using the IGT as a measure of risk-taking found a trend for higher risk-taking in people who were experiencing a manic or depressed mood state, whilst there were no differences between people in remission from or in euthymic stages of BD and control groups on IGT scores. Similar trends were observed in studies using the BART, where no differences were found between people in remission from or in euthymic stages of BD and control groups in BART scores.

Studies involving self-report measures showed more consistent findings than studies involving behavioural measures, reporting higher risk-taking behaviours in people experiencing a manic episode of BD or in non-clinical samples with elevated scores of (hypo)mania. This pattern was not observed in euthymic samples or non-clinical samples with low scores. Only three studies found evidence of higher risk-taking in participants with BD who were not experiencing a manic episode (Bakare et al., 2009; Fletcher et al., 2013b; Marengo et al., 2015). Nonetheless, Fletcher et al. (2013) reported that alcohol abuse during mania was a possible explanation for the observed higher rates of risky sexual behaviours and overspending during these states. Alcohol use has been associated with an increased likelihood to engage in risk-taking behaviours (e.g., Gayson et al., 2015), thus the effects of alcohol need to be taken into account when interpreting these results. Interestingly, Marengo

et al. (2015) found that higher risk-taking was associated with number of manic episodes experienced.

Finally, Bakare et al., (2009) recruited a group of adolescents diagnosed with BD. Adolescence has consistently been associated with a higher likelihood to engage in risk-taking behaviours (e.g., Potard et al., 2008), therefore it is likely that the findings observed are a result of the age group involved in the study rather than their clinical characteristics. Moreover, it is important to note that the study did not include a control group, thus the “high” rates of risk-taking behaviours reported appear to be based on subjective interpretation by the authors.

In summary, the results of the current review suggest that risk-taking could be conceptualised as a state marker of mania, rather than an endophenotype of BD. In support of this claim, Hidiroğlu et al. (2013) found no differences between first-degree relatives of people with BD and healthy controls in BART scores. Moreover, (Devlin et al., 2015) found higher (hypo)mania risk to be associated with poorer performance on the BART in a non-clinical sample of adults from the community. A finding which is particularly noteworthy comes from Roiser et al., (2009) who found that, following mood induction, which mimics (hypo)mania, people in remission from BD showed slower decision making on the CGT, but no impairments in general CGT performance compared to controls. However, it is important to note that the study by Roiser et al., (2009) involved a small sample of 15 volunteers, thus it is difficult to comment on the generalizability of their findings.

Research in the field of BD has shown evidence for neuropsychological deficits affecting decision-making in the acute states of BD. In particular, greater neuropsychological dysfunction has been associated with a higher number of manic episodes (for a review see Robinson and Ferrier, 2006), which could explain the findings observed in the current review. Moreover, abnormalities in thinking patterns have been found to precede behavioural

manifestations of mania in other studies (e.g., Goldberg et al., 2008), thus these results are of high clinical relevance in that risk-taking could be conceptualised as a marker of prodromal mania, thus opening an array of possibilities in terms of preventive clinical interventions.

In regards to depression, studies included in the current review did not find consistent evidence for higher risk-taking during depressive states of BD. Nonetheless, it has to be noted that most studies included involved samples of people in euthymic and/or manic states of BD, with very limited information available on depressive states. Holmes et al. (2009) involved a sample which comprised predominantly of people in euthymic and depressed states of BD, but they found no differences between people with BD and the control group on BART performance.

There is some evidence in research of neuropsychological dysfunction during BD depression (Robinson and Ferrier, 2006); a study comparing medicated and un-medicated participants experiencing a depressive episode of BD found evidence of altered cognitive functioning in medicated BD but not in the un-medicated group, compared to healthy controls (Holmes et al., 2008). Antidepressants have been consistently shown to contribute to cognitive impairments, especially when there is prolonged use (for a review see Moraros et al., 2017). Therefore, it can be inferred that neurocognitive dysfunction in BD depression could be a result of antidepressant use, particularly in people who experience repeated episodes and may require long-term treatment. Nonetheless, this remains a rarely explored topic in research specifically focusing on risk-taking behaviours in BD, thus further studies are necessary to support this claim.

The findings of the current review can also be explained in the context of the depression-avoidance hypothesis (Mason et al., 2012), which conceptualises risk-taking as a way of responding or trying to prevent negative affectivity in people diagnosed with BD. According to this psychological theory, people with BD experience conflicting emotions,

particularly during the manic states of the condition; for instance, co-occurring euphoria and sadness during mania (Cassidy et al., 1998). This is hypothesised to cause a cognitive dissonance, which signals to the brain to resolve the uncomfortable conflict by trying to trigger a more positive state (Harmon-Jones and Harmon-Jones, 2007). Consequently, people might engage in risk-taking behaviours, which are intrinsically rewarding and enticing to avoid the uncomfortable negative emotion. This hypothesis has not been formally tested in the context of risk-taking in BD. It would be beneficial to conduct future studies specifically focusing on this possible conceptualisation of risk-taking to contribute to the development of further psychological therapies, which could target these particular response styles, eventually reducing risk-taking behaviours in the BD population.

It is interesting to note that there seem to be a paucity of research focusing specifically on cognitive functioning in people experiencing a depressive episode of BD. The majority of literature on the topic focuses predominantly on euthymic and manic states of BD; therefore, more research is necessary to clarify whether risk-taking is present in some form during the depressive states of BD and further explore the role of medication.

#### *4.2. Predictors of risk-taking*

The current review also aimed at exploring whether there are any reported predictors of risk-taking in BD. Several predictors were identified and will be discussed further. The most widely reported predictor of risk-taking in BD was impulsivity, which was explored in four studies (Edge et al., 2013; Hıdıroğlu et al., 2013; Kathleen Holmes et al., 2009; Richardson and Garavan, 2010). Overall higher levels of impulsivity were found to be associated with higher risk-taking in BD. Findings were mixed in regard to the type of impulsive behaviour (motor, attentional or non-planning) related to risk taking and further research is needed to clarify this point.

High levels of impulsivity have been consistently reported in participants diagnosed with BD, including during euthymic states (for a review see Saddichha and Schuetz, 2014) and have also been observed in non-clinical populations at risk of developing BD, suggesting that impulsivity could be a possible vulnerability marker for BD (Wessa et al., 2015). These results might help elucidate the mechanisms behind risk-taking behaviours in the BD. Nonetheless, research on the topic is still scarce and further studies analysing the links between impulsivity and risk-taking in BD, with a focus on differences in mood states, would be beneficial to further our understanding of this topic.

Three studies investigated the links between medication and risk-taking. Use of antipsychotic medication (Reddy et al., 2014) and benzodiazepine (Adida et al., 2011) and non-adherence to psychiatric medication were positively correlated with higher rates of risk-taking behaviours, whilst use of antidepressants was negatively correlated with risk-taking behaviours, i.e., participants not using antidepressants were found to have higher rates of high-risk behaviours (Adida et al., 2011). It is worth noting that non-adherence to psychiatric medication has been associated with greater symptom severity and lower likelihood to achieve remission (Hong et al., 2011), thus it is possible that the higher rates of risk-taking are a result of these factors rather than medication in itself.

There is a debate on whether the cognitive impairments observed in BD are a stable trait marker of BD or whether they are dependent on mood episode. There is some evidence in support of the idea that chronic cognitive impairments persist beyond acute mood states of BD (Martínez-Arán et al., 2004); however, these studies rarely control for medication effects. Considering that a large proportion of people diagnosed with BD are on long-term maintenance pharmacotherapy, particularly antipsychotics and antidepressants (Geddes and Miklowitz, 2013), clarifying the impact of these on cognitive functioning and thus on risk-taking is of vital importance for the development of future treatment and therapy approaches.

The studies included in the current review offer some preliminary evidence to show that medication has a significant impact on rates of risk-taking. Nonetheless, evidence is still scarce to draw meaningful conclusions. Future studies including medication impact in regression models are required to offer some clarification on the mechanisms underlying the links observed in this review.

Among other explored factors, suicidal behaviour was found to be predictive of higher risk-taking in BD; Martino et al., (2011) found that patients with a history of suicide attempts scored worse on IGT than those without a history of suicide attempts. Nonetheless, the authors did not test the direction of the relationship between suicide attempts and IGT performance. The stress-diathesis model suggests that lower performance in decision-making tasks is a vulnerability factor for suicidal behaviour (Jollant et al., 2005), thus it is unclear whether these two patterns of behaviour occur concurrently or whether one causes the other. A recent review by McGirr and Turecki, (2008) found a relationship between impulsivity traits and suicidality in clients diagnosed with schizophrenia, thus it would be interesting to clarify how these three variables interlink in BD and whether the relationship between suicidality and risk-taking might be mediated by impulsivity.

Finally, one study found lack of insight to be a predictor of IGT performance (Adida et al., 2008). Nonetheless, the links between insight and risk-taking are complex and require careful interpretation. In fact, poor insight has been linked to other clinical variables (e.g., duration of illness, mood episode severity), thus it is difficult to comment of whether insight might be the result of a general poorer course of illness or whether it is a contributing factor to poorer functioning and risk-taking. Moreover, insight is a difficult construct to measure as it is often clinically conceptualised as the client's level of agreement with their "difficulties", thus based on subjective evaluations rather than an objective measure. Further studies would



be helpful to clarify possible nuances in relation to the role of insight in predicting risk-taking in BD.

It would also be beneficial to explore risk-taking behaviours within the context of the positive experiences during states of mania reported by people diagnosed with BD, in order to clarify whether risk-taking in itself is always a negative outcome, or whether certain types of risk-taking behaviours could have a more positive conceptualisation in modern society.

#### *4.3. Limitations*

This review yielded some helpful findings in relation to risk-taking behaviours in BD. Nonetheless, some limitations need to be noted. First, due to the difficulty in measuring risk-taking in real life situations, this review relied predominantly on studies involving self-report measures and laboratory measures (e.g., the IGT and CGT) of risk-taking. This poses a significant challenge in the generalisation of the findings as data from self-reports and laboratory settings is predominantly based on self-selecting participant samples with less illness severity; therefore, it is difficult to establish whether these samples are representative of the general population of people diagnosed with BD.

Furthermore, while there is some evidence of external validity of behavioural tasks such as the IGT, these tasks are difficult to interpret in terms of underlying processes as task performance could be influenced by motivational and cognitive variables that are not directly addressed in these measures (Busemeyer and Stout, 2002). Moreover, there is paucity of research investigating correlations between laboratory measures attempting to investigate the same construct, e.g. risk taking. The question of whether the different available tasks are all measuring risk-taking still remains unanswered (Buelow and Suhr, 2009); for instance, comparisons between the IGT, BART and CGT would be beneficial to help interpret the findings yielded in this review.

Additionally, although some studies included a case-control design, 35% studies (n=8) lacked comparisons with a control group, which made it challenging to establish causality between the variables identified in individual studies. This was particularly true for studies adopting self-report measures, which found people diagnosed with BD to report a variety of risk-taking behaviours. Nonetheless, it was difficult to conclude whether the reported behaviours were general characteristics of a BD diagnosis or whether they were due to differences in participant samples.

It is also important to notice that most studies reported relationships between risk-taking and other observed constructs, thus it was difficult to comment on causality between the different variables. This was particularly true for studies involving self-report measures where participants with BD reported a higher likelihood to engage in certain risk-taking behaviours. Moreover, non-response bias also poses a problem in cross-sectional studies as there is no method for testing whether participants opting to take part in the study are different from those who do not (Sedgwick, 2015). This point is particularly relevant for this review, where quality assessment identified a general lack of reporting in relation bias, most importantly in studies involving self-report measures and opt-in recruitment methods, where selection bias was rarely considered.

Finally, although some studies reported sub-group analysis, most studies included in the current review did not take into consideration the influence of demographic and clinical variables on the findings. This is likely to be a result of small sample sizes, particularly in studies involving clinical samples, which may have made it difficult to conduct further sub-group analyses.

#### *4.4. Clinical implications*

The current review had several clinical implications. First, the findings yielded suggest a trend for higher risk-taking behaviours during states of mania in BD and

(hypo)mania risk in non-clinical populations, which seem to point towards the idea of risk-taking as a characteristic of a “mania prodrome”. This is of high clinical relevance as, if risk-taking can be indicative of prodromal stages of mania, clinicians may wish to adopt preventative strategies specifically aimed at utilising Cognitive Behavioural Therapy (CBT) techniques to help the clients detect their warning signs by identifying subtle differences in thinking patterns, which could in turn help to prevent clients from experiencing an acute manic episode.

Furthermore, the identification of the role of medication in predicting risk-taking behaviours requires some consideration. At present, the overwhelming majority of people diagnosed with BD receive pharmacological treatment both in the acute stages of the condition and during periods of remission (National Collaborating Centre for Mental Health, 2014). Prescribed medication for BD routinely involves the use of antipsychotics and antidepressants, or a combination of both. The negative consequences of long-term use of both antipsychotic (Bentall and Morrison, 2002; Young et al., 2015) and antidepressant (Bet et al., 2013; Keefe et al., 2014) medication are widely documented in research. Side effects are one of the reasons reported by people diagnosed with BD for treatment non-adherence (Clatworthy et al., 2009), which constitutes a major issue in this population (World Health Organization, 2003). Therefore, the impact of medication on risk-taking behaviours must be carefully monitored in clinical practice and these links must be considered by both medical professionals and psychologists alike when considering the best approach for treatment and therapy.

Finally, the links between suicidal behaviour and risk-taking are of particular clinical relevance; in fact, people diagnosed with BD have higher rates of both suicide attempts and completed suicide compared to the non-clinical population (Clements et al., 2013). BD has also been linked to the highest risk of suicide among major psychiatric conditions (Goldstein

et al., 2012; Redfield Jamison, 2000; Abreu et al., 2009; Goodwin et al., 2007).

Understanding the relationship between suicidal behaviour and risk-taking could contribute to the development of preventative therapies, which specifically target these behaviours to improve quality of life and reduce completed suicide rates in BD. The causal relationship between suicidal behaviour and risk-taking remains unclear and it would be beneficial to conduct further research to clarify this point to further investigate whether suicidal behaviour is a form of risk-taking. This could help clinicians adopt more appropriate interventions targeting risk-taking, which could in turn decrease suicidality.

## **5. Conclusions**

Characterising risk-taking behaviour in BD is a challenging task. Studies on the topic show an over-reliance on laboratory and self-report measures, which make it difficult to generalise findings to real-life situations. Results from laboratory studies may be complemented by further observational research of clinical samples with BD.

Findings from the current review suggest that risk-taking behaviours are indeed more likely in people diagnosed with BD than controls, but that this might be limited to the manic stages of the condition, with participants in euthymic stages of BD showing no differences in risk-taking compared to control groups. Nonetheless, the methodological limitations previously identified pose a significant challenge in determining causation, thus any generalisation needs to be approached cautiously. Further longitudinal studies following groups of people diagnosed with BD across different states of the condition may offer further clarification for the mechanisms behind risk-taking and establish whether clinical factors influence this. However, these studies would involve a baseline measure of risk-taking during euthymic states to test any increases/decreases in risk-taking activity during acute states of BD, which poses significant challenges as it would be highly demanding for

participants and researchers alike. Further studies aimed at capturing real life situations might also be helpful to shed light on this topic.

The current review also found preliminary evidence to suggest that there are some factors that predict risk-taking in BD. Knowledge of these factors has significant clinical implications and could contribute to the development of more effective treatments and therapies for people diagnosed with BD, who still experience overwhelmingly high rates of relapses and recurrences.

### References

- \*Adida, M., Clark, L., Pomietto, P., Kaladjian, A., Besnier, N., Azorin, J.M., Jeanningros, R., Goodwin, G.M., 2008. Lack of insight may predict impaired decision making in manic patients. *Bipolar Disord.* 10, 829–837. doi:10.1111/j.1399-5618.2008.00618.x
- \*Adida, M., Jollant, F., Clark, L., Besnier, N., Guillaume, S., Kaladjian, A., Mazzola-Pomietto, P., Jeanningros, R., Goodwin, G.M., Azorin, J.-M., Courtet, P., 2011. Trait-Related Decision-Making Impairment in the Three Phases of Bipolar Disorder. *Biol. Psychiatry* 70, 357–365. doi:10.1016/j.biopsych.2011.01.018
- Altman, S., Haeri, S., Cohen, L.J., Ten, A., Barron, E., Galynker, I.I., Duhamel, K.N., 2006. Predictors of relapse in bipolar disorder: A review. *J. Psychiatr. Pract.* 12, 269–82.
- American Psychiatric Association, 2013. *Diagnostic and statistical manual of mental disorders (5th ed.)*. Washington, DC.
- Angst, J., 2013. Bipolar disorder in DSM-5: strengths, problems and perspectives. *International Journal of Bipolar Disorders*, 1(12), 1-3.
- Bagby, M.R., Bindseil, K.D., Schuller, D.R., Rector, N.A., Trevor Young, L., Cooke, R.G., Seeman, M. V, McCay, E.A., T. Joffe, R., 1997. Relationship between the five-factor model of personality and unipolar, bipolar and schizophrenic patients. *Psychiatry Res.* 70, 83–94. doi:10.1016/S0165-1781(97)03096-5
- \*Bakare, M.O., Agomoh, A.O., Ebigbo, P.O., Onyeama, G.M., Eaton, J., Onwukwe, J.U., Okonkwo, K.O., 2009. Co-morbid disorders and sexual risk behavior in Nigerian adolescents with bipolar disorder. *Int. Arch. Med.* 2, 16. doi:10.1186/1755-7682-2-16
- Bechara, A., Damasio, H., Damasio, A.R., 2000. Emotion, Decision Making, and the Orbitofrontal Cortex. *Cereb. Cortex* 10, 295–307.
- Bentall, R.P., Morrison, A.P., 2002. More harm than good: The case against using antipsychotic drugs to prevent severe mental illness. *J. Ment. Heal.* 11, 351–356.

doi:10.1080/09638230020023723

Bet, P.M., Hugtenburg, J.G., Penninx, B.W.J.H., Hoogendijk, W.J.G., 2013. Side effects of antidepressants during long-term use in a naturalistic setting. *Eur. Neuropsychopharmacol.* 23, 1443–1451. doi:10.1016/j.euroneuro.2013.05.001

Neuropsychopharmacol. 23, 1443–1451. doi:10.1016/j.euroneuro.2013.05.001

Blanco, C., Grant, J., Petry, N.M., Simpson, H.B., Alegria, A., Liu, S.-M., Hasin, D., 2008.

Prevalence and correlates of shoplifting in the United States: results from the National

Epidemiologic Survey on Alcohol and Related Conditions (NESARC). *Am. J.*

*Psychiatry* 165, 905–13. doi:10.1176/appi.ajp.2008.07101660

Brand, M., Labudda, K., Markowitsch, H.J., 2006. Neuropsychological correlates of

decision-making in ambiguous and risky situations. *Neural Networks* 19, 1266–1276.

doi:10.1016/j.neunet.2006.03.001

Buelow, M.T., Suhr, J.A., 2009. Construct Validity of the Iowa Gambling Task.

*Neuropsychol Rev* 19, 102–114. doi:10.1007/s11065-009-9083-4

Busemeyer, J.R., Stout, J.C., 2002. A contribution of cognitive decision models to clinical

assessment: Decomposing performance on the Bechara gambling task. *Psychol. Assess.*

14, 253–262. doi:10.1037/1040-3590.14.3.253

Cassidy, F., Murry, E., Forest, K., Carroll, B.J., 1998. Signs and symptoms of mania in pure

and mixed episodes. *J. Affect. Disord.* 50, 187–201. doi:10.1016/S0165-0327(98)00016-

0

Chamorro, J., Bernardi, S., Potenza, M.N., Grant, J.E., Marsh, R., Wang, S., Blanco, C.,

2012. Impulsivity in the general population: a national study. *J. Psychiatr. Res.* 46, 994–

1001. doi:10.1016/j.jpsychires.2012.04.023

\*Chandler, R.A., Wakeley, J., Goodwin, G.M., Rogers, R.D., 2009. Altered Risk-Aversion

and Risk-Seeking Behavior in Bipolar Disorder. *Biol. Psychiatry* 66, 840–846.

doi:10.1016/j.biopsych.2009.05.011

- Christodoulou, T., Lewis, M., Ploubidis, G.B., Frangou, S., 2006. The relationship of impulsivity to response inhibition and decision-making in remitted patients with bipolar disorder. *Eur. Psychiatry* 21, 270–273. doi:10.1016/j.eurpsy.2006.04.006
- Christopher, P.P., McCabe, P.J., Fisher, W.H., 2012. Prevalence of Involvement in the Criminal Justice System During Severe Mania and Associated Symptomatology. *Psychiatr. Serv.* 63, 33–39. doi:10.1176/appi.ps.201100174
- Clark, L., Iversen, S.D., Goodwin, G.M., 2002. Sustained attention deficit in bipolar disorder. *Br. J. Psychiatry* 180, 313-9.
- Clatworthy, J., Bowskill, R., Parham, R., Rank, T., Scott, J., Horne, R., 2009. Understanding medication non-adherence in bipolar disorders using a Necessity-Concerns Framework. *J. Affect. Disord.* 116, 51–55. doi:10.1016/j.jad.2008.11.004
- Clements, C., Morriss, R., Jones, S., Peters, S., Roberts, C., Kapur, N., 2013. Suicide in bipolar disorder in a national English sample: frequency, trends and characteristics. *Psychol. Med.* 43(12), 2593-602. doi: 10.1017/S0033291713000329
- \*de Sousa Gurgel, W., da Silva Carneiro, A.H., Barreto Rebouças, D., Negreiros de Matos, K.J., do Menino Jesus Silva Leitão, T., de Matos e Souza, F.G., Affective Disorders Study Group (GETA), 2013. Prevalence of bipolar disorder in a HIV-infected outpatient population. *AIDS Care* 25, 1499–503. doi:10.1080/09540121.2013.779625
- \*Devlin, H.C., Johnson, S.L., Gruber, J., 2015. Feeling Good and Taking a Chance? Associations of Hypomania Risk with Cognitive and Behavioral Risk Taking. *Cognit. Ther. Res.* 39, 473–479. doi:10.1007/s10608-015-9679-3
- \*Dvorak, R.D., Wray, T.B., Kuvaas, N.J., Kilwein, T.M., 2013. Mania and sexual risk: associations with behavioral self-regulation. *J. Affect. Disord.* 150, 1076–81. doi:10.1016/j.jad.2013.04.023



- \*Edge, M.D., Johnson, S.L., Ng, T., Carver, C.S., 2013. Iowa Gambling Task performance in euthymic bipolar I disorder: a meta-analysis and empirical study. *J. Affect. Disord.* 150, 115–22. doi:10.1016/j.jad.2012.11.027
- \*Fletcher, K., Parker, G., Paterson, A., Synnott, H., 2013a. High-risk behaviour in hypomanic states. *J. Affect. Disord.* 150, 50–6. doi:10.1016/j.jad.2013.02.018
- Fletcher, K., Parker, G.B., Manicavasagar, V., 2013b. Coping profiles in bipolar disorder. *Compr. Psychiatry* 54, 1177–84. doi:10.1016/j.comppsy.2013.05.011
- Gayson, C., Moss, L., Moss, M., 2015. Alcohol Use and Risky Behaviour: Evidence of Anxiolysis-Disinhibition from a Naturalistic Drinking Study. *Int. J. Psychol. Stud.* 7(2), 129-137. doi:10.5539/ijps.v7n2p129
- Geddes, J.R., Miklowitz, D.J., 2013. Treatment of bipolar disorder. *Lancet (London, England)* 381(9878), 1672-82. doi:10.1016/S0140-6736(13)60857-0
- Ghaemi, S.N., Sachs, G.S., Chiou, A.M., Pandurangi, A.K., Goodwin, F.K., 1999. Is bipolar disorder still underdiagnosed? Are antidepressants overutilized? *Journal of affective disorders*, 52, 135-44.
- Glahn, D.C., Bearden, C.E., Cakir, S., Barrett, J.A., Najt, P., Serap Monkul, E., Maples, N., Velligan, D.I., Soares, J.C., 2006. Differential working memory impairment in bipolar disorder and schizophrenia: effects of lifetime history of psychosis. *Bipolar Disord.* 8, 117–123. doi:10.1111/j.1399-5618.2006.00296.x
- Goldberg, J.F., Garno, J.L., Callahan, A.M., Kearns, D.L., Kerner, B., Ackerman, S.H., 2008. Overdiagnosis of Bipolar Disorder Among Substance Use Disorder Inpatients With Mood Instability. *J. Clin. Psychiatry* 69, 1751–1757. doi:10.4088/JCP.v69n1110
- \*Goldberg, J.F., Wenzel, S.J., Welker, T.M., Steer, R.A., Beck, A.T., 2005. Content-specificity of dysfunctional cognitions for patients with bipolar mania versus unipolar depression: a preliminary study. *Bipolar Disord.* 7, 49–56. doi:10.1111/j.1399-

5618.2004.00165.x

Goldstein, T.R., Ha, W., Axelson, D.A., Goldstein, B.I., Liao, F., Gill, M.K., Ryan, N.D., Yen, S., Hunt, J., Hower, H., Keller, M., Strober, M., Birmaher, B., 2012. Predictors of Prospectively Examined Suicide Attempts Among Youth With Bipolar Disorder. *Arch. Gen. Psychiatry* 69, 1113–22. doi:10.1001/archgenpsychiatry.2012.650

Gore, F.M., Bloem, P.J., Patton, G.C., Ferguson, J., Joseph, V., Coffey, C., Sawyer, S.M., Mathers, C.D., 2011. Global burden of disease in young people aged 10–24 years: a systematic analysis. *Lancet* 377, 2093–2102. doi:10.1016/S0140-6736(11)60512-6

Green, M.J., Cahill, C.M., Malhi, G.S., 2007. The cognitive and neurophysiological basis of emotion dysregulation in bipolar disorder. *J. Affect. Disord.* 103, 29–42. doi:10.1016/j.jad.2007.01.024

\*Hariri, A.G., Karadag, F., Gokalp, P., Essizoglu, A., 2011. Risky sexual behavior among patients in Turkey with bipolar disorder, schizophrenia, and heroin addiction. *J. Sex. Med.* 8, 2284–91. doi:10.1111/j.1743-6109.2011.02282.x

Harmon-Jones, E., Harmon-Jones, C., 2007. Cognitive Dissonance Theory After 50 Years of Development. *Zeitschrift für Sozialpsychologie* 38, 7–16. doi:10.1024/0044-3514.38.1.7

\*Hidroğlu, C., Demirci Esen, Ö., Tunca, Z., Neslihan Gürz Yalçın, S., Lombardo, L., Glahn, D.C., Özerdem, A., 2013. Can risk-taking be an endophenotype for bipolar disorder? A study on patients with bipolar disorder type I and their first-degree relatives. *J. Int. Neuropsychol. Soc.* 19, 474–82. doi:10.1017/S1355617713000015

\*Holmes, K.M., Bearden, C.E., Barguil, M., Fonseca, M., Serap, M.E., Nery, F.G., Soares, J.C., Mintz, J., Glahn, D.C., 2009. Conceptualizing impulsivity and risk taking in bipolar disorder: importance of history of alcohol abuse. *Bipolar Disord.* 11, 33–40. doi:10.1111/j.1399-5618.2008.00657.x

Holmes, M.K., Erickson, K., Luckenbaugh, D.A., Drevets, W.C., Bain, E.E., Cannon, D.M.,

- Snow, J., Sahakian, B.J., Manji, H.K., Zarate, C.A., 2008. A comparison of cognitive functioning in medicated and unmedicated subjects with bipolar depression. *Bipolar Disord.* 10, 806–815. doi:10.1111/j.1399-5618.2008.00628.x
- Hong, J., Reed, C., Novick, D., Haro, J.M., Aguado, J., 2011. Clinical and economic consequences of medication non-adherence in the treatment of patients with a manic/mixed episode of bipolar disorder: Results from the European Mania in Bipolar Longitudinal Evaluation of Medication (EMBLEM) Study. *Psychiatry Res.* 190, 110–114. doi:10.1016/j.psychres.2011.04.016
- Ibanez, A., Cetkovich, M., Petroni, A., Urquina, H., Baez, S., Gonzalez-Gadea, M.L., Kamienkowski, J.E., Torralva, T., Torrente, F., Strejilevich, S., Teitelbaum, J., Hurtado, E., Guex, R., Melloni, M., Lischinsky, A., Sigman, M., Manes, F., Martinez, L.M., 2012. The Neural Basis of Decision-Making and Reward Processing in Adults with Euthymic Bipolar Disorder or Attention-Deficit/Hyperactivity Disorder (ADHD). *PLoS One* 7, 1–11. doi:10.1371/journal.pone.0037306
- Johnson, S.L., Carver, C.S., 2012. The dominance behavioral system and manic temperament: motivation for dominance, self-perceptions of power, and socially dominant behaviors. *J. Affect. Disord.* 142, 275–82. doi:10.1016/j.jad.2012.05.015
- Jollant, F., Frank Bellivier, M., Leboyer, M., Astruc, B., Torres, S., Verdier, R., Castelnaud, D., Malafosse, A., Courtet, P., 2005. Impaired Decision Making in Suicide Attempters. *Am. J. Psychiatry* 162 (2), 304-10
- Kathleen Holmes, M., Bearden, C.E., Barguil, M., Fonseca, M., Serap Monkul, E., Nery, F.G., Soares, J.C., Mintz, J., Glahn, D.C., 2009. Conceptualizing impulsivity and risk taking in bipolar disorder: importance of history of alcohol abuse. *Bipolar Disord.* 11, 33–40. doi:10.1111/j.1399-5618.2008.00657.x
- Keefe, R.S.E., McClintock, S.M., Roth, R.M., Doraiswamy, P.M., Tiger, S., Madhoo, M.,

2014. Cognitive Effects of Pharmacotherapy for Major Depressive Disorder. *J. Clin. Psychiatry* 75, 864–876. doi:10.4088/JCP.13r08609
- Kim, S.W., Grant, J.E., Eckert, E.D., Faris, P.L., Hartman, B.K., 2006. Pathological gambling and mood disorders: Clinical associations and treatment implications. *J. Affect. Disord.* 92, 109–116. doi:10.1016/j.jad.2005.12.040
- Lam, D.H., Jones, S.H., Hayward, P., 2010. *Cognitive Therapy for Bipolar Disorder : a Therapist's Guide to Concepts, Methods, and Practice*. Chichester: John Wiley & Sons.
- Lam, D., Wright, K., Sham, P., 2005. Sense of hyper-positive self and response to cognitive therapy in bipolar disorder. *Psychol. Med.* 35, 69–77.
- Lauriola, M., Levin, I.P., 2001. Personality traits and risky decision-making in a controlled experimental task: an exploratory study. *Pers. Individ. Dif.* 31, 215–226. doi:10.1016/S0191-8869(00)00130-6
- Lobban, F., Taylor, K., Murray, C., Jones, S., 2012. Bipolar Disorder is a two-edged sword: A qualitative study to understand the positive edge. *J. Affect. Disord.* 141, 204–212. doi:10.1016/j.jad.2012.03.001
- Magar, E.C.E., Phillips, L.H., Hosie, J.A., 2008. Self-regulation and risk-taking. *Pers. Individ. Dif.* 45, 153–159. doi:10.1016/j.paid.2008.03.014
- \*Marengo, E., Martino, D.J., Igoa, A., Fassi, G., Scápola, M., Urtueta Baamonde, M., Strejilevich, S.A., 2015. Sexual risk behaviors among women with bipolar disorder. *Psychiatry Res.* 230, 835–8. doi:10.1016/j.psychres.2015.10.021
- Martínez-Arán, A., Vieta, E., Reinares, M., Colom, F., Torrent, C., Sánchez-Moreno, J., Benabarre, A., Goikolea, J.M., Comes, M., Salamero, M., 2004. Cognitive Function Across Manic or Hypomanic, Depressed, and Euthymic States in Bipolar Disorder. *Am. J. Psychiatry* 161, 262–270. doi:10.1176/appi.ajp.161.2.262
- \*Martino, D.J., Strejilevich, S.A., Torralva, T., Manes, F., 2011. Decision making in

euthymic bipolar I and bipolar II disorders. *Psychol. Med.* 41, 1319–1327.

doi:10.1017/S0033291710001832

Mason, L., O’Sullivan, N., Bentall, R.P., El-Dereby, W., 2012. Better than I thought: positive evaluation bias in hypomania. *PLoS One* 7, e47754. doi:10.1371/journal.pone.0047754

Mason, L., O’Sullivan, N., Montaldi, D., Bentall, R.P., El-Dereby, W., 2014. Decision-making and trait impulsivity in bipolar disorder are associated with reduced prefrontal regulation of striatal reward valuation. *Brain* 137, 2346–2355.

doi:10.1093/brain/awu152

McGirr, A., Turecki, G., 2008. What is specific to suicide in schizophrenia disorder?

Demographic, clinical and behavioural dimensions. *Schizophr. Res.* 98, 217–224.

doi:10.1016/j.schres.2007.09.009

\*Meade, C.S., Bevilacqua, L.A., Key, M.D., 2012. Bipolar disorder is associated with HIV transmission risk behavior among patients in treatment for HIV. *AIDS Behav.* 16, 2267–71. doi:10.1007/s10461-012-0203-4

\*Meade, C.S., Fitzmaurice, G.M., Sanchez, A.K., Griffin, M.L., McDonald, L.J., Weiss, R.D., 2011. The relationship of manic episodes and drug abuse to sexual risk behavior in patients with co-occurring bipolar and substance use disorders: a 15-month prospective analysis. *AIDS Behav.* 15, 1829–33. doi:10.1007/s10461-010-9814-9

\*Meade, C.S., Graff, F.S., Griffin, M.L., Weiss, R.D., 2008. HIV risk behavior among patients with co-occurring bipolar and substance use disorders: associations with mania and drug abuse. *Drug Alcohol Depend.* 92, 296–300.

doi:10.1016/j.drugalcdep.2007.07.013

Mishra, S., 2014. Decision-Making Under Risk. *Personal. Soc. Psychol. Rev.* 18, 280–307.

doi:10.1177/1088868314530517

Moraros, J., Nwankwo, C., Patten, S.B., Mousseau, D.D., 2017. The association of

antidepressant drug usage with cognitive impairment or dementia, including Alzheimer disease: A systematic review and meta-analysis. *Depress. Anxiety* 34, 217–226.

doi:10.1002/da.22584

National Collaborating Centre for Mental Health, 2014. *Bipolar Disorder: The Nice Guideline on the Assessment and Management of Bipolar Disorder in Adults, Children and Young People in Primary and Secondary Care.*

Nesvåg, R., Knudsen, G.P., Bakken, I.J., Høye, A., Ystrom, E., Surén, P., Reneflot, A., Stoltenberg, C., Reichborn-Kjennerud, T., 2015. Substance use disorders in schizophrenia, bipolar disorder, and depressive illness: a registry-based study. *Soc. Psychiatry Psychiatr. Epidemiol.* 50, 1267–1276. doi:10.1007/s00127-015-1025-2

Nicholson, N., Soane, E., Fenton-O’Creevy, M., Willman, P., 2005. Personality and domain-specific risk taking. *J. Risk Res.* 8, 157–176. doi:10.1080/1366987032000123856

Philips, M.L., Kupfer, D.J., 2013. Bipolar disorder diagnosis: challenges and future directions. *The Lancet.* 381, 1663-71.

Potard, C., Courtois, R., Rusch, E., 2008. The influence of peers on risky sexual behaviour during adolescence. *Eur. J. Contracept. Reprod. Heal. Care* 13, 264–270.

doi:10.1080/13625180802273530

\*Reddy, L.F., Lee, J., Davis, M.C., Altshuler, L., Glahn, D.C., Miklowitz, D.J., Green, M.F., 2014. Impulsivity and risk taking in bipolar disorder and schizophrenia.

*Neuropsychopharmacology* 39, 456–63. doi:10.1038/npp.2013.218

Reyna, V.F., Farley, F., 2006. Risk and Rationality in Adolescent Decision Making:

Implications for Theory, Practice, and Public Policy. *Psychol. Sci. Public Interes.* 7, 1–44.

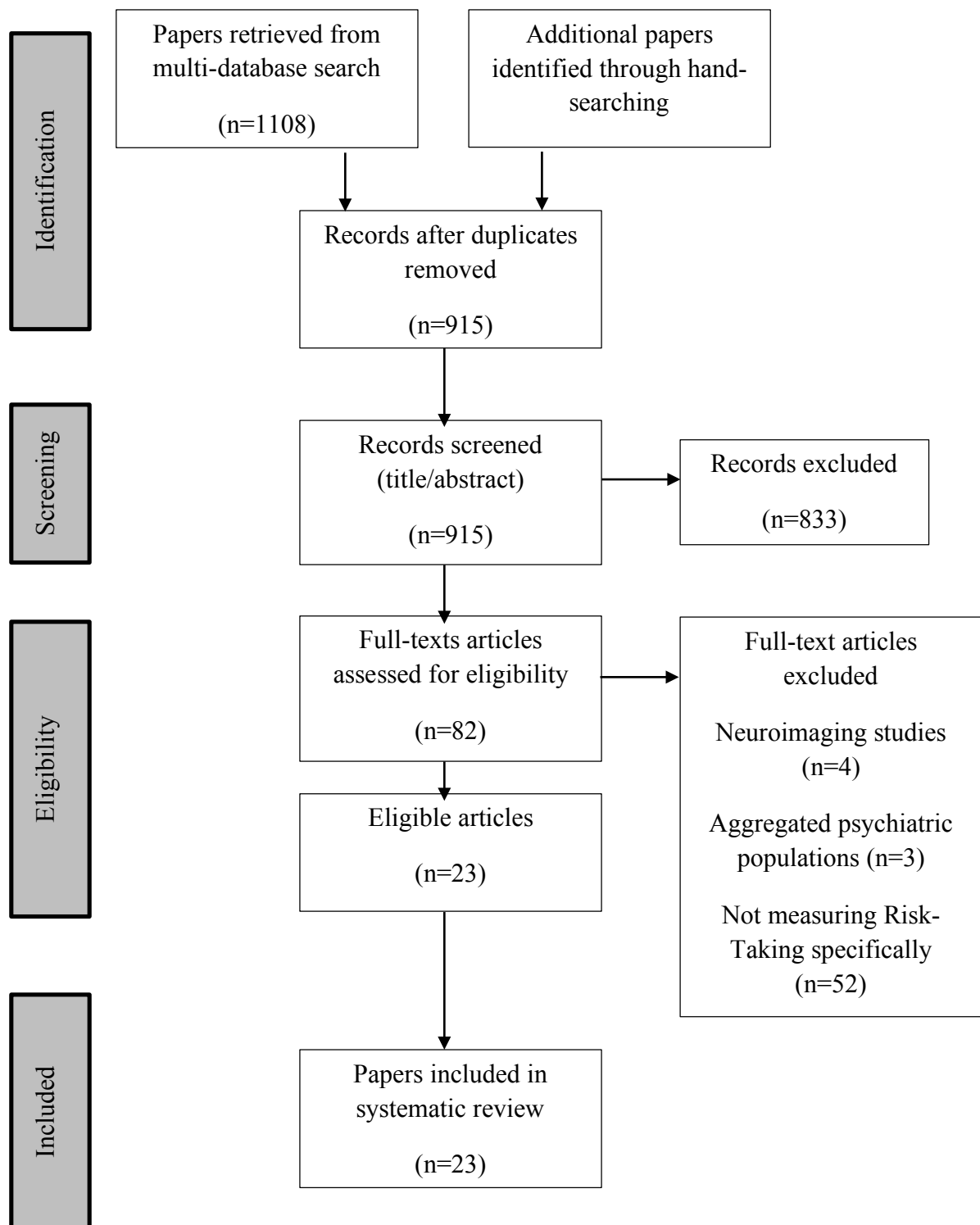
Reyna, V.F., Weldon, R.B., McCormick, M., 2015. Educating Intuition. *Curr. Dir. Psychol.*

*Sci.* 24, 392–398. doi:10.1177/0963721415588081

- \*Richardson, T., Garavan, H., 2010. Relationships between hypomanic symptoms and impulsivity and risk-taking propensity in an international sample of undergraduate students. *Undergrad. Res. J. Hum. Sci.* 9.
- Robinson, L.J., Ferrier, I.N., 2006. Evolution of cognitive impairment in bipolar disorder: a systematic review of cross-sectional evidence. *Bipolar Disord.* 8(2), 103–116.
- Robinson, L.J., Thompson, J.M., Gallagher, P., Goswami, U., Young, A.H., Ferrier, I.N., Moore, P.B., 2006. A meta-analysis of cognitive deficits in euthymic patients with bipolar disorder. *J. Affect. Disord.* 93, 105–115. doi:10.1016/j.jad.2006.02.016
- \*Roiser, J., Farmer, A., Lam, D., Burke, A., O'Neill, N., Keating, S., Smith, G.P., Sahakian, B., McGuffin, P., 2009. The effect of positive mood induction on emotional processing in euthymic individuals with bipolar disorder and controls. *Psychol. Med.* 39(5), 785-91. doi:10.1017/S0033291708004200
- Rubinsztein, J.S., Michael, A., Underwood, B.R., Tempest, M., Sahakian, B.J., 2006. Impaired cognition and decision-making in bipolar depression but no “affective bias” evident. *Psychol. Med.* 36(5), 629-639. doi:10.1017/S0033291705006689
- Saddichha, S., Schuetz, C., 2014. Is impulsivity in remitted bipolar disorder a stable trait? A meta-analytic review. *Compr. Psychiatry* 55, 1479–1484. doi:10.1016/j.comppsy.2014.05.010
- \*Saunders, K.E.A., Goodwin, G.M., Rogers, R.D., 2016. Insensitivity to the Magnitude of Potential Gains or Losses When Making Risky Choices: Women With Borderline Personality Disorder Compared With Bipolar Disorder and Controls. *J. Pers. Disord.* 30(4), 530-544. doi:10.1521/pedi\_2015\_29\_216
- Sedgwick, P., 2015. Bias in observational study designs: cross sectional studies. *Br. Med. J.* 350, 1–2. doi:10.1136/bmj.h1286
- \*Stewart, A.J., Theodore-Oklota, C., Hadley, W., Brown, L.K., Donenberg, G., DiClemente,

- R., Project STYLE Study Group, 2012. Mania symptoms and HIV-risk behavior among adolescents in mental health treatment. *J. Clin. Child Adolesc. Psychol.* 41, 803–10. doi:10.1080/15374416.2012.675569
- Tymula, A., Rosenberg Belmaker, L.A., Ruderman, L., Glimcher, P.W., Levy, I., 2013. Like cognitive function, decision making across the life span shows profound age-related changes. *Proc. Natl. Acad. Sci. U. S. A.* 110, 17143. doi:10.1073/pnas.1309909110
- von Elm, E., Altman, D.G., Egger, M., Pocock, S.J., Gøtzsche, P.C., Vandenbroucke, J.P., 2014. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: Guidelines for reporting observational studies. *Int. J. Surg.* 12, 1495–1499. doi:10.1016/j.ijisu.2014.07.013
- Wessa, M., Kollmann, B., Linke, J., Schönfelder, S., Kanske, P., 2015. Increased impulsivity as a vulnerability marker for bipolar disorder: evidence from self-report and experimental measures in two high-risk populations. *J. Affect. Disord.* 178, 18–24. doi:10.1016/j.jad.2015.02.018
- World Health Organization, 2003. Adherence to Long Term Therapies: Evidence for action.
- Yechiam, E., Hayden, E.P., Bodkins, M., O'Donnell, B.F., Hetrick, W.P., 2008. Decision making in bipolar disorder: A cognitive modeling approach. *Psychiatry Res.* 161, 142–152. doi:10.1016/j.psychres.2007.07.001
- Young, S.L., Taylor, M., Lawrie, S.M., 2015. “*First do no harm.*” A systematic review of the prevalence and management of antipsychotic adverse effects. *J. Psychopharmacol.* 29, 353–362. doi:10.1177/0269881114562090



**Figure 1.** Flowchart of the study selection process (adapted from PRISMA, 2015)

**Table 1.** Quality Assessment using STROBE score (von Elm et al., 2014)

Study	Strobe Item																																		
	1a	1b	2	3	4	5	6a	6b	7	8	9	10	11	12a	12b	12c	12d	12e	13a	13b	13c	14a	14b	14c	15	16a	16b	16c	17	18	19	20	21	22	
Adida et al. (2008)	-	+	+	+	-	+	+	+	+	+	-	+	+	+	+	-	-	-	-	-	-	+	-	NA	+	-	-	-	+	+	-	+	-	+	
Adida et al. (2011)	+	+	+	+	-	+	+	+	+	+	-	+	+	+	+	-	-	-	-	-	-	+	-	NA	+	-	-	-	+	+	+	+	-	+	
Bakare et al. (2009)	-	+	+	-	-	+	+	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	+	+	+	+	-	+	
Chandler et al. (2009)	-	+	+	-	-	-	+	+	+	+	-	+	+	+	+	-	-	-	-	-	-	+	-	NA	+	-	-	-	+	+	-	+	-	+	
De Sousa Gurgel et al. (2013)	-	+	+	-	+	+	+	NA	+	+	-	+	+	+	-	-	-	-	+	-	-	+	-	NA	+	+	-	-	+	+	-	-	-	+	
Devlin et al. (2015)	-	+	+	+	-	+	+	NA	+	+	-	+	+	+	-	-	-	-	-	-	-	+	-	NA	-	+	-	-	+	+	+	+	+	+	+
Dvorak et al. (2013)	-	+	+	+	-	+	-	-	+	+	-	-	+	+	+	-	-	-	-	-	-	+	-	-	+	-	-	-	+	+	+	+	+	+	+
Edge et al. (2013)	-	+	+	-	-	+	+	+	+	+	-	+	+	+	+	-	-	-	-	-	-	+	-	NA	+	-	-	-	+	+	+	+	-	+	

**Table 1.** Quality Assessment using STROBE score (continued)

Study	Strobe Item																																		
	1a	1b	2	3	4	5	6a	6b	7	8	9	10	11	12a	12b	12c	12d	12e	13a	13b	13c	14a	14b	14c	15	16a	16b	16c	17	18	19	20	21	22	
Fletcher et al. (2013)	+	+	+	-	-	+	+	NA	+	+	-	+	-	-	-	-	-	-	+	-	-	+	-	NA	+	-	-	-	+	+	+	+	+	+	
Goldberg et al. (2005)	-	+	+	+	-	+	+	-	+	+	-	+	+	+	+	-	-	-	+	-	-	+	-	NA	+	-	-	-	+	+	-	+	+	+	
Hariri et al. (2011)	-	+	+	-	-	+	+	-	+	+	-	-	+	-	+	-	-	-	-	-	-	+	-	NA	+	-	-	-	+	+	-	+	-	-	
Hidiroglu et al. (2013)	-	+	+	+	-	+	+	+	+	+	-	+	+	+	+	-	-	-	-	-	-	+	-	NA	+	+	-	-	+	+	+	+	+	+	
Holmes et al. (2009)	-	+	+	+	-	-	+	+	+	+	-	-	+	+	+	-	-	-	-	-	-	+	-	NA	+	-	-	-	+	+	+	+	+	+	-
Marengo et al. (2015)	-	+	+	-	-	+	+	+	+	+	-	-	+	+	+	-	-	-	-	-	-	+	-	NA	+	-	-	-	+	+	+	+	+	+	+
Martino et al. (2011)	-	+	+	+	-	+	+	+	+	+	-	-	+	+	+	-	-	-	-	-	-	+	-	-	+	-	-	-	+	+	+	+	+	-	+
Meade et al. (2008)	-	+	+	+	-	-	+	NA	+	+	-	+	+	+	+	-	-	-	+	-	-	+	-	-	+	+	-	-	+	+	+	+	+	-	+

**Table 1.** Quality Assessment using STROBE score (continued)

Study	Strobe Item																																	
	1a	1b	2	3	4	5	6a	6b	7	8	9	10	11	12a	12b	12c	12d	12e	13a	13b	13c	14a	14b	14c	15	16a	16b	16c	17	18	19	20	21	22
Meade et al. (2011)	+	+	+	+	-	+	+	-	+	+	-	+	+	+	+	-	-	-	+	-	-	+	-	-	+	+	-	-	+	+	+	+	+	+
Meade et al. (2012)	-	+	+	+	+	+	+	-	+	+	-	-	+	+	+	-	-	-	-	-	-	+	-	-	+	-	-	-	+	+	+	+	+	+
Reddy et al. (2014)	-	+	+	-	-	+	+	-	+	+	-	-	+	+	+	-	-	-	-	-	-	+	-	-	+	-	-	-	+	+	+	+	-	+
Richardson et al. (2010)	-	-	+	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	+	+	+	+	-	-
Roisier et al. (2009)	-	+	+	+	-	-	+	-	+	+	+	-	+	+	+	-	-	-	-	-	-	+	-	-	+	-	-	-	+	+	+	+	+	+
Saunders et al. (2016)	-	+	+	+	-	-	-	+	+	+	-	-	+	+	+	-	-	-	-	-	-	-	-	-	+	-	-	-	+	+	-	-	-	-
Stewart et al. (2012)	-	+	+	+	-	-	+	NA	+	+	-	+	+	+	+	-	-	-	+	+	+	+	-	-	+	+	-	-	+	+	+	+	+	-

**Table 2.** Studies included in the review

Author(s)	Design	Participants	Gender distribution	Age Mean (SD)	Risk-taking measure	Diagnosis/Hypomania measure	Key findings	Quality Score
Adida et al. 2008	Case- control	45 Manic 45 HC	51% M, 49% F 51% M, 49% F	37.8 (12.7) 37.3 (11.5)	IGT <sup>1</sup>	DSM-IV BD YMRS <sup>2</sup> HDRS <sup>3</sup>	Similar performance on the first block between the two groups. In the second block, the manic group chose more cards from the risky deck. No differences between group taking neuroleptics and those who were not.  IGT performance deficits highly related to lack of insight in the BD group.	66%
Adida et al. 2011	Case- control	45 Manic 32 Depressed 90 Euthymic 150 Control	51% M, 49% F 44% M, 56% F 36% M, 64% F 50% M, 50% F	37.8 (12.7) 43.8 (10.1) 39.3 (12) 38.8 (10.6)	IGT	DSM-IV BD-I YMRS HDRS	Manic, depressed and euthymic BD selected more cards from the risky decks than healthy controls. No differences observed between manic and depressed, depressed and euthymic or manic and euthymic. All groups preferred decks offering low-frequency penalties over those with high-frequency penalties.	72%
Bakare et al. 2009	Cross- Sectional	46 Adolescents with BD	63% M, 37% F	16.90 (1.07)	Clinical Interview for sexual risk behaviour <sup>4</sup>	DSM-IV BD	46% adolescents with BD had positive history of sexual risk behaviour in the past year. Sexual risk behaviour was associated with having a comorbid condition, level of religious activities (moderate, high level was a protective factor against sexual risk behaviour), parents' marital status (adolescents of single parents more likely to engage in sexual risk behaviours).	45%

<sup>1</sup>IGT: Iowa Gambling Task (Bechara et al., 1994); YMRS: Young Mania Rating Scale (Young et al., 1978); HDRS: Hamilton Depression Rating Scale (Hamilton et al., 1960). <sup>4</sup>Sexual risk behaviour defined as having unprotected sexual intercourse, intercourse with commercial sex workers, sexual intercourse with multiple partners without protection in the past year.

**Table 2.** Studies included in the review (continued)

Author(s)	Design	Participants	Gender distribution	Age Mean (SD)	Risk-taking measure	Diagnosis/Hypomania measure	Key findings	Quality Score
Chandler et al. 2009	Case-control	20 EBD <sup>1</sup> 20 Controls	45% M, 55% F 55% M, 45% F	19.2 (.25) 19.8 (.26)	Framed risky choice task	DSM-IV BD MDQ <sup>2</sup> MINI <sup>3</sup> HAM-D <sup>4</sup> YMRS <sup>5</sup>	When dilemmas were framed positively (in terms of gains) compared with negatively (in terms of losses) the shift between risk-averse and risk-seeking choices was significantly reduced in BD participants compared to healthy controls. BD participants did not show a general tendency to risk-taking, but instead they showed a reduced sensitivity to psychological factors that promote and inhibit risky behaviour (framing effects).	56%
de Sousa Gurgel et al. 2013	Case-control	11 BD <sup>6</sup> 120 non-BD	69% M, 31% F 67% M, 33% F	36.9 (10.9) 37.5 (10.9)	AUDIT <sup>7</sup> and BSS <sup>8</sup>	MDQ MINI	BD reported higher rates of sex with commercial partners, sex outside the primary relationship, smoking before HIV diagnosis, Alcohol Use Disorder before and after HIV diagnosis, illicit drug use before and after HIV diagnosis, compared to the non-BD group.	65%
Devlin et al. 2015	Cross-Sectional	156 Adults from the community	47% M, 53% F	28.92 (11.51)	CARE-costs <sup>9</sup> CARE-benefits CARE-behaviour BART <sup>10</sup>	HPS <sup>11</sup>	Hypomania risk was associated with increased expected involvement in risk-taking in the next 6 months and it was also associated with less tokens earned on the BART, indicative of poorer performance on the risk-taking task. Participants with higher hypomania risk also anticipated significantly fewer costs to result from engaging in risk-taking, but showed no differences in appraisals of benefit to result from engaging in risk-taking.	70%

<sup>1</sup>EBD: Euthymic Bipolar Disorder; <sup>2</sup>MDQ: Mood Disorder Questionnaire (Hirschfeld et al., 2000); <sup>3</sup>MINI: Mini International Neuropsychiatric Interview (Sheehan et al., 1998); <sup>4</sup>HAM-D: Hamilton Depression Rating Scale (Hamilton, 1960); <sup>5</sup>YMRS: Young Mania Rating Scale (Young et al., 1968). <sup>6</sup>both groups were HIV positive; <sup>7</sup>AUDIT: Alcohol Use Disorder Identification Test (Saunders et al., 1993); <sup>8</sup>BSS: Behavioural Surveillance Surveys (Amon et al., 2000). <sup>9</sup>CARE: Cognitive Appraisal of Risk Events scale (Fromme et al., 1997); <sup>10</sup>BART: Balloon Analogue Risk Task (Lejuez et al., 2002); <sup>11</sup>HPS: Hypomania Personality Scale (Eckbald and Chapman, 1986).

**Table 2.** Studies included in the review (continued)

Author(s)	Design	Participants	Gender distribution	Age Mean (SD)	Risk-taking measure	Diagnosis/Hypomania measure	Key findings	Quality Score
Dvorak et al. 2013	Cross- Sectional	595 University students	35% M, 65% F	20.17	CARE – Risky Sexual Activity Scale <sup>1</sup>	WASSUP <sup>2</sup>	Risk for mania interacted with effortful control to predict risky sexual behaviour. When the risk of mania was high, effortful control buffered against the likelihood of reporting risky sexual events. When the risk of mania was low, effortful control was unrelated to the likelihood of risky sexual behaviour. Similarly, for number of risky sexual behaviours, at low levels of effortful control, risk for mania was positively associated with involvement in risky sex, but at high levels of effortful control, risk for mania was unrelated to risky sex. Age was related to the likelihood to engage in risky sex; older participants were more likely to engage in risky sex than younger ones.	65%
Edge et al. 2013	Case- Control	55 BD-I R <sup>3</sup> 39 Control	35% M, 65% F 41% M, 59% F	36 (11.9) 33.5 (12.8)	IGT <sup>4</sup>	DSM-IV BD-I BRMS <sup>5</sup> MHRSD <sup>6</sup>	There were no significant differences between the BD and control group in the IGT performance. BD participants were not found to be more likely than controls to select cards from risky decks. There was also no significant correlation between demographic variables, mood state, illness severity, comorbidity, mood stabilizer use or impulsivity and likelihood to select from risky decks in the IGT.	66%

CARE: Cognitive Appraisal of Risk Event Scale – Risky Sexual Activity Scale (Fromme et al., 1997); <sup>2</sup>Willingly Approached Set of Statistically Unlikely Pursuits (Johnson and Carver, 2006). <sup>3</sup>BD-I R: Bipolar Disorder Type 1 in Remission; <sup>4</sup>IGT: Iowa Gambling Task (Bechara et al., 1994); <sup>5</sup>BRMS: Bech-Rafaelson Mania Scale (Bech et al., 1979); <sup>6</sup>MHRSD: Modified Hamilton Rating Scale for Depression (Miller et al., 1985).

**Table 2.** Studies included in the review (continued)

Author(s)	Design	Participants	Gender distribution	Age Mean (SD)	Risk-taking measure	Diagnosis/Hypomania measure	Key findings	Quality Score
Fletcher et al. 2013	Cross- Sectional	93 BD-II	37% M, 63% F	33.6 (11.6)	Self-report questionnaire	MINI <sup>1</sup> QIDS-SR <sup>2</sup>	71% participants reported overspending when hypomanic. Participants reported conflict with family members, financial hardship and being unable to afford general living expenses as the most common consequences of overspending. 68% participants reported excessive alcohol consumption when hypomanic. Participants also reported being able to consume a larger quantity of alcohol than usual when hypomanic. The most common consequences of excessive alcohol use were risky sexual behaviour, conflict with family/friends/partner, aggressive behaviour, socially inappropriate behaviour and experiencing shame, guilt or remorse.	65%
Goldberg et al. 2005	Case- Control	23 BD <sup>3</sup> 28 MDE <sup>4</sup> 24 Control	48% M, 52% F 32% M, 68% F 29% M, 71% F	40.35 (15.36) 43.96 (11.56) 31.67 (15.16)	CCL-M <sup>5</sup>	DSM-IV BD or MDE YMRS <sup>6</sup> HAM-D <sup>7</sup>	BD participants scored significantly higher than both MDE and Control participants on the Excitement and Risk-Taking subscale of the CCL-M.	68%

<sup>1</sup>MINI: Mini International Neuropsychiatric Interview (Sheehan et al., 1998); <sup>2</sup>QIDS-SR: Quick Inventory of Depressive Symptoms – Self-Report (Rush et al., 2003). <sup>3</sup>Hypomanic/Manic Bipolar Episode; <sup>4</sup>Unipolar Major Depressive Episode; <sup>5</sup>CCL-M: Cognition Checklist for Mania (Beck, 1976); YMRS: <sup>6</sup>Young Mania Rating Scale (Young et al., 1978); <sup>7</sup>HAM-D: Hamilton Rating Scale for Depression (Hamilton et al., 1960)



**Table 2.** Studies included in the review (continued)

Author(s)	Design	Participants	Gender distribution	Age Mean (SD)	Risk-taking measure	Diagnosis/Hypomania measure	Key findings	Quality Score
Hariri et al. 2011	Case- Control	88 SCH <sup>1</sup> 129 BD <sup>2</sup> 170 HA <sup>3</sup> 98 Control	36% M, 64% F 41% M, 59% F 69% M, 31% F 49% M, 51% F	34.9 (8.8) 32.3 (9) 31.8 (8.3) 33.8 (6)	Semi-structured questionnaire	DSM-IV BD, SCH, HA	The majority of risky sexual behaviours occurred in the Heroin Addict (HA) group. However, the BD group showed higher rates than the HA for unprotected sex (65% BD, 55% HA), but lower rates than in the SCH (67%) and Control (77%) groups, which showed the highest rates. The BD group also showed higher rates than the SCH and Control groups for having sex with a polygamous person (24% BD, 22% SCH, 19% Control). The BD group (11%) also reported the highest rates of undesired pregnancies than all other groups (10% SCH, 10% HA, 0% Control).	49%
Hidiroglu et al. 2013	Case- Control	30 BD 25 BD-R <sup>4</sup> 30 HC <sup>5</sup>	37% M, 63% F 32% M, 68% F 37% M, 63% F	35.5 (10.63) 40.2 (13.41) 35.73 (10.23)	BART <sup>6</sup>	DSM-IV BD YMRS <sup>6</sup> HAM-D 21 <sup>7</sup>	Both the BD and BD-R groups had significantly lower adjustment scores after the loss of a temporary gain on the BART than the HC group. There were no significant differences between the group in the number of exploded balloons in the BART. Linear regression analysis showed no effects of clinical characteristics (e.g. duration of illness, duration of euthymia, number of past episodes) on the BART scores.	75%

<sup>1</sup>SCH: Schizophrenia (in remission for 2 months); <sup>2</sup>BD: Bipolar Disorder (in remission for 2 months) <sup>3</sup>HA: Heroin Addiction (after detox). <sup>4</sup>BD-R: Bipolar Disorder First Degree Relatives; <sup>5</sup>HC: Healthy Controls; BART: Balloon Analogue Risk Task (Lejuez et al., 2002); YMRS: Young Mania Rating Scale – Turkish Version (Karadag et al., 2002); HAM-D 21: 21-item Hamilton Depression Rating Scale –Turkish Version (Aydemir & Deveci, 2003).

**Table 2.** Studies included in the review (continued)

Author(s)	Design	Participants	Gender distribution	Age Mean (SD)	Risk-taking measure	Diagnosis/Hypomania measure	Key findings	Quality Score
Holmes et al. 2009	Case-	31 BD-A <sup>1</sup>	52%M, 48% F	42.4 (10.4)	BART <sup>4</sup>	DSM-IV BD	Between group differences were found in the number of popped balloons on the BART. Post-hoc analysis found that the BD-A popped significantly more balloons than both the HC and BD-N groups. There were no differences between the BD-N and HC groups. The BD-A group also did not show learning behaviour, pumping the same amount of air when the previous balloon popped as when it did not pop. In contrast the BD-N and HC groups adjusted their behaviour. There was no effect of mood on the BART performance when BD participants were divided into euthymic, (hypo)manic and depressed.	60%
	Control	24 BD-N <sup>2</sup> 25 HC <sup>3</sup>	21% M, 79% F 44% M, 56% F	39.5 (12.4) 38.3 (10.5)		HAM-D <sup>5</sup> YMRS <sup>6</sup>		
Marengo et al. 2015	Case- Control	63 BD 63 HC	Female Sample	33 (NA) 33 (NA)	Structured Interview HIV-risk TLFB <sup>7</sup>	DSM-IV BD YMRS HAM-D	BDW group reported more frequently having been diagnosed two or more times with an STI. Repeated STI in BDW was associated with earlier age at onset of BD, longer diagnostic delay and higher number of (hypo)manic episodes. The BDW group was also found to be significantly more likely than the HC group, to have had sex with casual sexual partners, non-monogamous sexual partners and partners with HIV unknown condition.	65%

<sup>1</sup>BD-A: Bipolar Disorder with a history of alcohol abuse/dependence; <sup>2</sup>BD-N: Bipolar Disorder with no history of alcohol abuse/dependence; <sup>3</sup>HC: Healthy Controls; <sup>4</sup>BART: Balloon Analogue Risk Task (Lejuez et al., 2002); <sup>5</sup>HAM-D: Hamilton Rating Scale for Depression (Hamilton et al., 1960); <sup>6</sup>YMRS: Young Mania Rating Scale (Young et al., 1978). <sup>7</sup>HIV-risk Timeline Followback interview (Carey et al., 2001).

**Table 2.** Studies included in the review (continued)

Author(s)	Design	Participants	Gender distribution	Age Mean (SD)	Risk-taking measure	Diagnosis/Hypomania measure	Key findings	Quality Score
Martino et al. 2011	Case- Control	48 BD-I <sup>1</sup> 37 BD-II 34 Controls	39% M, 61% F 21% M, 79% F 35% M, 65% F	37.7 (10.3) 42.8 (10.8) 40 (12.9)	IGT <sup>2</sup>	DSM-IV BD HAMD <sup>3</sup> YMRS <sup>4</sup>	There were no significant differences between the two BD groups and healthy controls on IGT performance. Participants with a history of suicide attempts scores worse than those without a history of suicide attempts on the IGT.	65%
Meade et al. 2008	Cross- Sectional	101 BD+SUD <sup>5</sup>	46% M, 54% F	39.33 (10.10)	RAB <sup>6</sup>	DSM-IV BD and SUD	39% participants had multiple sexual partners and 69% engaged in unprotected sex over the past 6 months. When compared to the US adult population rates, the study participants engaged in higher rates of sex with multiple partners, sex trading, sex with prostitutes and injection drug use. Recent manic episode, lower psychiatric severity, and greater drug severity were all significant independent predictors of increased HIV risk.	65%
Meade et al. 2011	Cross- Sectional	61 BD+SUD	59%M, 41%F	38.3 (11.1)	RAB	DSM-IV Manic or Depressive Episode	76.3% participants had unprotected sex and 23.7% had multiple partners. For mania, average weeks of manic episode predicted sex risk score, with participants who experienced more mania engaging in greater sexual risk. Increases in cocaine use also predicted an increase in sexual risk scores. Average weeks of depression were not a predictor of RAB scores.	76%

<sup>1</sup>BD-I and BD-II: Euthymic Bipolar Disorder Type I and Type II; <sup>2</sup>IGT: Iowa Gambling Task (Bechara et al., 1994); <sup>3</sup>HAMD: Hamilton Rating Scale for Depression (Hamilton, 1960); <sup>4</sup>YMRS: Young Mania Rating Scale (Young et al., 1978). <sup>5</sup>BD+SUD: co-occurring Bipolar Disorder and Substance Use Disorder; <sup>6</sup>RAB: Risk Assessment Battery (Metzger et al., 2001).

**Table 2.** Studies included in the review (continued)

Author(s)	Design	Participants	Gender distribution	Age Mean (SD)	Risk-taking measure	Diagnosis/Hypomania measure	Key findings	Quality Score
Meade et al. 2012	Case- Control	22 BD 21 MDD <sup>1</sup> 20 NMD <sup>2</sup>	65% M, 35% F	45.3 (7.1)	TLFB <sup>3</sup>	DSM-IV BD, MDD, NMD MINI <sup>4</sup>	All participants were diagnosed with HIV. Participants in the BD group were significantly more likely than the MDD and NMD groups to report unprotected sex over the past 3 months. There was a significant BDxSUD interaction; the relationships between BD and unprotected sex was greater among participants with SUD compared to no-SUD. Participants in the BD group were also significantly less likely to take their ARV medication than MDD and NMD groups. Adherence to ARV was poorer in participants who reported unprotected intercourse with HIV-negative partners compared to those who did not. Participants who reported greater unprotected intercourse with HIV-negative partners and lower ARV medication adherence had greater symptoms of mania and depression.	67%
Reddy et al. 2014	Case- Control	68 BD 38 SCH <sup>5</sup> 36 Controls	54% M, 46% F 55% M, 45% F 56% M, 44% F	44 (10.6) 44.7 (9.2) 41.4 (10)	BART <sup>6</sup>	DSM-IV BD, SCH BPRS <sup>7</sup> HAM-D <sup>8</sup> YMRS <sup>9</sup>	There were significant differences between the schizophrenia group and the BD and Control groups on BART performance, but no differences between the BD and Control groups. The Schizophrenia group showed more risk aversion than the BD and Control groups.	58%

<sup>1</sup>MDD: Major Depressive Disorder; <sup>2</sup>NMD: no mood disorder; TLFB: <sup>3</sup>Timeline Follow-Back Method (Carey et al., 2001); <sup>4</sup>MINI: Mini International Neuropsychiatric Interview (Sheehan et al., 1998). <sup>5</sup>SCH: Schizophrenia; <sup>6</sup>BART: Balloon Analogue Risk Task (Lejuez et al., 2002); <sup>7</sup>BPRS: Brief Psychiatric Rating Scale (Ventura et al., 1993); <sup>8</sup>HAM-D: Hamilton Depression Rating Scale (Hamilton, 1960); <sup>9</sup>YMRS: Young Mania Rating Scale (Young et al., 1978).

**Table 2.** Studies included in the review (continued)

Author(s)	Design	Participants	Gender distribution	Age Mean (SD)	Risk-taking measure	Diagnosis/Hypomania measure	Key findings	Quality Score
Richardson et al. 2010	Cross- Sectional	246 Undergraduate Students	14%M, 86% F	22.26 (6.11)	DOSPERT <sup>1</sup>	HCL-32 <sup>2</sup>	There were strong positive correlations between hypomanic symptoms and impulsivity and risk-taking. Hypomania scores were significantly predicted by total DOSPERT scores, but not by the individual subscales of the DOSPERT. Thus, hypomanic symptoms were related with a higher propensity to risk-taking in general, but not with a particular type of risk-taking. Demographic variables influenced this relationship; hypomania was associated with ethical risk-taking in participants who were younger in age. There was also a stronger relationship between the DOSPERT health/safety subscale and higher hypomania scores for women compared to men.	29%
Roiser et al. 2009	Case- Control	15 EBD <sup>3</sup> 19 HC <sup>4</sup>	33% M, 67% F 84% M, 16% F	44.4 (13.4) 35.3 (13.6)	CGT <sup>5</sup> AGNG <sup>6</sup>	SCAN <sup>7</sup> BDI <sup>8</sup> AMS <sup>9</sup>	The BD group made significantly more commission errors during ‘sad’ target blocks than ‘happy’ in the AGNG compared to controls. The BD group responded more slowly than the HC group on the CGT, even after controlling for age. However, there were no differences in risk adjustment (the extent to which participants altered their betting behaviour based on risk) or quality of decision making between the two groups.	67%

<sup>1</sup>DOSPERT: Domain Specific Risk-Taking Scale (Blais and Weber, 2006); <sup>2</sup>HCL-32: 32-item Hypomania Checklist (Angst et al., 2005). <sup>3</sup>EBD: Euthymic Bipolar Disorder; <sup>4</sup>HC: Healthy Controls; <sup>5</sup>CGT: Cambridge Gambling Task (Rogers et al. 1999); <sup>6</sup>AGNG: Affective Go/No Go test (Murphy et al., 1999); <sup>7</sup>SCAN: Schedules for the clinical assessment of Neuropsychiatry (Wing et al., 1990); <sup>8</sup>BDI: Beck Depression Inventory (Beck et al., 1961); <sup>9</sup>AMS: Altman Mania Scale (Altman et al., 1997).

**Table 2.** Studies included in the review (continued)

Author(s)	Design	Participants	Gender distribution	Age Mean (SD)	Risk-taking measure	Diagnosis/Hypomania measure	Key findings	Quality Score
Saunders et al. 2016	Case- Control	20 BD 20 BPD <sup>1</sup> 20 HC	Women only samples	36.1 33.65 32.7	Risky-Choice Task <sup>2</sup>	DSM-IV BD, BPD HAM-D <sup>3</sup> YMRS <sup>4</sup>	Participants in the BPD group showed less attention to prospective losses and gains than both the BD and HC groups. There were no differences between the BD and HC groups.	43%
Stewart et al. 2012	Case- Control	151 ESM+ <sup>5</sup> 569 ESM-	32%M, 68% F 46% M, 54% F	14.89 (1.31) 14.93 (1.35)	Adolescent Risk Behaviour Assessment	DSM-IV criteria for mania or hypomania	Participants classified in the ESM+ group were significantly more likely than those in the ESM- group to have had vaginal or anal sex, have two or more partners in the last 90 days, test positive for an STI, have unprotected sex and exchange sex for money, drugs or shelter. Multiple sexual partners was significantly associated with greater impulsivity.	68%

<sup>1</sup>BPD: Borderline Personality Disorder; <sup>2</sup>Risky-Choice Task (Rock et al., 2013; Rogers et al., 2003); <sup>3</sup>HAM-D: Hamilton Rating Scale for Depression (Hamilton, 1960); <sup>4</sup>YMRS: Young Mania Rating Scale (Young et al., 1978). <sup>5</sup>ESM+: Adolescents with Elevated Symptoms of Mania - meeting subthreshold or threshold criteria for mania.

**Table 3.** Outcomes for the main three research questions

Study	Evidence of higher risk taking in BD	Groups compared	Predictors of risk-taking	Did the study control for medication effects?
Adida et al. 2008	Yes	BD Manic vs Healthy Controls	Lack of insight predicted higher risk-taking	Yes – no differences between BD group taking medication and BD group not taking medication
Adida et al. 2011	Yes – no differences between mood states. All BD groups had higher risk-taking than controls	BD Manic, BD Depressed, BD Euthymic vs Healthy Controls	Low level of education, high depression ratings (HDRS score), use of benzodiazepine, non-use of SNRI antidepressants and family history of BD were significant predictors of higher risk-taking.	Yes – use of benzodiazepine and SNRI antidepressants were significant predictors of IGT scores in the BD groups
Bakare et al. 2009	Yes – however, no control group was present	Adolescents with BD	Presence of co-morbid disorders, level of religious activities and marital status of the parents were significant predictors of risk-taking. Children of single parents were more likely to engage in sexual risk-taking. Moderate/high levels of religious activities were protective against risk-taking.	No

**Table 3.** Outcomes for the main three research questions (continued)

Study	Evidence of higher risk taking in BD	Groups compared	Predictors of risk-taking	Did the study control for medication effects?
Chandler et al. 2009	No	Euthymic BD vs Healthy Controls	NA	Yes - BD group was medication free
De Sousa Gurgel et al. 2013	Yes	HIV+ BD vs HIV+ Controls	NA	No
Devlin et al. 2015	Yes – higher hypomania risk associated with higher risk-taking	Adults from the community assessed for hypomania	NA	Non-clinical sample – medication-free
Dvorak et al. 2013	Yes – only when effortful control was low and risk for mania was high	University students assessed for hypomania	Older age and higher sensation seeking were significant predictors of a higher likelihood of having engaged in risky sexual behaviours in the past 6 months. After controlling for gender, sensation seeking was only significant for men but not women. Effortful control was also protective against risk-taking, but only in participants at high risk for mania.	Non-clinical sample – medication-free



**Table 3.** Outcomes for the main three research questions (continued)

Study	Evidence of higher risk taking in BD	Groups compared	Predictors of risk-taking	Did the study control for medication effects?
Edge et al. 2013	No	BD-I in remission vs healthy controls	No relationship between demographic variables (age, gender, education), mood state, illness severity (number of previous episodes, number of hospitalisations, number of suicide attempts), comorbidity, use of mood stabilisers, impulsivity and risk-taking.	Yes – no effects of mood stabilisers on IGT performance
Fletcher et al. 2013	Yes – self-reported higher risk during hypomania	BD-II	NA	No
Goldberg et al. 2005	Yes – BD had higher risk taking than both Major Depressive Episode and Control groups	BD (hypo)manic vs Major Depressive Episode and Healthy Controls	NA	No

**Table 3.** Outcomes for the main three research questions (continued)

Study	Evidence of higher risk taking in BD	Groups compared	Predictors of risk-taking	Did the study control for medication effects?
Hariri et al. 2011	No	BD in remission vs Schizophrenia, Heroin Users and Healthy Controls	NA	No
Hidiroglu et al. 2013	No – BD and BD-R only had lower adjustment scores in the BART but no evidence of general tendency of higher risk-taking	BD vs BD-Relatives and Healthy Controls	Impulsivity correlated with risk-taking. Higher scores on the BIS-Total, BIS-Attentional, BIS-Motor and BIS-Non Planning scales correlated with higher number of exploded balloons on the BART.  No significant relationships between duration of illness or euthymia, number of previous episodes, number of previous hospitalisations and risk-taking measures were found.	No

**Table 3.** Outcomes for the main three research questions (continued)

Study	Evidence of higher risk taking in BD	Groups compared	Predictors of risk-taking	Did the study control for medication effects?
Holmes et al. 2009	No – only for the BD with history of alcohol abuse. No differences between BD with no history of alcohol abuse and healthy controls	BD with history of alcohol abuse vs BD with no history of alcohol abuse and Healthy Controls	Higher scores on the BIS-Motor subscales correlated with more balloons popped on the BART. There were no correlations between the BIS-Attentional and BIS-Non Planning subscales with scores on the BART.	Yes
Marengo et al. 2015	Yes – self-reported	BD vs Healthy Controls	Earlier age at onset of BD, longer diagnostic delay, higher number of (hypo)manic episodes correlated with repeated STI. There were no associations between BD type, history of substance abuse, number of depressive episodes, age at first intercourse, not being married/living with a partner and risk-taking behaviours.	No

**Table 3.** Outcomes for the main three research questions (continued)

Study	Evidence of higher risk taking in BD	Groups compared	Predictors of risk-taking	Did the study control for medication effects?
Martino et al. 2011	No	Euthymic BD-I and BD-II vs Healthy Controls	History of suicide attempts was a significant predictor of a higher likelihood to engage in risk-taking behaviours.	No
Meade et al. 2008	Yes	Co-occurring BD and Substance Use Disorder compared with US general population	Recent manic episode, lower psychiatric severity, greater drug severity were all significant predictors of HIV risk.	No
Meade et al. 2011	Yes – higher sexual risk in participants who reported more weeks of mania compared to depression	Co-occurring BD and Substance Use Disorder	More average weeks of mania and days of cocaine use were predictors of higher sexual risk behaviour. Depression was unrelated to sexual risk behaviour.	No

**Table 3.** Outcomes for the main three research questions (continued)

Study	Evidence of higher risk taking in BD	Groups compared	Predictors of risk-taking	Did the study control for medication effects?
Meade et al. 2012	Yes – BD had higher risk-taking than both Major Depression and Healthy Control Group	BD vs Major Depression and Healthy Controls	Poorer adherence to psychiatric medication, greater symptoms of mania and depression and poorer adherence with ARV treatment were all predictors of higher likelihood of having sex with HIV negative partners.	Yes – poorer medication adherence associated with higher risk-taking behaviours
Reddy et al. 2014	No	BD vs Schizophrenia and Healthy Controls	Taking antipsychotic medication was a predictor of lower scores on the BART even after controlling for symptom severity and history of psychosis.	Yes – BD taking antipsychotics were more risk-averse than those not taking antipsychotics
Richardson et al. 2010	Yes – higher hypomania was significantly correlated with higher risk-taking	Undergraduate students assessed for risk of hypomania	Higher BIS-Attentional and BIS-Motor scores predicted higher scores on the HCL-32 Risk-Taking/Irritable subscale. Risk taking propensity (measured by DOSPERT Ethical and Health-Safety subscales) was a predictor of higher scores on HCL-32 Risk-Taking/Irritable subscale.	Non-clinical sample – medication-free

**Table 3.** Outcomes for the main three research questions (continued)

Study	Evidence of higher risk taking in BD	Groups compared	Predictors of risk-taking	Did the study control for medication effects?
Roisier et al. 2009	No – BD group responded slower than Healthy Controls, but no evidence of higher risk-taking	Euthymic BD vs Healthy Controls	NA	No
Saunders et al. 2016	No	BD vs Borderline Personality Disorder and Healthy Controls	NA	Yes – no effect reported
Stewart et al. 2012	Yes – higher risk of mania associated with higher sexual risk-behaviours	Adolescents assessed for risk of mania	NA	Non-clinical group – medication-free

**Appendix A: Journal of Affective Disorders – Guide for Authors****Description**

*The Journal of Affective Disorders* publishes papers concerned with **affective disorders** in the widest sense: **depression, mania, anxiety and panic**. It is interdisciplinary and aims to bring together different approaches for a diverse readership. High quality papers will be accepted dealing with any aspect of affective disorders, including biochemistry, pharmacology, endocrinology, genetics, statistics, epidemiology, psychodynamics, classification, clinical studies and studies of all types of treatment.

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Running head: DECISION MAKING AND RISK IN BIPOLAR DISORDER

Section 2: Research Paper

**Decision Making and Risk in Bipolar Disorder: A quantitative study using Fuzzy Trace Theory**

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### Abstract

**Background:** Risk-taking behaviours are common in people diagnosed with Bipolar Disorder (BD), and the consequences of these behaviours are numerous, impacting on quality of life. Studies conducted in BD attributed risk-taking to impulsivity and mood fluctuations, among other factors such as appraisal and coping styles. Nonetheless, an innovative theory of decision-making (Fuzzy Trace Theory; FTT) hypothesised that risk-taking is a “reasoned” action, rather than an impulsive one. The aims of this study were to characterise a group of people with BD based on FTT, and to test whether measures of FTT were predictive of risk-taking intentions in this population.

**Methods:** The study included a sample of 58 participants with a self-reported diagnosis of BD, who were asked to complete a series of online questionnaires. Correlations and hierarchical regression models explored the cross sectional relationship between FTT measures and risk-taking intentions.

**Results:** It was found that some BD clinical characteristics of the sample were associated with risk-taking intentions. There was significant variability on responses to FTT measures (verbatim and gist) in the sample included. Finally, measures of FTT were found to be significantly associated with risk-taking intentions in BD and both gist and verbatim scales significantly predicted risk-taking intentions (medium effect sizes), after controlling for mood and impulsivity.

**Limitations:** The main limitations of this study were a self-reported diagnosis of BD, the small sample size (n=58), older age group and the online recruitment methods, which could limit generalizability of the results.

*Keywords:* bipolar disorder, risk taking, decision making, fuzzy trace theory, impulsivity

Decision making and risk in people diagnosed with bipolar disorder.

## **1. Introduction**

Decision-making has been recognised to improve across the lifespan, in part due to a progression in brain development that leads adults away from the risky decisions typical of adolescence (Christakou et al., 2013). Adults are considered better decision-makers than adolescents, in particular, in decisions that involve risk (Tymula et al., 2013).

Dual-process theories of decision-making propose that this complex ability involves two different types of information processing mechanisms: one which is intuitive and based on the person's initial reaction or "gut feeling" to the situation and the other, which is more rational/computational, based on a careful trade-off of risks and benefits of the decision at hand and it is thought to succeed the initial intuitive process (for a review see Evans, 2008). These two systems are believed to work on a continuum; nonetheless, the intuitive system is usually recognised as more primitive and based on emotions, whilst the rational system is believed to be mainly a result of the modern era and it is often perceived as a "rationality boost" to intuitive thinking (Slovic et al., 2005).

In this modern paradigm, behaviours such as risk-taking have been understood as resulting from some sort of "fault" of the analytical thinking system and they have often been attributed to inherent traits of the person performing such behaviours (for a review see Evans, 2008). Within this framework, emotion plays a central role (Cameron and Leventhal, 2003; Chaiken and Trope, 1999; Epstein, 1994; Sloman, 1996), as it has been found to strongly influence the ability to engage in analytical thinking, thus generally impacting on decision-making (Schwarz, 2000). This observation is particularly relevant for clinical populations, such as Bipolar Disorder (BD), where emotion is a key characteristic.

### *1.1. Risk-taking in bipolar disorder*



Bipolar disorder encompasses a group of “affective disorders” characterised within the diagnostic paradigm by extreme shifts in mood, energy and level of socio-psychological functioning (American Psychiatric Association, 2013). Despite its utility in grouping people who report similar experiences, diagnosis has been often subject to one main critique: it masks heterogeneity and does not take into account the unique experiences of people who fall under a similar diagnostic label (e.g., Philips & Kupfer, 2013). This critique must be taken into account particularly when conducting studies involving people with BD, whose diagnosis can be difficult to operationalise due to the heterogeneous nature of BD and its characteristic frequent “mood shifts”. For the purpose of this paper, BD will be operationalised according to the Diagnostic and Statistical Manual of Mental Disorders criteria (American Psychiatric Association, 2013) as, despite their limitation, they remain the most widely used paradigm in research.

BD is associated with impairments in decision-making abilities, in particular in decisions involving risk. People diagnosed with BD have been found to have a higher propensity for risk-taking behaviour than the general population (Chandler et al., 2009), which can have overwhelming adverse consequences, impacting on multiple areas of the person’s life including their physical safety, social and occupational functioning, finances and relationships (Kleinman et al., 2003).

Research has found people with BD to show impaired scores in tasks involving decision-making in both the manic (Adida et al., 2008; Murphy et al., 2001; Rubinsztein et al., 2006) and depressed (Murphy et al., 2001; Rubinsztein et al., 2006) states of the condition. There is also evidence showing decision-making abilities to be affected in euthymic clients with BD (Chandler et al., 2009). Nonetheless, studies investigating decision-making in euthymic stages of BD yield contrasting results (Adida et al., 2011; Murphy et al., 2001).

Several psychological and pharmacological interventions have been developed in an attempt to address the challenges that people with BD face, in relation to the observed risk-taking behaviours; nonetheless, their efficacy remains understudied (for a review see MacDonald et al., 2016). Moreover, risk-taking in clinical practice seems to be generally approached with interventions that are “reactive” (after the behaviour has occurred) and indirect (because risk is considered the manifestation of something else, like a manic mood experience) in nature, instead of proactive or preventative. Thus, it is of utmost importance to clarify the processes behind risk-taking in people diagnosed with BD to design proactive/preventive interventions.

Engagement in risk-taking behaviours is currently listed as a symptom of mania (American Psychiatric Association, 2013); however, there are no comprehensive psychological models that explore the development of these behaviours during different mood states, including euthymia. For example, the “depression avoidance” hypothesis (Thomas et al., 2007), posits that risk-taking is a strategy for people diagnosed with BD to avoid depression during periods of mania, suggesting that risk-taking is dependent on mood state. Nonetheless, this theory is limited in that it does not offer a comprehensive conceptualisation of risk-taking across all the different states of BD, which has been observed in research.

Other studies have attributed risk-taking to a difficulty in regulating the pursuit of goals (Johnson, 2005), which is closely linked to impulsivity, a concept that has been extensively explored in BD research. For example, a recent meta-analysis found that people diagnosed with BD show elevated scores in the Barratt Impulsivity Scale (BIS-11) compared to controls (Saddichha and Schuetz, 2014). The authors reported that the impairment in decision-making observed in BD might be a characteristic of the acute phases of BD, rather than a general trait of people diagnosed with BD. A claim supported by several studies that

found that, although people with BD often show elevated scores on self-report measures of impulsivity (e.g. the BIS-11), they do not consistently show impairments in behavioural tasks requiring planning and forethought (Holmes et al., 2009; Lombardo et al., 2012). Therefore, it is possible that the process underlying risk-taking behaviour in BD is more complex than hypothesised in the impulsivity literature.

### *1.2. Fuzzy trace theory (FTT) as an alternative framework for BD*

An innovative theory of decision-making, Fuzzy Trace Theory (FTT) (Brainerd and Kingma, 1984; Brainerd and Reyna, 1992), offered a new conceptualisation of the mechanisms behind risk-taking behaviours, which moves away from the traditional perspective that risk-taking is a result of impulsivity, towards a different understanding of risk-taking as the result of a “reasoned” (but faulty) process. This theory is promising in relation to BD as it could help clarify the contrasting findings reported in the impulsivity literature on BD.

Historically, dual-processing theories of decision-making have attributed risk-taking to an over-reliance on a more intuitive (gist-based) way of processing information (Tymula et al., 2013), conceptualising more advanced decision making as the ability to carry out a rational process of trade-offs between risks and benefits to select the most optimal choice. These ideas have been challenged by FTT, which proposes a counterintuitive argument that optimal decision making is based on intuition rather than rationality (Brainerd and Kingma, 1984; Brainerd and Reyna, 1992).

FTT posits that, when people are exposed to a meaningful stimulus in their daily lives, they record their experiences by creating verbatim and gist representations that are stored in memory (Reyna, 2008, 2004; Reyna and Rivers, 2008). Verbatim representations are mental representations that are recorded as similarly as possible to the original experience, thus capturing the information in the exact form it was first presented (i.e., it is

literal, or verbatim). Conversely, a gist representation is more qualitative and it captures the “bottom line” meaning of the information recorded; it is often subjective, and it is influenced by several factors including the person’s emotional state, educational/cultural background and their developmental stage (e.g., adulthood vs adolescence) (Reyna and Brainerd, 1995).

FTT demonstrates how analytical thinking, rather than intuitive thinking, leads to risk-taking behaviours. For example, in a decision-making task involving unsafe sex, when a person is presented with the information that there is a 1% chance of contracting HIV when engaging in unprotected sex, adolescents (who have been shown to rely predominantly on verbatim-based thinking) are more likely to engage in unprotected sex because they base their decision on the idea that 1% is objectively a really low risk. However, they fail to consider that, although objectively 1% is a low risk, 1% means that it only takes once (one infected person) for a person to contract HIV through unprotected sex. Conversely, in gist-based thinking the bottom-line meaning is considered, i.e. that it only takes once to contract HIV, indicating that unsafe sex is not a good option.

Therefore, analytical (verbatim) thinking is faulty from the outset as it disregards the bottom-line (gist) meaning of the information presented, leading to risky decisions (e.g., engaging in unsafe sex), implying the idea of a “reasoned route” to risk-taking. Risk-taking is no longer conceptualised as the product of an impulsive act, but as a “deliberate” action based on verbatim thinking (Reyna, 2004).

### *1.2.1. FTT and emotion*

A major difference between FTT and other dual processes approaches is their interpretation of emotion in the context of risk-taking. In fact, whilst traditional dual-system approaches link emotion to suboptimal decision-making (hence more risk-taking), FTT distinguishes between emotion and intuition (Rivers et al., 2008). According to FTT, emotion is not synonym of poor decision-making; in fact, valence (i.e. a simple evaluation of

a stimulus as “good or bad” based on an intuitive “gut feeling”), is a necessary component of gist and it is helpful in decision-making processes (Chick and Reyna, 2012). Nonetheless, valence is thought to be based on experience. Therefore, whilst adults, who have acquired the necessary experience to trigger a negative “gut feeling”, which will lead them to avoid a risky situation (e.g. an unprotected sex), adolescents lack this experience and thus, might have acquired a “faulty valenced conception” that unprotected sex is fun. This causes them to fail to consider the risks associated with this, an ability that comes subsequently when adolescents experience the negative consequences of unprotected sex (e.g. sexually transmitted diseases).

The role of arousal in decision-making is also relevant. Arousal is believed to heighten the motivational effects of rewards; thus, in a verbatim-based thinking process, where there is a trade-off of risks and benefits, decision-makers are even more likely to take risks as they tend to over-estimate the benefits and discount the risks of their decision. Interestingly, gist-based thinking was found to not be impacted by arousal, thus explaining why less advanced thinkers (e.g., adolescents) are found to be more susceptible to arousal than more advanced thinkers (e.g., adults) (Rivers, Reyna, & Mills, 2008).

FTT offers an interesting framework to further our understanding of risk-taking behaviours in BD. Clarifying where BD is placed on the continuum between verbatim and gist-based thinking could offer an innovative insight into the processes leading to risk-taking in this population. This could potentially complement the idea that risk taking in BD is a result of impulsivity or heightened mood, which is often characterised as an intrinsic and unchangeable personality trait in people with BD, creating a less stigmatising idea that risk taking occurs on a normal continuum between verbatim and gist-based thinking.

Moreover, some preliminary findings from FTT show interesting implications for the involvement of these concepts in risk reduction programs. Reyna et al. (2015b) tested a FTT-

informed intervention for the reduction of risk-taking behaviours on a sample of adolescents and found it was successful in reducing risk-taking behaviours and that it was more effective than another risk-reduction programme based on traditional concepts of risk-taking behaviours. These findings could have promising clinical implications for the development of new interventions specifically targeting risk-taking behaviours and treatment non-adherence in people diagnosed with BD.

### *1.3. The current study*

The current study aimed at characterising a group of people who self-reported being diagnosed with BD in terms of FTT theory. To achieve this aim the next steps were followed and hypotheses investigated:

- a) Aim 1: we evaluated the links between the clinical characteristics of the sample and risk-taking intentions. Research on BD suggests that BD Type I, longer duration of BD and a higher number of episodes of BD are associated with a worse outcome (for a review see Sanchez-Moreno et al., 2009). Moreover, as outlined above, mood (mania in particular) is associated with higher risk-taking in BD. Thus, it was hypothesised that people with a diagnosis of BD Type I (compared to Type 2 and other BD diagnoses), with an early diagnosis (compared to late), a higher severity of illness (operationalized as higher number of episodes) and who were currently experiencing a mood episode (both mania or depression) would score higher on risk-taking intentions scales (measured by the DOSPERT).
- b) Aim 2: we characterised the patterns of response of the sample on FTT measures (i.e. gist and verbatim scales). Based on previous research outlined above, it was hypothesised that people diagnosed with BD would obtain higher scores on verbatim measures compared to gist, indicating

higher endorsement of verbatim representations.

- c) Aim 3: we explored the associations between the FTT scales and risk-taking intentions. Research on FTT reported above suggests that people who endorse verbatim representations (compared to gist) are more likely to engage in risk-taking behaviours. Therefore, it was hypothesised that there would be a positive correlation between verbatim scales and risk-taking intentions scales and a negative correlation between gist scales and risk-taking intentions scales.
- d) Aim 4: we investigated whether FTT scales predict risk-taking intentions after accounting for mood state and impulsivity. Impulsivity and mood are well established predictors of risk-taking in research involving people diagnosed with BD. Nonetheless, research on FTT suggests that risk-taking is not purely a result of higher impulsivity or emotion. Therefore, it was hypothesised that FTT scales would be significant predictors of risk-taking intentions in people diagnosed with BD even after accounting for mood and impulsivity.

Studies of decision-making in clinical populations are of immense value, because they can help to clarify the nature of suboptimal processes in a clinical population, in order to establish brain-behaviour relationships and point towards the development of potential treatments for BD. By characterising BD using FTT, it is aimed to offer a clearer framework to conceptualise decision making and risk-taking behaviours in people diagnosed with BD, as well as offer clinical recommendations to improve outcome in BD.

## **2. Materials and Methods**

A total of 110 participants were recruited using social media (Twitter), UK and international charities, and client support organisations. Only 58 participants (53%)

completed the study. The research inclusion criteria required participants to be over the age of 18, be fluent English speakers, able to provide informed consent and self-reported having a diagnosis of bipolar disorder. Demographic information is available in Table 1.

### *2.1. Measures*

Data were collected through anonymised online questionnaires using Qualtrics software (2005), Version 3.5.0, Copyright © [2017]. Demographic (age, gender, current employment, level of education, ethnicity and marital status) and clinical (time since diagnosis, diagnosis type, number of previous episodes of BD, information about current psychological therapy and type, and current medication and type, current mood state, other mental health diagnoses) variables were gathered using individual items.

#### *2.1.1. Fuzzy Trace Theory Scales*

*Verbatim scales.* Two verbatim scales introduced by Mills, Reyna and Estrada (2008) were used for the current study. The first scale, a Specific-Risk scale, comprised of 5 items that listed concrete consequences of risky sexual behaviour (e.g., contracting HIV or sexually transmitted diseases) and asked participants to estimate the personal risk of those consequences on a 5-point scale ranging from strongly disagree to strongly agree. These items were designed to trigger verbatim memories of past behaviours (e.g., instances where the person engaged in unprotected sex), thus involving a verbatim (or analytic) mode of thinking. The scale showed excellent reliability ( $\alpha=.96$ ); details are available in Table 2. A second verbatim scale, the Quantitative Risk Scale, asking participants to quantify their risk of having an STD on a scale from 0 to 100 was also used as a validity check. High scores on the specific risk and quantitative risk scales indicate endorsement of verbatim principles.

*Gist scales.* Three gist scales were used to measure gist-based thinking (Mills et al., 2008). The Categorical Risk Scale comprised of 9 items that measured categorical thinking about risk (e.g., “even low risks happen to someone”), and were rated on a 5-point scale



ranging from strongly disagree to strongly agree. High scores on the categorical risk scale indicate higher categorical thinking about risk. The scale showed acceptable reliability ( $\alpha=.79$ ); information is available in Table 2. The Gist Principles Scale contained 15 simple statements about risk (e.g., avoid risk) and participants were asked to indicate which statements applied to them (or not). High scores on the gist principles scale indicate lack of endorsement of gist principles. The scale showed good reliability ( $\alpha=.80$ ). Details are available in Table 2. The final gist scale, Global Risk, asked participants to state their personal risk of having sex as “low”, “medium” or “high”. High scores on the global risk question indicate high personal risk perception.

### *2.1.2. Measurement of mood*

Participants' manic symptoms were evaluated using the Mood Disorder Questionnaire (MDQ; Hirschfeld et al., 2000), and mood was assessed with the 7up 7down inventory (Youngstrom et al., 2013). The MDQ is a 5-item self-report questionnaire, which has been developed as a screening tool for bipolar disorder. Participants are asked to answer ‘yes’ or ‘no’ to a series of questions about lifetime symptoms of mania and hypomania and subsequently indicate the degree of impairment caused by these symptoms. The questionnaire also asks about the participants' blood relatives' history of bipolar disorder and whether the participants have ever received a diagnosis of bipolar disorder. In order to obtain a positive screen, the following criteria must be met: a positive score (‘yes’) on 7 out of 13 items of the main questionnaire; a positive response (‘yes’) to question 2 (‘if you checked yes to any of the above, have several of these ever happened during the same period of time’); a ‘moderate’ or ‘serious’ response to question 3 (‘how much of a problem did any of these cause you’). The scale showed acceptable reliability in our sample ( $\alpha=.71$ ); details are available in Table 2.

The 7up 7down inventory is a measure carved from the General Behaviour Inventory (GBI). It comprises seven items asking about symptoms of mania (7up) and seven items asking about depressive symptoms (7down). Participants are asked to state how often they have experienced each symptom during the past two weeks and score each item on a scale of never or hardly ever, sometimes, often, very often or almost constantly (scored 0 to 3). Both the 7up ( $\alpha=.93$ ) and 7down ( $\alpha=.96$ ) scales showed excellent reliability in our sample.

Information is available in Table 2.

### *2.1.3. Measurement of impulsivity*

Impulsivity was measured using the simplified version of the Barratt Impulsiveness Scale (BIS-11; Spinella, 2007). The BIS-11 simplified is a widely used measure of impulsiveness and comprises 14 items scored on a 4-point scale of rarely/never, occasionally, often and almost always/always (scored 1 to 4). The scale showed excellent reliability ( $\alpha=.90$ ) in our sample. Information is available in Table 2.

### *2.1.4. Measurement of risk-taking intentions*

Information about participants' risk-taking intentions was collected using the Domain Specific Risk Taking Scale for Adult Population (DOSPERT; Blais & Weber, 2006). The DOSPERT encompasses two subscales measuring risk taking behaviour (RT) and risk perception (RP). Each scale comprises 30 items. The RT subscale was used for the current study. The scale is scored using a 7-point scale from "extremely unlikely" to "extremely likely" (scored 1 to 7) and asks the participants to score their likelihood to engage in each stated behaviour or activity. The DOSPERT\_RT scale comprise of 5 further subscales, each comprising 6 items and evaluating risk-taking intentions in different domains: ethical ( $\alpha=.65$ ), financial ( $\alpha=.77$ ), health/safety ( $\alpha=.72$ ), recreational ( $\alpha=.86$ ) and social ( $\alpha=.77$ ). A further subscale was also computed for the current study and it comprised of items 9 ("having an affair with a married man/woman") and 15 ("engaging in unprotected sex") of the

DOSPERT specifically asking about sexual-risk intentions ( $\alpha=.62$ ). All subscales showed good and acceptable reliability in our sample. Information is available in Table 2.

### *2.2.Data Analyses*

Data were analysed using SPSS version 22.0. To determine internal consistency of the scales utilised in the study, Cronbach's alpha was calculated. Descriptive and frequency analyses were conducted and correlation and partial correlations analyses were used to explore the links between clinical variables and risk-taking intentions.

Subsequently, participants' response patterns on the gist and verbatim scales were evaluated via exploratory analyses, using measures of central tendency and graphical visual inspections, to characterise BD in terms of endorsement of gist and verbatim principles. Following this stage, correlation analyses between FTT scales and between FTT with DOSPERT Risk-Taking subscales were used to explore the links between endorsement of verbatim/gist principles and risk-taking intentions. Finally, hierarchical regression models were conducted to explore whether FTT scales predicted risk-taking intentions after controlling for mood and impulsivity.

### *2.3.Ethical Statement*

The current study was approved by the Faculty of Health and Medicine Research Ethics Committee (FHMREC Reference: C15136) at Lancaster University.

## **3. Results**

### *3.1.Participants' Characteristics*

A total of 110 participants accessed the online link to the survey used in the study. Among these, 58 participants (52%) fully completed the study and were included for analysis. When comparing final sample with participants who did not complete the study, but provided demographic information ( $n=20$ ), no significant differences between groups

were observed for example on age ( $t(76)=-1.55, p=.12$ ), gender ( $\chi^2(2)=3.50, p=.17$ ), and education level ( $\chi^2(1)=3.46, p=.06$ ) (more details upon request).

Demographic and clinical characteristics of the sample are presented in Table 1. The mean age of those with complete data was 49 (SD=15; range 21-78); of these, 68% were female (n=39). Eighty-six percent were native English speakers, 72% reported being either in employment or students, and 85% reported having completed some form of higher education (undergraduate, masters or PhD/Doctorate degree). Thirty-three percent participants self-disclosed having received a diagnosis of BD Type I, 46% of BD Type II, 19% of BD Not Otherwise Specified and 2% of Schizoaffective Disorder. Only 5% received these diagnoses in the year prior to the study, and 26% were diagnosed more than 16 years ago. Twenty-three percent reported having a co-morbid MH diagnosis in addition to BD. The majority (83%) were currently on psychotropic medication for BD, whilst only 40% reported receiving psychological therapy. Thirty-five percent self-reported that they were currently experiencing a mood episode, whilst 24%, reported having experienced their last BD episode more than 6 months ago.

In terms of MDQ scores, 53 participants (91%) obtained a positive screening on the MDQ, derived from a score of 7 or higher on the first 13 items, a 'yes' score on question 2 and a 'moderate' or 'serious' response on question 3. Only 5 (9%) participants obtained a negative screening on the MDQ.

### *3.2.Data screening and preparation*

Response patterns were screened to check for assumptions of normality. Categorical Risk and the Gist Principles scales showed relatively normal distributions (Table 3). Conversely, scores on the Global Risk Question were not normally distributed, showing a trend towards lower scores. In terms of verbatim scales, they also showed a non-normal

distribution with the same trend towards lower scores for both the Specific Risk Scale and the Quantitative Risk Scale. Details are available in Figures 1 to 6 and Table 3.

In terms of sample responses to DOSPERT Risk-Taking subscales, all showed a fairly normal distribution. Similarly, scores on the BIS were normally distributed. Conversely, scores on the 7up and 7down scales showed a non-normal distribution with a trend towards lower scores. Details are available in Table 3.

After exploring cases showing extreme scores (potential univariate outliers), two participants were identified reporting the maximum score possible on the Specific Risk Scale (an unusually higher score when compared with rest of the sample). Based on this finding, the potential influence of these participants was evaluated when this scale was included in our analyses.

### *3.3.Aim 1: Associations between bipolar clinical characteristics and Risk-Taking intentions*

Associations between BD clinical characteristics and risk-taking intentions are presented in Table 4. When testing the association of diagnosis type (Bipolar Type I vs. Else) with risk taking intentions, it was found that people in the BD I group had lower scores than participants with other BD diagnoses (BD-Type II, BD NOS, Schizoaffective Disorder) on the DOSPERT Sex subscale ( $r=.28$ ).

When assessing the association of early (diagnosed more than 6 years ago) vs. late onset (diagnosed less than 6 years ago) with risk intentions scales, after controlling for age (correlation of age with early onset vs late was  $r=.48$ ), non-significant correlations were observed. However, being older was significantly associated with a reduction on intentions to engage in risk on Financial ( $r=-.29$ ), Recreational ( $r=-.33$ ) and Social subscales ( $r=-.28$ ).

Current experience of a mood episode (irrespective of valence, manic or depressive) showed significant positive correlations with higher scores on the Financial subscale ( $r=.35$ ).

Finally, higher severity of illness ( $\geq 10$  previous mood episodes in the past) was positively correlated with risk-taking intentions in health/safety ( $r=.27$ ) and recreational ( $r=.32$ ) domains, after controlling for age.

#### *3.4.Aim 2: Response pattern on gist and verbatim scales*

In terms of response on verbatim scales (Specific Risk and Quantitative Risk scales), after excluding the two outliers mentioned above, the Specific Risk ( $M=7.10$ ,  $SD=4.08$ , observed range=5 to 25) and Quantitative Risk scales ( $M=.97$ ,  $SD=2.16$ , observed range=0 to 10) showed a trend towards low scores, indicating lack of endorsement of verbatim principles.

Regarding measures of gist, 77% scored 'low', 18% scored 'medium' and 5% scored 'high' on the Global Risk Question, indicating a general low perception of personal risk of having sex. Scores on both the Categorical Risk ( $M=24.78$ ,  $SD=5.89$ , observed range=4 to 36) and Gist Principles Scales ( $M=20.93$ ,  $SD=3.20$ , observed range=15 - 28) showed more variability than in the previous scales.

##### *3.4.1. Correlations between FTT scales.*

When testing the correlations between the individual FTT scales there were significant negative correlations between the Categorical Risk Scale and the Specific Risk Scale ( $r_s=-.27$ ), positive correlations between the Gist Principles Scale and the Global Risk Question ( $r_s=.29$ ) and the Quantitative Risk Question ( $r_s=.35$ ), a significant positive correlation between the Global Risk Question and the Quantitative Risk Question ( $r_s=.29$ ), a significant positive correlation between the Specific Risk Scale and the Quantitative Risk Question ( $r_s=.53$ ). No significant correlations were observed between the Gist Principles Scale and the Specific Risk Scale (verbatim) (Table 5).

#### *3.5.Aim 3: Correlations between FTT scales and risk-taking intentions*

To test whether endorsement of verbatim or gist were related to risk-taking intentions, correlation analyses were performed. In terms of verbatim scales, as aforementioned, it was noted that two participants obtained unusually high scores on the Specific Risk Scale, thus they were removed from correlation analyses for the Specific Risk Scale but not for the other scales.

In terms of verbatim scales, there were significant correlations between Specific Risk Scale and the DOSPERT Ethical ( $r_s=.26, p<.05$ ), Financial ( $r_s=.29, p<.05$ ), Health/Safety ( $r_s=.46, p<.01$ ) and Sex ( $r_s=.44, p<.01$ ) subscales. This indicates that endorsement of verbatim principles was related to higher risk-taking intentions in the explored domains. The Quantitative Risk Scale showed significant positive correlations with the Ethical ( $r_s=.44$ ), Financial ( $r_s=.49$ ), Health/Safety ( $r_s=.40$ ) and Sex ( $r_s=.48$ ) subscales, also implying that endorsement of verbatim principles was linked with higher risk-taking intentions in the observed domains (Table 6).

Regarding gist measures, the Categorical Risk Scale was not significantly correlated with any of the risk-taking intentions scales. However, the Gist Principles Scale showed significant positive correlations with Ethical ( $r=.40$ ), Health/Safety ( $r=.36$ ) and Sex ( $r=.49$ ) subscales. High scores on the Gist Principles Scale indicate low endorsement of gist principles. Therefore, the results indicate that endorsement of gist principles was protective against risk-taking intentions in the Ethical, Health/Safety and Sex domains. Finally, the Global Risk Scale was positively correlated with the Financial ( $r_s=.31$ ) and Sex Subscales ( $r_s=.42$ ). High scores on the Global Risk Scale indicate high perception of personal risk, thus the results show that higher perception of personal sexual risk is related with higher sexual risk-taking intentions (Table 6).

*3.6.Aim 4: Does FTT predict risk-taking intentions after controlling for mood and impulsivity?*

To test whether FTT scales were predictive of risk-taking intentions after controlling for mood and impulsivity, FTT scales that were found to be significantly correlated with DOSPERT subscales were entered together into a hierarchical multiple regression model. Mood and impulsivity were entered separately into the regression model. First, mood was included in Step 1 of the regression model followed by the addition of the FTT scales in Step 2. Subsequently, impulsivity was added in Step 1 of the regression model (substituting mood), followed by the addition of the FTT scales in Step 2.

When predicting intentions to engage in risk-taking related with sex, both the Gist Principles Scale and the Specific Risk Scale made significant contributions ( $part=.31$  and  $part=.22$ ) to the model, after controlling for mood, where the (hypo)manic scale (7up) also made a significant contribution ( $part=.27$ ) (Table 7). The pattern of results was similar when impulsivity (BIS Total Score) was added to the model, replacing mood. However, impulsivity was not a significant predictor of risk-taking intentions in the sexual domain when FTT scales were entered the model. FTT scales added 27% of variance over and above impulsivity (Table 8).

When predicting risk-taking intentions in the ethical domain, only the Gist Principles Scale ( $part=.25$ ) and (hypo)mania (7up;  $part=.27$ ) were found to be significant predictors (Table 9). The same pattern was observed when impulsivity was added to the model, replacing mood; the Gist Principles Scale predicted a significant amount of variance ( $part=.29$ ) and impulsivity also made a significant contribution to the model ( $part=.42$ ) (Table 10).

Finally, when predicting risk-taking intentions in the health/safety domains, the opposite pattern was observed. In this model, only the Specific Risk Scale made a significant contribution ( $part=.24$ ) instead of the Gist Principles Scale and the depression scale (7down;  $part=.25$ ) instead of the (hypo)mania scale (7up) significantly contributed to the variance



(Table 11). In the model that included impulsivity instead of mood, impulsivity was the strongest predictor ( $\beta=.42$ ), followed by the Gist Principles Scale ( $\beta=.24$ ) and the Specific Risk Scale ( $\beta=.21$ ), which almost reached significance ( $p=.05$ ).

All these models were statistically significant, showing significant predictors small or medium effect sizes in the expected direction when predicting intentions to engage in risk behaviours. Effect sizes were calculated using Pearson's  $r$ , where  $.10 < r < .30$  is a small effect size,  $.30 < r < .50$  is a medium effect size and  $r \geq .50$  is a large effect size (Ferguson, 2009).

#### **4. Discussion**

The current study characterised a group of people diagnosed with BD in terms of FTT theory. First, the links between clinical characteristics of the sample and risk-taking intentions were explored. Second, the patterns of response of the sample on FTT scales was investigated. Third, the associations between FTT measures and risk-taking intentions were tested. Finally, it was investigated whether endorsement of verbatim or gist principles predicts risk-taking intentions in different domains. The findings were promising in that gist and verbatim measures explained unique variance in risk-taking intentions that went beyond the effects of impulsivity and mood. However, due to the small sample size and other limitations that will be discussed in detail later in the paper, results must be interpreted cautiously.

##### *4.1. BD Clinical Characteristics and Risk-Taking Intentions*

Before proceeding to comment on the main results of the study, it is important to outline some information about the characteristics of the participants included. The sample of the current study was varied in terms of BD diagnosis type and experiences related to BD (e.g. duration of BD, number of episodes), which reflects the heterogeneous nature of BD. Nonetheless, it can be noted that most participants were females and of an older age group. Similarly, most participants reported being in some form of employment (or students) and

having completed higher education, which is somewhat unrepresentative of people with BD in general (Hilty et al., 2006; Zimmerman et al., 2010). These characteristics must be held in mind when generalising the findings of the current study.

In relation to the first step to explore the links between participants' clinical characteristics and risk-taking intentions, having a diagnosis of BD Type I was associated with lower risk-taking intentions in the sex domain (a small effect size), whilst currently experiencing a mood episode was related with higher risk-taking intentions in the financial domain (medium effect size). Finally, a proxy of severity of illness (having had 10 or more episodes of BD) correlated with higher rates of risk-taking intentions in the health/safety and recreational domains (small and medium effects respectively).

The finding that a self-report diagnosis of BD Type I was associated with lower risk-taking in the sex domain was counterintuitive. However, further analyses are required to see if this association persists after controlling for potential confounders such as current mood state or treatment status. For example, people with a BD Type I diagnosis are generally exposed to more aggressive pharmacological treatments than other forms of BD (National Institute for Health and Care Excellence, 2011), that could in part explain this finding.

Another interesting finding of the current study was the relationship between mood episode and financial risk-taking. It was found that currently experiencing a mood episode positively correlated with higher risk-taking intentions in the current sample, highlighting the fact that higher rates of risk-taking intentions in BD could be linked to the effects of mood instead of BD diagnosis in general. Unfortunately, information about the valence of mood episode was not available, thus it was not possible to test whether the effects of current mood episode on risk-taking were related with manic, depressive or mixed episodes. Studies exploring risk-taking in BD have found consistent evidence of higher rates of risk-taking behaviours during the manic states of BD (Adida et al., 2011, 2008). Nevertheless, the

relationship between depressive episodes and risk-taking in BD is less clear with studies on the topic yielding contrasting results (e.g., Adida et al., 2008; Robinson and Ferrier, 2006). It would be beneficial to conduct further research to investigate this point further. Future studies may wish to compare the BD group with non-clinical groups experiencing sub-syndromal (hypo)mania and depression to clarify the nuances in relation to these patterns of behaviour.

Finally, it was found that severity of illness (having had 10 or more episodes of BD) correlated with higher rates of risk-taking intentions in the health/safety and recreational domains. Research in the field of BD showed that a higher number of episodes is related to worse outcome (Di Marzo et al., 2006). Therefore, it is difficult to further expand on the relationship between severity of illness and risk-taking as this could be due to a variety of factors linked to a longer and more severe course of BD.

#### *4.2. Characterising BD and risk-taking with FTT measures*

One of the main aims of the current research was to explore where BD is placed on the continuum between verbatim and gist. It was hypothesised that people with BD would show an over-reliance on verbatim rather than gist representations. Nonetheless, results did not support our hypothesis considering the general pattern of lack of endorsement of verbatim principles scales in our sample. However, it is important to note that the sample included in the current study comprised mostly people from an older age group (with a mean age of 49 years). Older age is hypothesised to be associated with reliance on gist over verbatim representations (Reyna and Brainerd, 1995; Reyna and Farley, 2006) and thus, this fact must be considered when interpreting these findings.

Interestingly, the pattern of responses on gist scales was varied, showing that non-endorsement of verbatim principles was not directly related to endorsement of gist principles. Moreover, the current study also found no significant correlations between the gist and

verbatim scales. These findings are in line with research on FTT hypothesising that verbatim and gist representations are encoded simultaneously, but retrieved separately, depending on the stimuli presented (Rivers et al., 2008). Thus, people can have distinct (even contradictory) representations of the same situation, but will rely on verbatim or gist depending on a series of factors (e.g. age or stimuli).

In terms of the association between FTT and risk-taking, it was found that FTT scales correlated with risk-taking intentions in the expected direction. Namely, endorsement of verbatim principles (although not common) was positively correlated with higher risk-taking intentions on the ethical, financial, health/safety and sexual domains. Conversely, endorsement of gist principles was correlated with lower risk-taking intentions in the ethical, health/safety and sexual domains. Finally, there were no significant correlations between the Categorical Risk Scale and any of the measures of risk-taking intentions. These findings are partially consistent with other studies in the field, which found contrasting patterns for verbatim and gist measures in relation to risk-taking (e.g., Mills et al., 2008).

The current study also found a counterintuitive result when evaluating the association of Global Risk Question and risk; in fact, high scores on this scale were found to be positively correlated with risk-taking intentions in the sexual domain, contrary to findings reported by Mills et al., (2008), who found negative correlations between the two variables. FTT suggests that people who are more likely to take risks are prone to deny vulnerability when a “global measure” is used, but can acknowledge their risks when cued to recall specific events in which they engaged in risk-taking behaviours. Conversely, risk-avoiders would be able to acknowledge their global risk of having sex but tend to score lower on measures asking for specific risk-taking as they have less events to recall (Reyna et al., 2015b; Reyna and Brainerd, 1995). Finally, as aforementioned, the current study found no

associations between the Categorical Risk Scale and risk-taking intentions. Further research is needed to clarify this point.

#### *4.3. Do FTT measures predict risk-taking intentions?*

The main findings of the current study were related to the unique predictive value of the verbatim (Specific Risk Scale and Quantitative Risk Scale) and gist scales (Gist Principles Scale, Categorical Risk Scale and Global Risk Question) when predicting risk-taking intentions after controlling for mood or impulsivity. The results showed that, even after controlling for mood and impulsivity, which are considered cardinal variables when explaining risk-taking in numerous studies (e.g., Hıdıroğlu et al., 2013; Reddy et al., 2014), endorsement of verbatim and gist principles explained a statistically significant amount of the variance (medium effect sizes) in risk-taking intentions in the sample. This was in the expected direction, supporting our main hypothesis that risk-taking is not simply a result of the impulsive behaviour or mood fluctuations typical of BD, but a combination of more complex processes involved in decision-making situations (Mills et al., 2008; Reyna, 2008; Reyna and Brainerd, 1991).

There were some subtle differences about predictors when explaining variance on different domains of risk-taking intentions, which need to be replicated in future studies. Of relevance was the fact that the process triggered by stimuli related with sex (item content of FTT scales) was also capable of predicting risk-taking intentions in other domains such as ethical and health/safety.

Significant differences in predictors of risk-taking intentions across different domains have been observed in previous research (e.g., Blais and Weber, 2006), suggesting that the processes underlying risk-taking intentions in specific domains might be different. These findings might help explain the different patterns of predictors found in our sample, with gist (but not verbatim) predicting risk-taking intentions in the ethical domain, and verbatim (but

not gist) predicting risk-taking intentions in the health/safety domains. For example, ethical decisions have been hypothesised to be fundamentally different from other types of decisions, in that they involve decisions that may directly benefit or harm others (Crossan et al., 2013). As such, decisions in the ethical domain are usually based on the person's internal "ethical code", and have been found to be overwhelmingly dominated by "intuition" rather than "rationality" (Rand et al., 2014) thus relying on gist representations rather than verbatim. People might have internalised certain situations as "bad" or "good", deriving the bottom line meaning from their experiences.

Conversely, decisions concerning health/safety are usually based on precise information – e.g. risk percentages when trying to consider the lifetime prevalence of a health condition – and thus are more likely to cue verbatim representations when the person is faced with a decision (Reyna, 2008), supporting our finding that verbatim-based processes (not gist) predicted health/safety risk intentions. However, these finding requires further testing.

#### *4.4. Clinical implications*

The results of the current study have clinical implications for the management of risk-taking in people diagnosed with BD. Nonetheless, due to the small sample size and other limitations that will be further explored below, any attempt at generalising the findings must be approached with caution.

The idea of a "reasoned route" to risk-taking in BD is of high clinical relevance; in fact, moving away from the idea that risk-taking is an impulsive act, clinicians may wish to consider preventative approaches aimed at modifying whether the person relies on verbatim/gist representations during decision-making. Research on FTT has found promising results in relation to the applications of this theoretical framework to practical interventions for risk-reduction in the adolescent population (Reyna and Adam, 2003; Reyna and Mills, 2014).

Most importantly, our findings might help explain why current interventions to prevent risk-taking in BD are often proven ineffective. In fact, risk-prevention programs are usually based on the idea that by providing the client with detailed information about the risks and benefits of their behaviours, they will be more likely to avoid risky choices. Nonetheless, we have observed how this approach is based on the idea that optimal decision-making is a result of a careful trade-off of risks and benefits, which has been hypothesised to cause opposite effects (i.e. more risk-taking) in FTT (Mills et al., 2008; Reyna and Adam, 2003; Reyna and Farley, 2006). In fact, it has been found that, when relying on verbatim-based thinking, although people may be able to correctly recall the specific facts related to a situation, they still fail to derive the bottom-line meaning of the situation presented to them, which is key to informed decision-making (Reyna, 2008). Thus, clinicians may wish to consider new ideas promoted by FTT to inform a re-evaluation of current preventative programs for people diagnosed with BD.

It is also important to note that gist-based thinking has been shown to be protective against risk-taking, not only in laboratory tasks but also in real life decisions, even in populations that are usually characterised as “risk-takers”. For instance, a study found that adolescents who perceive risk qualitatively (based on the bottom line, or gist meaning of the situation) are less likely to engage in risk-taking behaviours than adolescents engaging in a verbatim-based process of trade-off between risks and rewards (e.g., Reyna and Farley, 2006). One of the main critiques of studies focusing on impulsivity and mood is that the measures used have little generalizability as they are only applicable to laboratory settings (e.g., Buelow and Suhr, 2009). Considering the direct link between gist processing and decision-making in real-life situations, our findings may be generalizable to both real-life and clinical scenarios. However, further observational research may be helpful to test this claim.

#### *4.5.Limitations*

The results of the current study must be interpreted within its limitations. First, it is important to note that due to the recruitment methods through online means, the current study might have a bias toward a group of people that was relatively high functioning and might have missed potential participants who were toward the lower functioning end of the spectrum. However, some preliminary analyses comparing participants who completed the study and those who did not showed non-significant differences on a series of variables (e.g., age, diagnosis type, level of education).

It is also important to outline that the available clinical information (including BD diagnosis) was self-reported by the participants; thus, there was no objective evidence to confirm diagnosis of BD and other clinical variables. In particular, in relation to the self-reported diagnosis of BD, it is important to acknowledge that this might have impacted on the validity of the results. Nonetheless, due to funding and study design restrictions it was difficult to employ a different method to validate BD diagnosis. Future studies may wish to utilise valid diagnostic measures (e.g. the MINI – International Neuropsychiatric Interview)(Sheehan et al., 1998) to address this potential issue.

Furthermore, due to the relatively small number of participants, the number of variables entered into the regression models was limited to ensure statistical power. This made it difficult to explore the effects of clinical and demographic variables on the predictive value of FTT scales regarding risk-taking intentions. It would be beneficial to conduct further larger scale studies to clarify this point.

It also has to be noted that a large number of statistical comparisons were conducted to test the hypotheses of the current study. This, in addition to the small number of participants included in the study, might have increased the chances of Type 1 error. Nonetheless, it was decided not to perform adjustment to the data set (e.g. Bonferroni correction) as this was an exploratory study to characterise a clinical population utilising a



new measure (FTT scales) and generate hypotheses, which could have been compromised when adopting more stringent criteria of statistical significance. Future studies may wish to address this potential issue by recruiting a larger sample in order to increase statistical power and reduce the chances of Type 1 error.

Another potential limitation of the current study was the lack of a control group. Nonetheless, the recruitment of a control group was beyond the scope of the current study, which aimed at providing an initial characterisation of people with a self-reported diagnosis of BD according to FTT measures. Future larger scales studies are necessary to explore how this clinical population compares to a healthy control group in relation to FTT scales and risk-taking intentions.

It is also important to take into account that the FTT scales used in the current study were specifically designed to test risk-taking intentions in an adolescent sample (see Mills et al., 2008). Thus, it is possible that this impacted on the results in the current study, which involved a sample of an older age group, compared to the adolescent sample involved in the original study from which the scales were adapted.

Moreover, the sample involved in the current study was a relatively older sample in terms of age, and most participants reported currently being employed (or students) and having completed some form of higher education, which is somewhat unrepresentative of the general BD population. Further research may wish to recruit larger samples of younger and older participants to offer potential comparisons between age group, to clarify patterns of response in FTT measures.

Finally, due to the use of online questionnaires, it was difficult to control response rate and to ensure that participants who took part in the study completed all measures administered. This led to missing data and incomplete responses. Future studies may wish to

consider face-to-face methods to overcome some of the abovementioned limitations faced by the current piece of research.

## **5. Conclusions**

This study found some promising results to help explain the links between FTT measures and risk-taking intentions in BD. The main finding was that gist and verbatim representations are both independent predictors of risk-taking intentions in the sexual, ethical and health/safety domains, even after controlling for mood and impulsivity. This offers a new conceptualisation of the mechanisms behind risk-taking in BD, which move away from the traditional idea that risk-taking is simply the result of impulsivity and mood fluctuations in this clinical population, towards a more complex framework based on the idea of a “reasoned route” to risk-taking.

The findings had some clinical implications, particularly regarding the development of new preventative interventions to target risk-taking as well as treatment non-adherence, which are common problems in people diagnosed with BD. Further research would be of high value to further our understanding of risk-taking in this clinical population.

### References

- Adida, M., Clark, L., Pomietto, P., Kaladjian, A., Besnier, N., Azorin, J.M., Jeanningros, R., Goodwin, G.M., 2008. Lack of insight may predict impaired decision making in manic patients. *Bipolar Disord.* 10, 829–837. doi:10.1111/j.1399-5618.2008.00618.x
- Adida, M., Jollant, F., Clark, L., Besnier, N., Guillaume, S., Kaladjian, A., Mazzola-Pomietto, P., Jeanningros, R., Goodwin, G.M., Azorin, J.-M., Courtet, P., 2011. Trait-Related Decision-Making Impairment in the Three Phases of Bipolar Disorder. *Biol. Psychiatry* 70, 357–365. doi:10.1016/j.biopsych.2011.01.018
- American Psychiatric Association, 2013. *Diagnostic and statistical manual of mental disorders (5th ed.)*. Washington, DC.
- Blais, A.-R., Weber, E.U., 2006. A Domain-Specific Risk-Taking (DOSPERT) scale for adult populations. *Judgm. Decis. Mak.* 1, 33–47.
- Brainerd, C.J., Kingma, J., 1984. Do children have to remember to reason? A fuzzy-trace theory of transitivity development. *Dev. Rev.* 4, 311–377. doi:10.1016/0273-2297(84)90021-2
- Brainerd, C.J., Reyna, V.F., 1992. Explaining “Memory Free” Reasoning. *Psychol. Sci.* 3, 332–339.
- Buelow, M.T., Suhr, J.A., 2009. Construct Validity of the Iowa Gambling Task. *Neuropsychol Rev* 19, 102–114. doi:10.1007/s11065-009-9083-4
- Cameron, L.D., Leventhal, H., 2003. *The self-regulation of health and illness behavior*. Routledge, New York.
- Chaiken, S., Trope, Y., 1999. *Dual-process theories in social psychology*. Guildford Press, New York.
- Chandler, R.A., Wakeley, J., Goodwin, G.M., Rogers, R.D., 2009a. Altered risk-aversion and risk-seeking behavior in bipolar disorder. *Biol. Psychiatry* 66, 840–6.

doi:10.1016/j.biopsycho.2009.05.011

Chick, C.F., Reyna, V.F., 2012. A fuzzy trace theory of adolescent risk taking: Beyond self-control and sensation seeking., in: *The Adolescent Brain: Learning, Reasoning, and Decision Making*. American Psychological Association, Washington, pp. 379–428.  
doi:10.1037/13493-013

Christakou, A., Gershman, S.J., Niv, Y., Simmons, A., Brammer, M., Rubia, K., 2013. Neural and Psychological Maturation of Decision-making in Adolescence and Young Adulthood. *J. Cogn. Neurosci.* 25, 1807–1823. doi:10.1162/jocn\_a\_00447

Crossan, M., Mazutis, D., Seijts, G., 2013. In search of virtue: the role of virtues, values and character strengths in ethical decision making. *J Bus Ethics* 113, 567–581.  
doi:10.1007/s10551-013-1680-8

Di Marzo, S., Giordano, A., Pacchiarotti, I., Colom, F., Sánchez-Moreno, J., Vieta, E., 2006. The impact of the number of episodes on the outcome of Bipolar Disorder. *Eur. J. Psychiatry* 20, 21–28.

Epstein, S., 1994. Integration of the Cognitive and the Psychodynamic Unconscious. *Am. Psychol.* 49, 709–724. doi:10.1037/0003-066X.49.8.709

Evans, J.B., 2008. Dual-Processing Accounts of Reasoning, Judgment, and Social Cognition. *Annu. Rev. Psychol* 59, 255–78. doi:10.1146/annurev.psych.59.103006.093629

Ferguson, C.J., 2009. An effect size primer: A guide for clinicians and researchers. *Professional Psychology: Research and Practice.* 40(5), 532-38. doi: 10.1037/a0015808

Hastie, R., Park, B., 1986. The Relationship Between Memory and Judgment Depends on Whether the Judgment Task is Memory-Based or On-Line. *Psychol. Rev.* 93, 258–268.  
doi:10.1037/0033-295X.93.3.258

Hilty, D.M., Leamon, M.H., Lim, R.F., Kelly, R.H., Hales, R.E., 2006. A review of bipolar disorder in adults. *Psychiatry (Edgmont).* 3, 43–55.

- Hirschfeld, R.M., Williams, J.B., Spitzer, R.L., Calabrese, J.R., Flynn, L., Keck, P.E., Lewis, L., Mcelroy, S.L., Post, R.M., Rappport, D.J., Russell, J.M., Sachs, G.S., Zajecka, J., 2000. Development and validation of a screening instrument for bipolar spectrum disorder: the Mood Disorder Questionnaire. *Am. J. Psychiatry* 157, 1873-5. doi: 10.1176/appi.ajp.157.11.1873
- Hidroğlu, C., Demirci Esen, Ö., Tunca, Z., Neslihan Gürz Yalçın, S., Lombardo, L., Glahn, D.C., Özerdem, A., 2013. Can risk-taking be an endophenotype for bipolar disorder? A study on patients with bipolar disorder type I and their first-degree relatives. *J. Int. Neuropsychol. Soc.* 19, 474–82. doi:10.1017/S1355617713000015
- Holmes, K.M., Bearden, C.E., Barguil, M., Fonseca, M., Serap, M.E., Nery, F.G., Soares, J.C., Mintz, J., Glahn, D.C., 2009. Conceptualizing impulsivity and risk taking in bipolar disorder: importance of history of alcohol abuse. *Bipolar Disord.* 11, 33–40. doi:10.1111/j.1399-5618.2008.00657.x
- Johnson, S.L., 2005. Mania and dysregulation in goal pursuit: a review. *Clin. Psychol. Rev.* 25, 241–262. doi:10.1016/j.cpr.2004.11.002
- Kleinman, L., Lowin, A., Flood, E., Gandhi, G., Edgell, E., Revicki, D., 2003. Costs of Bipolar Disorder. *Pharmacoeconomics* 21, 601–622. doi:10.2165/00019053-200321090-00001
- Lombardo, L.E., Bearden, C.E., Barrett, J., Brumbaugh, M.S., Pittman, B., Frangou, S., Glahn, D.C., 2012. Trait impulsivity as an endophenotype for bipolar I disorder. *Bipolar Disord.* 14, 565–570. doi:10.1111/j.1399-5618.2012.01035.x
- MacDonald, L., Chapman, S., Syrett, M., Bowskill, R., Horne, R., 2016. Improving medication adherence in bipolar disorder: A systematic review and meta-analysis of 30 years of intervention trials. *J. Affect. Disord.* 194, 202–221. doi:10.1016/j.jad.2016.01.002

- Mills, B., Reyna, V.F., Estrada, S., 2008. Explaining Contradictory Relations between Risk Perception and Risk Taking. *Psychol. Sci.* 19, 429–433. doi: 10.1111/j.1467-9280.2008.02104.x
- Murphy, F.C., Rubinsztein, J.S., Michael, A., Rogers, R.D., Robbins, T.W., Paykel, E.S., Sahakian, B.J., 2001. Decision-making cognition in mania and depression. *Psychol. Med.* 31, 679–93.
- National Institute of Health and Care Excellence, 2014. Bipolar Disorder: Assessment and management. Available from:  
<https://www.nice.org.uk/guidance/cg185/resources/bipolar-disorder-assessment-and-management-pdf-35109814379461>
- Philips, M.L., Kupfer, D.J., 2013. Bipolar disorder diagnosis: challenges and future directions. *The Lancet.* 381, 1663-71.
- Rand, D.G., Epstein, Z.G., Gosling, S., López-Rodríguez, L., Jiménez, J., 2014. Risking Your Life without a Second Thought: Intuitive Decision-Making and Extreme Altruism. *PLoS One* 9, e109687. doi:10.1371/journal.pone.0109687
- Reddy, L.F., Lee, J., Davis, M.C., Altshuler, L., Glahn, D.C., Miklowitz, D.J., Green, M.F., 2014. Impulsivity and Risk Taking in Bipolar Disorder and Schizophrenia. *Neuropsychopharmacology* 39, 456–463. doi:10.1038/npp.2013.218
- Reyna, V.F., 2008. A theory of medical decision making and health: fuzzy trace theory. *Med. Decis. Making* 28, 850-65. doi:10.1177/0272989X08327066
- Reyna, V.F., 2004. How People Make Decisions That Involve Risk: A Dual-Processes Approach. *Curr. Dir. Psychol. Sci.* 13, 60–66. doi: 10.1111/j.0963-7214.2004.00275.x
- Reyna, V.F., Adam, M.B., 2003. Fuzzy-Trace Theory, Risk Communication, and Product Labeling in Sexually Transmitted Diseases. *Risk Anal.* 23, 325–342. doi:10.1111/1539-6924.00332

Reyna, V.F., Brainerd, C.J., 1995. Fuzzy-trace theory: An interim synthesis. *Learn. Individ. Differ.* 7, 1–75. doi:10.1016/1041-6080(95)90031-4

Reyna, V.F., Brainerd, C.J., 1991. Fuzzy-trace theory and framing effects in choice: Gist extraction, truncation, and conversion. *J. Behav. Decis. Mak.* 4, 249–262.

doi:10.1002/bdm.3960040403

Reyna, V.F., Farley, F., 2006. Risk and Rationality in Adolescent Decision Making:

Implications for Theory, Practice, and Public Policy. *Psychol. Sci. Public Interes.* 7, 1–44. doi: 10.1111/j.1529-1006.2006.00026.x

Reyna, V.F., Mills, B.A., 2014. Theoretically Motivated Interventions for Reducing Sexual Risk Taking in Adolescence: A Randomized Controlled Experiment Applying Fuzzy-Trace Theory. *J. Exp. Psychol. Gen.* 143, 1627–1648. doi:10.1037/a0036717

Reyna, V.F., Rivers, S.E., 2008. Current Theories of Risk and Rational Decision Making.

*Dev. Rev.* 28, 1–11. doi:10.1016/j.dr.2008.01.002

Reyna, V.F., Weldon, R.B., McCormick, M., 2015a. Educating Intuition: Reducing Risky Decisions Using Fuzzy-Trace Theory. *Curr. Dir. Psychol. Sci.* 24, 392–398.

doi:10.1177/0963721415588081

Reyna, V.F., Weldon, R.B., McCormick, M., 2015b. Educating Intuition: Reducing risky decisions using fuzzy trace theory. *Curr. Dir. Psychol. Sci.* 24, 392–398.

doi:10.1177/0963721415588081

Rivers, S.E., Reyna, V.F., Mills, B., 2008. Risk Taking under the Influence: A Fuzzy-Trace Theory of Emotion in Adolescence. *Dev. Rev.* 28, 107–144.

doi:10.1016/j.dr.2007.11.002

Robinson, L.J., Ferrier, I.N., 2006. Evolution of cognitive impairment in bipolar disorder: a systematic review of cross-sectional evidence. *Bipolar Disord.* 8, 103–116. doi:

10.1111/j.1399-5618.2006.00277.x

Rubinsztein, J.S., Michael, A., Underwood, B.R., Tempest, M., Sahakian, B.J., 2006.

Impaired cognition and decision-making in bipolar depression but no “affective bias” evident. *Psychol. Med.* 36, 629-639. doi:10.1017/S0033291705006689

Saddichha, S., Schuetz, C., 2014. Is impulsivity in remitted bipolar disorder a stable trait? A meta-analytic review. *Compr. Psychiatry* 55, 1479–1484.

doi:10.1016/j.comppsy.2014.05.010

Sanchez-Moreno, J., Martinez-Aran, A., Tabarés-Seisdedos, R., Torrent, C., Vieta, E.,

Ayuso-Mateos, J.L., 2009. Functioning and Disability in Bipolar Disorder: An Extensive Review. *Psychotherapy and Psychosomatics*, 78, 285-97. doi: 10.1159/000228249.

Schwarz, N., 2000. Emotion, cognition, and decision making. *Cogn. Emot.* 14, 433–440.

doi:10.1080/026999300402745

Sheehan, D.V., Lecrubier, Y., Harnett-Sheehan, K., Amorim, P., Janavs, J., Weiller, E.,

Hergueta, T., Baker, R., Dunbar, G., 1998. The M.I.N.I. International Neuropsychiatric Interview (M.I.N.I.): The Development and Validation of a Structured Diagnostic Psychiatric Interview. *J. Clin Psychiatry*, 59 (suppl 20), 22-33.

Sloman, S.A., 1996. The Empirical Case for Two Systems of Reasoning. *Psychol. Bull.* 119, 3–22. doi:10.1037/0033-2909.119.1.3

Slovic, P., Peters, E., Finucane, M.L., Macgregor, D.G., 2005. Affect, risk, and decision making. *Health Psychol.* 24, S35-40. doi: 10.1037/0278-6133.24.4.S35

Spinella, M., 2007. Normative data and a short form of the Barratt Impulsiveness Scale. *Int. J. Neurosci.* 117, 359–368. doi: 10.1080/00207450600588881

Thomas, J., Knowles, R., Tai, S., Bentall, R.P., 2007. Response styles to depressed mood in bipolar affective disorder. *J. Affect. Disord.* 100, 249–52. doi:10.1016/j.jad.2006.10.017

Tymula, A., Rosenberg Belmaker, L.A., Ruderman, L., Glimcher, P.W., Levy, I., 2013. Like cognitive function, decision making across the life span shows profound age-related



changes. *Proc. Natl. Acad. Sci. U. S. A.* 110, 17143-8. doi:10.1073/pnas.1309909110

Vartanian, O., Mandel, D.R., Duncan, M., 2011. Money or life: Behavioral and neural context effects on choice under uncertainty. *J. Neurosci. Psychol. Econ.* 4, 25–36. doi:10.1037/a0021241

Youngstrom, E.A., Murray, G., Johnson, S.L., Findling, R.L., 2013. The 7 Up 7 Down Inventory: A 14-Item Measure of Manic and Depressive Tendencies Carved From the General Behavior Inventory. *Psychol. Assess.* 25, 1377–1383. doi:10.1037/a0033975

Zimmerman, M., Galione, J.N., Chelminski, I., Young, D., Dalrymple, K., Ruggero, C.J., 2010. Sustained unemployment in psychiatric outpatients with bipolar disorder: frequency and association with demographic variables and comorbid disorders. *Bipolar Disord.* 12, 720–726. doi:10.1111/j.1399-5618.2010.00869.x

**Table 1.** Demographic and clinical information

Variable	
Age, <i>Mean(SD), [Range]</i>	49 (15), [21-78]
Female, <i>n (%)</i>	39 (68)
In employment/Students, <i>n (%)</i>	34 (59)
Native English Speakers, <i>n (%)</i>	50 (86)
Attended Higher Education, <i>n (%)</i>	49 (85)
Ethnicity, <i>n (%)</i>	
White British/White Other	49 (85)
Asian	3 (5)
Mixed	1 (2)
Black/African/Caribbean	1 (2)
Other Ethnic Background	4 (7)
Time since diagnosis, <i>n (%)</i>	
In the past year	3 (5)
In the past 2-5 years	13 (23)
In the past 6-10 years	15 (26)
In the past 11-15 years	10 (17)
More than 16 years ago	17 (29)
Diagnosis Type, <i>n (%)</i>	
Bipolar Type I	19 (33)
Bipolar Type II	27 (46)
Bipolar NOS	11 (19)
Schizoaffective Disorder	1 (2)
Number of BD episodes experienced, <i>n (%)</i>	
Between 0-5 episodes	16 (28)
Between 6-10 episodes	16 (28)
Between 11-20 episodes	8 (14)
More than 20 episodes	18 (31)
Currently in psychological therapy, yes, <i>n (%)</i>	11 (19)
Cognitive Behavioural Therapy	2 (3)
Counselling	2 (3)
Psychotherapy	3 (5)
Other/Not specified	4 (7)
Currently receiving BD medication yes, <i>n (%)</i>	48 (83)
Combination	28 (62)
Mood Stabilizers	10 (22)
Antipsychotics	4 (9)
Antidepressants	2 (3)
Currently experiencing a mood episode yes, <i>n (%)</i>	35
Last mood episode more than 6 months ago, <i>n (%)</i>	24
Other comorbid diagnoses yes, <i>n (%)</i>	23

**Table 2.** Reliability Analysis

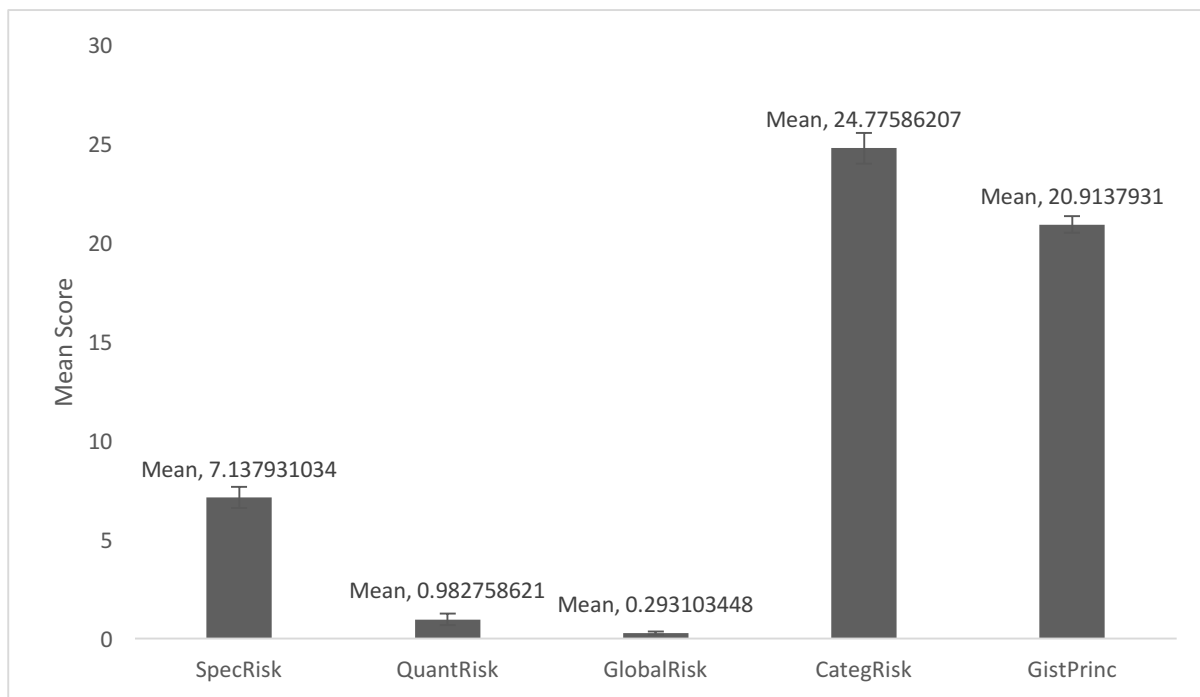
Scale	Cronbach's alpha
Mood Disorder Questionnaire	.71
7up	.93
7down	.96
Barratt Impulsiveness Scale (BIS)	.90
BIS Non Planning Subscale	.83
BIS Motor Subscale	.87
BIS Attentional Subscale	.75
DOSPERT Risk-Taking	
Ethical Subscale	.65
Financial Subscale	.77
Health/Safety Subscale	.72
Recreational Subscale	.86
Social Subscale	.77
Sex Subscale	.62
DOSPERT Risk-Perception	
Ethical Subscale	.68
Financial Subscale	.82
Health/Safety Subscale	.70
Recreational Subscale	.88
Social Subscale	.78
Fuzzy Trace Theory Scales	
Categorical Risk Scale	.79
Gist Principles Scale	.80
Specific Risk Scale	.96

**Table 3.** Distribution of scores and normality scores for individual scales

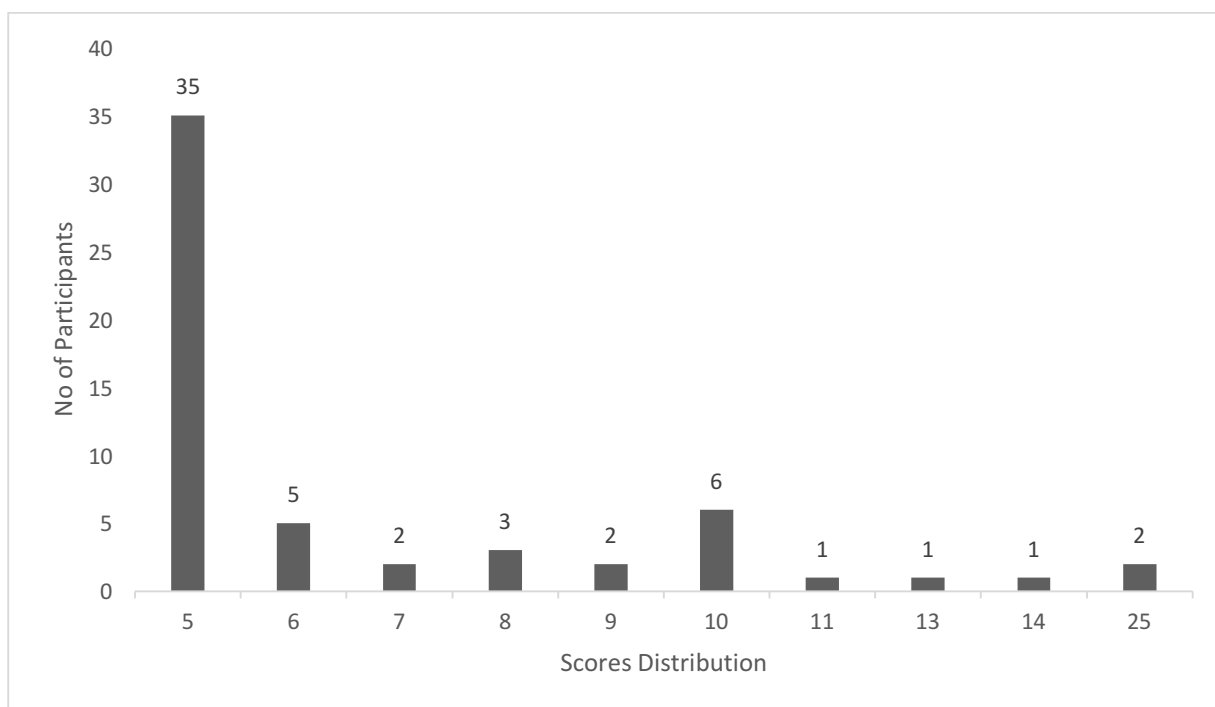
Scales	Mean (Range)	SD	Shapiro-Wilk
Categorical Risk	24.77 (4-36)	5.89	.92
Gist Principles	20.93 (15-28)	3.20	.97
Global Risk	.29 (0-2)	.56	.56***
Specific Risk	7.10 (5-25)	4.08	.56***
Quantitative Risk	.97 (0-10)	2.17	.52***
DOSPRT RT			
Ethical	16.85 (6-34)	7.15	.95*
Financial	13.37 (6-30)	7.15	.88***
Health/Safety	21.15 (6-42)	8.79	.97
Recreational	19.78 (6-42)	10.80	.93**
Social	32.25 (12-42)	7.43	.92**
Sex	6.93 (2-14)	3.87	.90***
7up	12.17 (7-27)	5.33	.87***
7down	14.94 (7-28)	6.58	.91***
BIS	28.48 (8-50)	9.12	.99

Note: \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

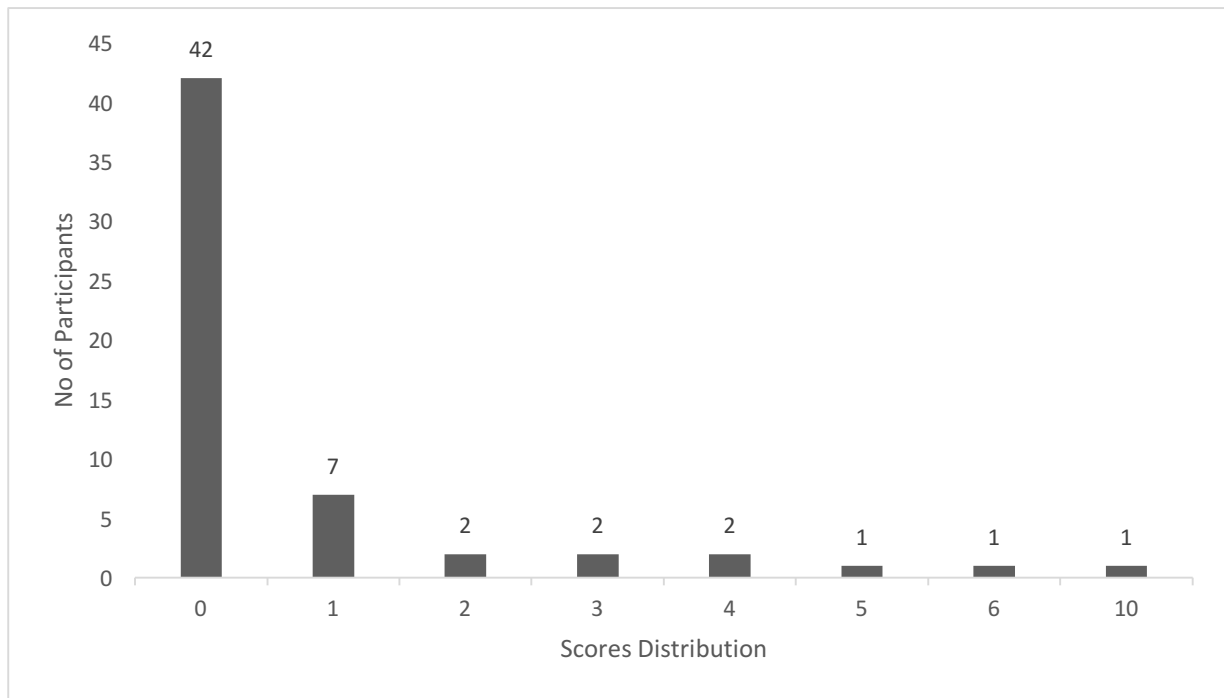
**Figure 1.** Mean Scores and standard error for individual FTT scales



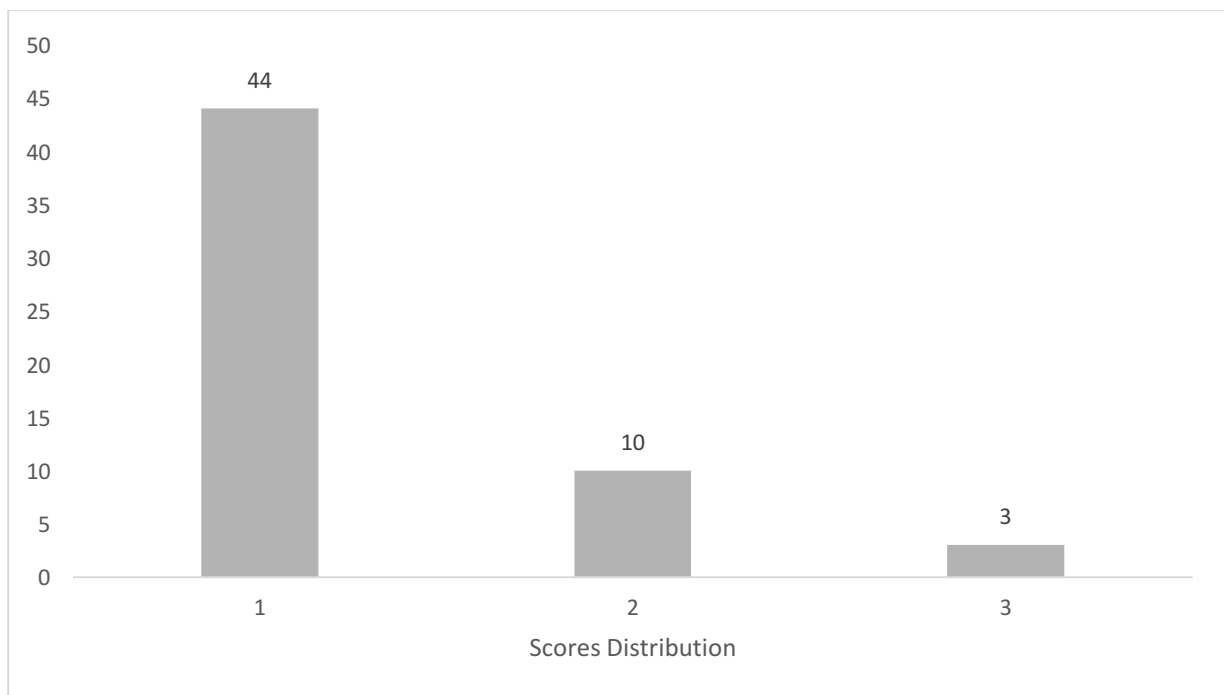
**Figure 2.** Scores distribution for Specific Risk Scale



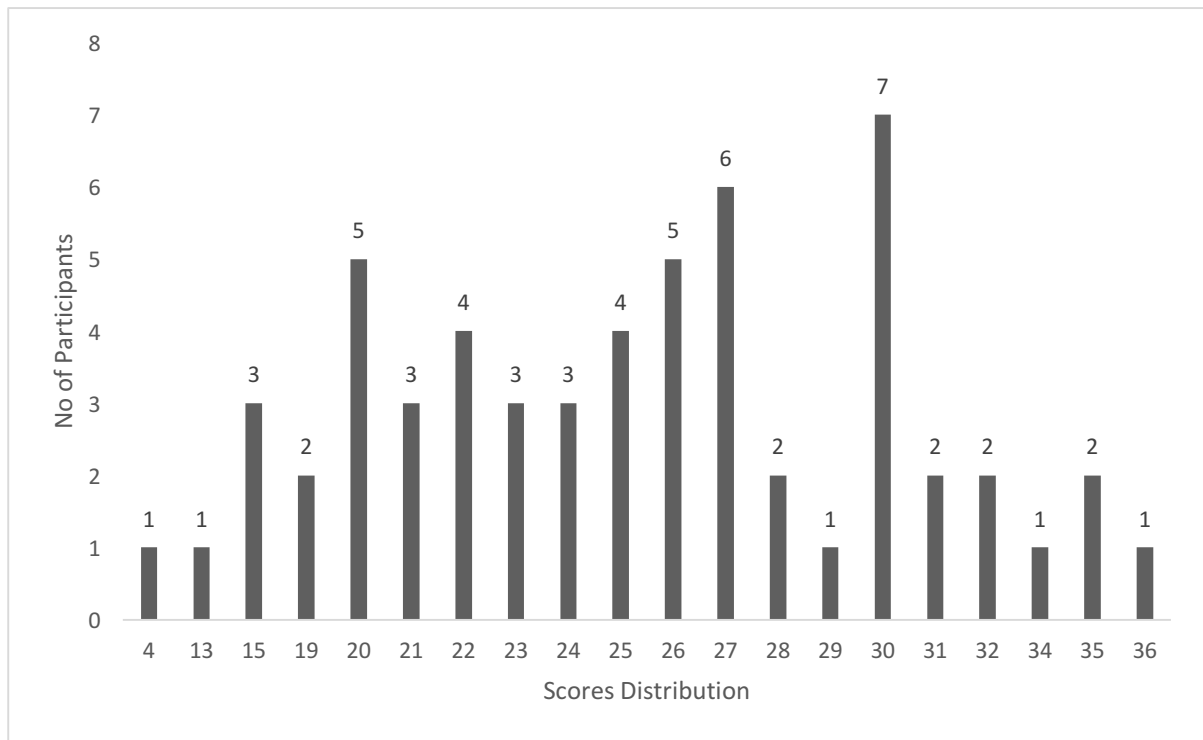
**Figure 3.** Scores Distribution for Quantitative Risk Scale



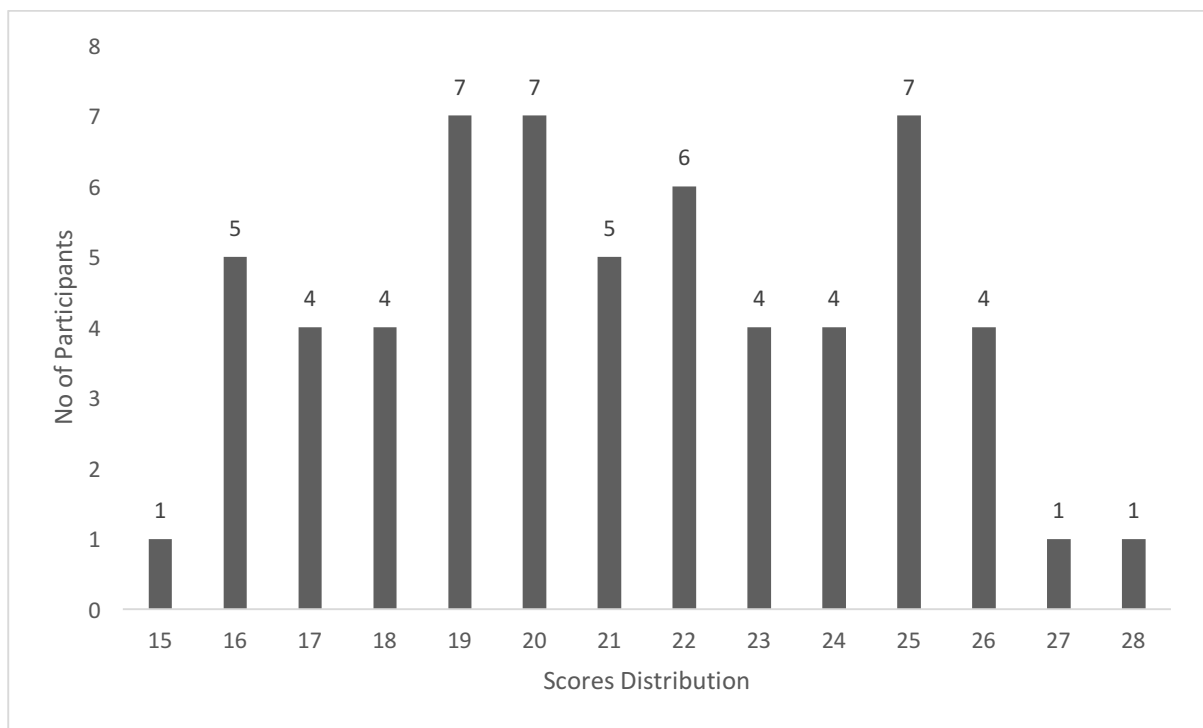
**Figure 4.** Scores Distribution for Global Risk Question



**Figure 5.** Scores Distribution for Categorical Risk Scale



**Figure 6.** Scores Distribution for Gist Principles Scale



**Table 4.** Correlations between clinical variables and risk-taking intentions

Clinical Variable	DOSPERT Subscale					
	Ethical	Financial	Health/Safety	Recreational	Social	Sex
BD-I vs other BD	.17	.02	.13	.04	.20	.28*
Early onset vs late <sup>‡</sup>	-.16	-.19	-.12	-.19	.10	-.14
Mood episode (yes)	.19	.35*	.25	.25	.08	.08
Number of episodes <sup>‡‡</sup>	.17	.24	.27*	.32*	.15	.18

Note: \* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$

<sup>‡</sup> Partial correlation, controlling for age (n=55).

<sup>‡‡</sup> Partial correlation, controlling for age (n=55).

**Table 5.** Correlations between FTT scales

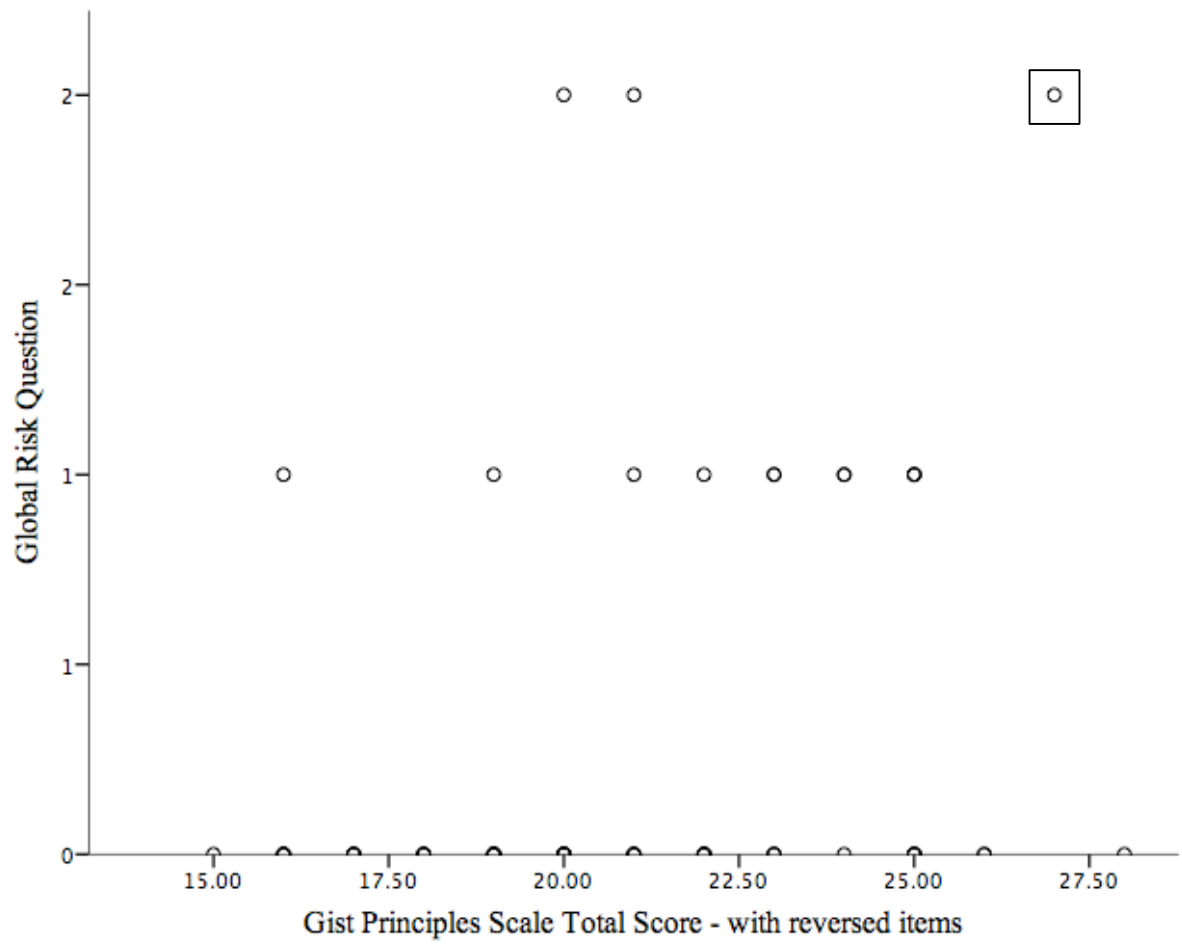
Scale	CategRisk	GistPrinc	GlobalRisk <sup>‡</sup>	SpecRisk <sup>‡</sup>	QuantRisk <sup>‡</sup>
Categorical Risk	-	-.18	-.01	-.27*	-.21
Gist Principles	-.18	-	.29*	.21	.35**
Global Risk <sup>‡</sup>	-.01	.29*	-	.26	.29*
Specific Risk <sup>‡</sup>	-.27*	.21	.26	-	.53**
Quantitative Risk <sup>‡</sup>	-.21	.35**	.29*	.53**	-

Note: \* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$

<sup>‡</sup>Spearman's rho



**Figure 7.** Scatterplot to check for outliers for the Global Risk Question and Gist Principles Scale



**Table 6.** Correlations between FTT scales and risk-taking intentions

Scales	DOSPERT Risk-Taking					
	Ethical	Financ	Health/S	Recreat	Social	Sex
SpecRisk <sup>1‡</sup>	.26*	.29*	.46**	.09	.19	.44**
Quant <sup>‡</sup>	.44**	.49**	.40**	.21	.15	.48**
CategRisk	-.03	-.10	-.09	.07	.21	.03
GistPrinc	.40**	.19	.36**	.23	.21	.49***
GlobalRisk <sup>‡</sup>	.26	.31*	.27	.01	.22	.42**

Note: BIS = Barratt Impulsiveness Scale; SpecRisk = Specific Risk Scale; Quant = Quantitative Risk Scale; CategRisk = Categorical Risk Scale; GistPrinc = Gist Principles Scale; GlobalRisk = Global Risk Question. <sup>1</sup>Scores for the Specific Risk Scale are based on the sample with the two outliers removed (n=56). \* $p < .05$ ; \*\* $p < .01$  \*\*\* $p < .0001$ .

<sup>‡</sup>Spearman's rho

**Table 7.** Hierarchical Regression model for FTT scales and mood predicting DOSPERT Sex

Subscale

Variables	R <sup>2</sup>	$\Delta R$	B (SE)	95% Confidence Interval	
				Lower	Upper
Step1 – Intercept	.29	.29***	.77 (1.44)	-2.11	3.65
7up – (hypo)mania			.29 (.08)	.12	.45
7down - Depression			.17 (.07)	.03	.31
Step 2 – Intercept	.44	.16**	-7.39 (2.63)	-12.68	-2.10
7up – (hypo)mania			.20 (.08)	.04	.35
7down - Depression			.09 (.07)	-.04	.22
Gist Principles			.38 (.13)	.12	.64
Specific Risk			.39 (.19)	.02	.76

Note: Overall Model -  $F(4, 51)=10.17, p < .001$ ; \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

**Table 8.** Hierarchical Regression model for FTT scales and impulsivity predicting DOSPERT Sex Subscale

Variables	R <sup>2</sup>	ΔR	B (SE)	95% Confidence Interval	
				Lower	Upper
Step1 – Intercept	.10	.10*	3.15 (1.61)	-.08	6.39
BIS Total Score			.13 (.05)	.03	.24
Step 2 – Intercept	.37	.27***	-7.99 (2.85)	-13.72	-2.27
BIS Total Score			.07 (.05)	-.02	.17
Gist Principles			.47 (.13)	.21	.73
Specific Risk			.47 (.19)	.08	.85

Note: Overall Model -  $F(3, 52)=10.54, p<.001$ ; \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

**Table 9.** Hierarchical Regression model for FTT scales and mood predicting DOSPERT Ethical Subscale

Variables	R <sup>2</sup>	ΔR	B (SE)	95% Confidence Interval	
				Lower	Upper
Step1 – Intercept	.22	.22**	6.94 (2.82)	1.28	12.60
7up – (hypo)mania			.52 (.16)	.20	.85
7down - Depression			.21 (.14)	-.06	.48
Step 2 – Intercept	.33	.11*	-5.73 (5.42)	-16.61	5.15
7up – (hypo)mania			.38 (.16)	.06	.70
7down - Depression			.08 (.13)	-.19	.35
Gist Principles			.58 (.27)	.04	1.12
Specific Risk			.67 (.38)	-.10	1.43

Note: Overall Model -  $F(4, 51)=6.26, p<.001$ ; \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

**Table 10.** Hierarchical Regression model for FTT scales and impulsivity predicting DOSPERT

## Ethical Subscale

Variables	R <sup>2</sup>	ΔR	B (SE)	95% Confidence Interval	
				Lower	Upper
Step1 – Intercept	.29	.29***	4.69 (2.69)	-.71	10.08
BIS Total Score			.42 (.09)	.24	.60
Step 2 – Intercept	.42	.13**	-10.20 (5.14)	-20.52	.12
BIS Total Score			.34 (.09)	.17	.52
Gist Principles			.65 (.24)	.17	1.12
Specific Risk			.56 (.35)	-.14	1.25

Note: Overall Model -  $F(3, 52)=12.79, p<.001$ ; \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

**Table 11.** Hierarchical Regression model for FTT scales and mood predicting DOSPERT

## Health/Safety Subscale

Variables	R <sup>2</sup>	ΔR	B (SE)	95% Confidence Interval	
				Lower	Upper
Step1 – Intercept	.23	.23**	8.55 (3.34)	1.85	15.25
7up – (hypo)mania			.42 (.19)	.04	.80
7down - Depression			.48 (.16)	.16	.80
Step 2 – Intercept	.33	.10*	-3.98 (6.47)	-16.97	9.02
7up – (hypo)mania			.26 (.19)	-.12	.64
7down - Depression			.34 (.16)	.02	.67
Gist Principles			.50 (.32)	-.14	1.15
Specific Risk			.95 (.46)	.03	1.86

Note: Overall Model -  $F(4, 51)=6.31, p<.001$ ; \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

**Table 12.** Hierarchical Regression model for FTT scales and impulsivity predicting DOSPERT Health/Safety Subscale

Variables	R <sup>2</sup>	ΔR	B (SE)	95% Confidence Interval	
				Lower	Upper
Step1 – Intercept	.29	.29***	6.68 (3.22)	.23	13.14
BIS Total Score			.51 (.11)	.29	.72
Step 2 – Intercept	.42	.13**	-9.54 (6.19)	-21.96	2.89
BIS Total Score			.41 (.10)	.20	.62
Gist Principles			.65 (.28)	.09	1.22
Specific Risk			.83 (.42)	-.01	1.67

Note: Overall Model -  $F(3, 52)=12.43, p<.001$ ; \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

Running head: DIAGNOSIS AND FORMULATION: A CONSTANT TENSION

Section 3: Critical Appraisal

**Integrating diagnosis-led quantitative research in clinical psychology practice**

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## Integrating diagnosis-led quantitative research in clinical psychology practice

### **Introduction**

The findings of the systematic review and the research paper provided promising results to help conceptualise risk-taking behaviour in people diagnosed with Bipolar Disorder (BD). The review provided strong evidence supporting the idea that BD is indeed characterised by higher rates of risk-taking behaviours, particularly during manic states, offering a helpful summary of the contrasting pieces of research available in the field. Another important finding of the systematic review was the identification of certain clinical and demographic predictors of risk-taking in this population, which remains an underexplored aspect of research in BD, despite its high clinical relevance. These findings were discussed in relation to several limitations of the current literature, identified in the review, as well as in the design of the studies involved, including an over-reliance on self-report and laboratory measures, which make it challenging to generalise the results.

Within the context of risk-taking behaviours in BD, the research paper offered a helpful addition to the findings of the systematic review, in that it provided an interesting new conceptualisation of risk-taking behaviours in BD, which goes beyond traditional studies in the field attributing such behaviours to impulsivity and mood states (particularly mania). In fact, the results showed that constructs proposed by Fuzzy Trace Theory (FTT; Reyna and Rivers, 2008; Rivers et al., 2008) significantly predicted risk-taking intentions even after controlling for the effects of impulsivity and mood. These results are promising in that they move away from the idea of risk-taking as an impulsive act, which cannot be controlled and toward FTT ideas of a “reasoned route” to risk-taking. This new conceptualisation is clinically relevant in light of studies conducted by Reyna and colleagues (e.g., Reyna et al., 2015; Reyna and Mills, 2014), which involved FTT principles to successfully design risk reduction interventions in other populations (e.g. adolescents). Nonetheless, several

limitations were observed in the methodology of the research paper. In particular, a relatively small sample size made it challenging to answer some of the questions arising from the results because, in order to preserve statistical power, it was necessary to limit the number of variables entered in the regression models utilised.

A discussion of the results and limitations of the two pieces of research was presented in detail in each individual paper. Thus, the current critical review aims at offering a reflective discussion on the process of conducting quantitative research as a trainee clinical psychologist. There will be a particular focus on the personal dilemma resulting from adopting diagnostic criteria in research, whilst continuing to utilise formulation-based thinking as a default position.

To achieve this aim, this critical review will first consider some of the strengths and limitations of both diagnosis and formulation within the context of research and clinical practice. Subsequently, the difficulties of conducting research involving people diagnosed with BD will be discussed. Finally, these reflections will be integrated within a discussion of the changing role of clinical psychologists, offering ideas on how clinical psychologists can attempt to resolve this conflict between two contrasting paradigms in their roles as “scientist practitioners”.

### **Diagnosis versus formulation: a constant tension**

Working within the field of clinical psychology, it soon becomes apparent that there is a real tension between the diagnostic paradigm, adopted by most of our medical colleagues, and the formulation-based paradigm, which clinical psychology promotes (The British Psychological Society, 2011). Currently, diagnosis appears to be the predominant paradigm in mental health services, despite a recent rise in interest in psychological formulation. In recent years, with the publication of the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, (DSM-5; American Psychiatric Association, 2013), diagnosis has



been under scrutiny by both clinicians and researchers alike, which makes this review particularly timely.

Diagnoses are usually conceptualised as “labels” that help us categorise “clinical populations” according to common symptoms and patterns (Macneil et al., 2012). This categorisation has been found to be helpful both in research and clinical practice, as it helps predict outcomes, inform pharmacological treatment and allows for a clustering of clinical populations, which is helpful when conducting research and designing specialised mental health services.

However, despite its helpful aspects, diagnosis has been widely criticised for being intrinsically flawed, as it appears to be based on a surface-level categorisation of symptoms and disregard entire aspects of people’s experiences. In fact, one of the main problems with this practice is that a “label” tells us little (if any) information about causation; knowing that someone has a diagnosis of “schizophrenia”, does not provide any information about what factors might have triggered, contributed to, and maintained that person’s difficulties (Kendell and Jablensky, 2003).

Moreover, diagnosis also provide no information about the client’s experience of that particular “condition”; it is often limited to a description of symptoms that does not take into account the person’s relationship with their difficulties and how they react to their symptoms (Macneil et al., 2012). It also often lacks cultural validity, as it fails to take into account the person’s cultural context and how this may have contributed to the development of a set of experiences that are classed as “symptoms”, making it a problem-focused approach (Canino and Alegría, 2008; Hinton and Lewis-Fernández, 2011).

Another common critique of diagnosis is that it lacks validity. Diagnoses are not discrete entities with concrete boundaries, but tend to often overlap with one another. In fact, a frequent problem in psychiatry is that of “diagnostic inflation” (Batstra and Frances, 2012).

The boundaries of diagnosis seem to have been steadily expanding over the years, as psychiatrists struggle to distinguish people who “fit” the criteria for a certain “illness” from those who do not (Frances, 2013). This has caused some critics to claim that diagnosis might be pathologising what could be conceptualised as normal human experiences in the context of the person’s individual life course (e.g., Allen, 2013; Maj, 2014).

In recent years, there has been a reconsideration of diagnostic concepts such as “schizophrenia” (Wong, 2014), “personality disorders” (Kim and Tyrer, 2010) and “bipolar disorder” (Ghouse et al., 2013; Vieta and Phillips, 2007). These diagnoses have been put under scrutiny by both psychiatrists and clinical psychologists calling for a re-evaluation of the language used within mental health services (May, 2007; Moncrieff, 2007).

Kinderman and colleagues (2013) urged clinicians to “drop the language of disorder”, in an attempt to redefine some of these concepts (diagnoses) within clinical practice. In the context of this critique, clinical psychologists have played an important role in advocating for an alternative approach, which sees formulation at the centre of client care (The British Psychological Society, 2011). Nonetheless, a detailed critique of diagnostic criteria is beyond the scope of this critical review.

From the evidence abovementioned, it is evident that the shortfalls of diagnostic systems are well documented in clinical psychology research; formulation is often offered as the “better alternative” to the limitations of the available diagnostic systems. However, this alternative paradigm is not free of limitations. Psychological formulation has been a core skill for clinical psychologists (Health & Care Professions Council, 2015; The British Psychological Society, 2011) since the emergence of the “scientist-practitioner” model in the 1950s. It is commonly understood as a process whereby the therapist and the client develop a “shared understanding” of the client’s presenting difficulties and develop “working hypotheses”, which will guide the process of therapy (The British Psychological Society,

2011). As such, this “working hypothesis” is something that needs to be tested and it can shift and change as therapy progresses and new information comes to light (Harper and Moss, 2003). Psychologists use formulation as a link between psychological theory, evidence base and practice. One of the main differences between a psychological formulation and a medical diagnosis is that formulation is not based on “truth” or “certainty”, it is not meant to be a label to define someone’s “problems” and “symptoms”, but rather a useful account, developed collaboratively with the client, of the client’s history and presenting difficulties (Johnstone, 2006).

Formulation is considered particularly helpful in clinical practice as it is developed collaboratively with clients and often based on the core idea that “...at some level it all makes sense” (Butler, 1998, p. 2) and that, although someone’s difficulties may appear confusing, chaotic, challenging and upsetting, when considered within the person’s context, their experiences make sense.

One of the aspects which, in my opinion, is most rewarding about developing a formulation with our clients is when there is an almost surprising realisation that their experiences are not as “unusual” and “abnormal” as they once thought, but that they serve a function. This can have an incredibly validating effect for our clients, who have often experienced stigma (both from society as well as internalised stigma), and it can be the key to success in psychological therapy.

However, despite its strengths, a fundamental problem with formulation stands in its definition; although the term “formulation” is widely used in clinical practice, people seem to attribute different meanings to it (Flinn et al., 2015). It is interesting to consider the idea of inter-rater reliability regarding formulations; one of the main critiques brought forward in relation to diagnosis, is that it often shows poor inter-rater reliability, thus arising doubts about its validity. Nonetheless, in relation to formulation, this issue is rarely considered. In

the claim, as clinical psychologists, that there can be different formulations of a client's difficulties and that they are based on "usefulness" rather than "truth", we may be risking invalidating what could be a very helpful tool to be used, not only in clinical psychology, but across different disciplines.

Moreover, in my opinion, as formulation is predominantly based on a clinician's skills and knowledge, it has as much potential for being "pathologising" and "invalidating" as its diagnosis counterpart if approached in unhelpful ways. Finally, it is important to consider that, as formulation is becoming increasingly accepted in clinical practice and some research approaches, it is open to criticism regarding its reliability and validity. It was aforementioned how inter-rater reliability has been considered to be problematic and its validity still seem to be overwhelmingly unexplored.

Diagnosis and formulation are both approaches that have strengths and limitations, which can create a state of tension between these two paradigms, which is particularly relevant when, as clinical psychologists, we embark in the task of conducting research involving clinical populations.

The British Psychological Society (BPS, 2014) outlined the role of clinical psychologists stating the following:

*"Clinical psychologists are trained to reduce psychological distress and to enhance and promote psychological wellbeing by the systematic application of knowledge derived from psychological theory and research"* (p. 5).

It is evident from the statement above that research is a key aspect to consider when discussing the role of clinical psychologists. We are considered "reflective scientist practitioners" and expected to base our practice on the available evidence-base in our work with clients, as well as contribute to the development of the evidence-base. It is in this conceptualisation that, in my opinion, the tension arises.

Although formulation offers a more in depth account of a client's story and thus is of incredible value in clinical practice, research remains largely dominated by diagnostic paradigms (Boyle, 2007). This is particularly true for quantitative research where, in order to design studies with a certain rigour and validity, strict categorisations based on diagnostic criteria are still used as a "gold standard" (Zwarenstein et al., 2008). As a trainee clinical psychologist conducting quantitative research, this causes a significant dilemma; in fact, as we advocate and criticise diagnosis in our clinical practice, we are "forced" to embrace these concepts in our researcher roles.

### **Characterising Bipolar Disorder in research**

In attempting the task of conducting my thesis on risk-taking behaviour in Bipolar Disorder (BD), I was faced with the dilemma of having to decide on criteria to characterise a group of people to take part in my study. As a trainee clinical psychologist, this caused several challenges. The first difficulty arose as I realised that, in order to proceed with the study, it was necessary to reflect on my personal position on the general idea of diagnosis.

Although I agree with the position of clinical psychologists in criticising diagnosis, I am not completely opposed to the concept. I believe that diagnostic criteria can serve a helpful function in helping us characterise "common experiences" and communicate with other professions using commonly understood terms. Diagnoses can be conceptualised as "labels", which can be particularly helpful when conducting research. Nonetheless, with diagnosis comes a degree of "power" that I find incredibly dangerous. In the UK, psychiatric diagnosis can be utilised to mandate "involuntary treatment", which can generate stigma and a sense of powerlessness for our clients as they undergo their therapeutic journeys through mental health services (Hayne, 2003; Rüsçh et al., 2013). Thus, the problem with diagnosis, in my opinion, stands in the way it is used and the significant power it still holds rather than in the concept in itself.

The power diagnosis holds is of high relevance to BD, particularly when considering its limitations. The diagnosis of BD has been topic of heated debates since its conception with the idea of “manic-depressive insanity” brought forward by Kraepelin in the 1890s (Jablensky, 1999). In its latest diagnosis-based form, BD is conceptualised as a cyclical condition, characterised by episodes of both (hypo)mania and depression, as well as an array of other symptoms (American Psychiatric Association, 2013).

The cyclical nature of BD poses significant problems when considering the validity of its diagnosis. Three main challenges in diagnosis BD have been identified. First, diagnostic criteria for BD are based on the idea of a “typical pattern” of (hypo)manic and depressive episodes, which is often not applicable in real-life where the experiences of people with a diagnosis of BD vary considerably (Vieta and Phillips, 2007). Second, BD encompasses a range of symptoms that are too generic and can often overlap with those of other diagnoses (Vieta and Phillips, 2007). Third, a high comorbidity between diagnoses of BD and substance abuse has been observed in research (e.g., Sherwood Brown et al., 2001); certain substances, such as cocaine, have been found to mimic the mood fluctuations typical of (hypo)manic episodes of BD (Morton, 1999), thus posing a significant challenge when attempting to distinguish between the two.

To address some of the abovementioned challenges, researchers formulated the idea of a “bipolar spectrum”, which has also been considered in the latest version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) (American Psychiatric Association, 2013), applicable to those clients who do not meet strict criteria for diagnosis (Ghaemi, 2013). However, this concept has been often criticised as it is seen to blur the boundaries between normal human experiences and psychiatric diagnoses (Zorumski and Rubin, 2011). Thus, one fundamental question must be considered: is BD diagnosis a valid concept?

Attempting to answer this question is not an easy task. It is difficult to ignore the numerous pieces of research outlining the limitations of BD diagnosis, which seem to suggest that it is not a valid concept. Nonetheless, at present there seem to be a lack of valid alternatives to diagnosis that can be applied in psychology research. The integration of diagnosis in research will be further discussed in the next section.

### **Integrating diagnosis and formulation in research**

It was briefly mentioned earlier in this paper how both diagnosis and formulation have strengths and limitations that need to be considered when evaluating these two concepts. Regarding research, diagnosis can be helpful in that it can offer commonly understood “labels” that can be adopted to categorise clinical populations with “common features” to investigate certain phenomena that otherwise would be challenging to explore. Nonetheless, diagnosis remains limited in terms of accounting for individual differences and the nuances observed in different “conditions”. Conversely, the idiosyncratic nature of formulation-based approaches could be helpful in research to explore the links between results and clinical applications, to translate research findings into real-life situations. However, formulation still has significant limitations in terms of categorisation, as it faces the problem of perhaps being “too idiosyncratic”.

Consequently, I believe that by celebrating one whilst demonising the other poses a significant challenge for psychologists and other clinicians alike. In fact, one question must be considered in this debate: How can we maintain scientific rigour in research if we completely demolish diagnosis?

Recent years have seen an increase in qualitative research methods in psychology, which are less reliant on diagnosis and strict categorisations, and more focused on individual experiences (Dixon-Woods et al., 2006; Meyrick, 2006). Nonetheless, qualitative approaches are still widely criticised (Hammersley, 2007) and remain scarce compared to their

quantitative counterpart. In fact, quantitative research is still considered somewhat “superior” to qualitative approaches by many researchers, and Randomised Controlled Trials (RCTs) remain the “gold standard” of psychological research methods (Zwarenstein et al., 2008). It is interesting to note how opposing the clinical and research fields still are within clinical psychology. On one side, we have countless reflective articles and position papers advocating for formulation-based approaches in clinical practice. Yet, clinical psychology research is still dominated by diagnosis-based approaches.

This fragmentation is not limited to individual research studies but it is also reflected in clinical psychology guidance, which provides most the evidence-base for clinical practice. In fact, despite their recognition of the flaws in diagnostic criteria, published guidance by the National Institute for Health and Care Excellence (NICE) is still deeply rooted in diagnostic systems. Researching NICE publications, it soon becomes evident that there is guidance for “bipolar disorder”, “depression”, “Post-Traumatic Stress Disorder” and many other, which appear to be diagnosis-led.

One of the main reasons for this phenomenon is perhaps the fact that, despite the utility of formulation in both direct and indirect work with clients, we are still far from reaching a common agreement on how formulations are developed, which leaves this helpful practice open to criticism. I believe that, as clinical psychologists, we have a duty to push for the development of alternatives to diagnosis as this practice causes significant challenges for both clients and clinicians.

Mental health diagnosis is still surrounded by incredible stigma in society (Ben-Zeev et al., 2010; Corrigan, 2007) and, although receiving a diagnosis might be helpful for some clients, the negative consequences of this practice often outweigh the positives (Hayne, 2003). Mental health stigma has been found to be associated with low self-esteem (Link et al., 2001) as well as reduced help seeking (Clement et al., 2015), which can in turn cause



significant difficulties in the long term as clients experience a lack of social support and struggle to access services in a timely manner (Corrigan et al., 2014). Moreover, diagnosis is still predominantly based on a “disease model” (Deacon, 2013; Volkow et al., 2015), which can cause further psychological harm as clients are surrounded by unhelpful narratives about their difficulties and hinder recovery (Yanos et al., 2010).

However, for the purpose of research, it is important to acknowledge that, as a profession, we are still far from developing a helpful paradigm that can substitute the utility of diagnostic criteria in categorising clinical populations whilst attempting to preserve scientific rigour. Therefore, I believe that it is unhelpful to create a state of constant tension between professions embracing formulation as their default position and those relying on diagnostic frameworks. In fact, this practice can be detrimental, not only as it can prevent collaboration, but also as it can generate confusing messages for our clients, which can impact on their therapeutic journey through mental health services.

Bridging the gap between diagnosis and formulation in research is a challenging task and it can be conceptualised as part of a wider divide between clinical research (and the development of the evidence base) and clinical practice. A possible way forward is to explore this crucial issue during clinical training, which can be conceptualised as a “golden period” in a clinical psychologist’s career where, as trainees, we are in close contact with both the worlds of research and clinical practice. This is a unique opportunity that could be utilised to develop creative approaches to start integrating psychological formulation in clinical research and develop research models that incorporate both formulation and diagnosis.

This challenging, but in my opinion achievable task, could be achieved by perhaps considering the way in which, as clinical psychologists, we use diagnosis in our research and integrating formulation-based ideas in our way of writing clinical research. Moreover, I

believe that it is of vital importance to keep a critical eye when utilising diagnostic labels in research and focus on relating research findings to clinical implications, whilst keeping in mind the idiosyncratic experiences of clients who may share a similar diagnostic label.

**How does this apply to clinical practice?**

Mental health services in the UK are still predominantly structured around psychiatric diagnosis; from the point of referral to access to treatment and therapy, the diagnostic framework prevails. Clinical psychologists working within this diagnosis-dominated system need to be familiar and utilise diagnostic concepts, particularly in light of their changing role. Clinical Psychologists are increasingly expected to integrate indirect ways of working within their practice, in addition to direct client work, as it was outlined by the Department of Health (2007) in their document “*Mental Health: New Ways of Working for Everyone*”. As part of this role shift, psychologists are asked to provide consultation and supervision to other professional groups, whose practice is based within the diagnostic paradigm. Thus, clinical psychologists must be able to work with diagnosis, whilst integrating their formulation-based knowledge in their practice, in order to ensure best quality of care for the clients and enhance staff teams’ understanding of the client’s difficulties.

Moreover, mental health services within the NHS are currently commissioned based on the “*payment by results*” system, which is predominantly based on diagnosis and outcome measures to operationalise “complexity” and “successful treatments” (Department of Health, 2011). An important part of the role of clinical psychologists working within the NHS is to develop service provision to improve clients’ access and journeys through services. Thus, due to the current prevalence of diagnostic concepts in decisions involving funding and development of services, it is of crucial importance for clinical psychologists to be familiar with these concepts and able to utilise them in their everyday practice.

Clinical psychologists are increasingly occupying senior positions with the National Health System (NHS). In relation to the integration of diagnosis and formulation in clinical practice, it is important to think creatively about the ways in which we work within a wider clinical team and consider our role within the NHS to promote positive change. As individuals, for instance we could start by continuing to introduce formulation-based ways of working within a wider team context and promoting a critical approach to the use of diagnosis. Nonetheless, it is important to acknowledge that shifting a paradigm that has been dominant for several decades will take time and effort from individuals but most importantly from the profession as a whole and the professional bodies involved (e.g. British Psychological Society; Health and Care Professions Council).

### **Conclusions**

This review discussed the strengths and limitations of both diagnosis and formulation. Specific challenges in relation to the diagnosis of BD were also considered in relation to conducting quantitative research with people diagnosed with BD. It was outlined how diagnosis can serve as a helpful tool both in research and clinical practice as it can offer a clustering system that is shared across different disciplines and aid communication between practitioners working within mental health services. Therefore, it was advocated that clinical psychologists must be familiar with diagnostic systems and able to utilise these within their roles both as clinicians and researchers. This is of relevance due to the current limitations of formulation in light of its idiosyncratic nature and the difficulties caused by this in relation characterising common experiences in research.

At present, formulations, although helpful at an individual client level, are unable to replace the current diagnostic system. Future research should focus on further examining the validity of formulation and its inter-rater reliability, as well as consider the role of formulation in quantitative research.

### References

- Allen, F., 2013. The past, present and future of psychiatric diagnosis. *World Psychiatry* 12, 111–112. doi:10.1002/wps.20027
- American Psychiatric Association, 2013. *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC.
- Batstra, L., Frances, A., 2012. Diagnostic Inflation. *J. Nerv. Ment. Dis.* 200, 474–479. doi:10.1097/NMD.0b013e318257c4a2
- Ben-Zeev, D., Young, M.A., Corrigan, P.W., 2010. DSM-V and the stigma of mental illness. *J. Ment. Heal.* 19, 318–327. doi:10.3109/09638237.2010.492484
- Boyle, M., 2007. The problem with diagnosis. *Psychologist* 20, 290–292.
- Butler, G., 1998. Clinical Formulation, in: Bellack, A.S., Hersen, M. (Eds.), *Comprehensive Clinical Psychology*, Vol 6. Pergamon, Oxford, pp. 1–2.
- Canino, G., Alegría, M., 2008. Psychiatric diagnosis – is it universal or relative to culture? *J. Child Psychol. Psychiatry* 49, 237–250. doi:10.1111/j.1469-7610.2007.01854.x
- Clement, S., Schauman, O., Graham, T., Maggioni, F., Evans-Lacko, S., Bezborodovs, N., Morgan, C., Rüsch, N., Brown, J.S.L., Thornicroft, G., 2015. What is the impact of mental health-related stigma on help-seeking? A systematic review of quantitative and qualitative studies. *Psychol. Med.* 45, 11–27. doi:10.1017/S0033291714000129
- Corrigan, P.W., 2007. How Clinical Diagnosis Might Exacerbate the Stigma of Mental Illness. *Soc. Work* 52, 31–39. doi:10.1093/sw/52.1.31
- Corrigan, P.W., Druss, B.G., Perlick, D.A., 2014. The Impact of Mental Illness Stigma on Seeking and Participating in Mental Health Care. *Psychol. Sci. Public Interes.* 15, 37–70. doi:10.1177/1529100614531398
- Deacon, B.J., 2013. The biomedical model of mental disorder: A critical analysis of its validity, utility, and effects on psychotherapy research. *Clin. Psychol. Rev.* 33, 846–861.

doi:10.1016/j.cpr.2012.09.007

Department of Health, 2011. A simple guide to Payment by Results. Available from:

<http://www.apollonursingresource.com/wp-content/uploads/2013/10/PbR-Simple-Guide-FINAL.pdf>

Department of Health, 2007. Mental Health: New Ways of Working for Everyone. Available from:

[http://webarchive.nationalarchives.gov.uk/+/www.dh.gov.uk/prod\\_consum\\_dh/groups/dh\\_digitalassets/@dh/@en/documents/digitalasset/dh\\_074495.pdf](http://webarchive.nationalarchives.gov.uk/+/www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/documents/digitalasset/dh_074495.pdf)

Dixon-Woods, M., Bonas, S., Booth, A., Jones, D.R., Miller, T., Sutton, A.J., Shaw, R.L.,

Smith, J.A., Young, B., 2006. How can systematic reviews incorporate qualitative research? A critical perspective. *Qual. Res.* 6, 27–44. doi:10.1177/1468794106058867

Flinn, L., Braham, L., das Nair, R., 2015. How reliable are case formulations? A systematic

literature review. *Br. J. Clin. Psychol.* 54, 266–290. doi:10.1111/bjc.12073

Frances, A., PS, W., 2013. The New Crisis in Confidence in Psychiatric Diagnosis. *Ann.*

*Intern. Med.* 200, 97–106. doi:10.7326/0003-4819-159-3-201308060-00655

Ghaemi, S.N., 2013. Bipolar spectrum: a review of the concept and a vision for the future.

*Psychiatry Investig.* 10, 218–24. doi:10.4306/pi.2013.10.3.218

Ghouse, A.A., Sanches, M., Zunta-Soares, G., Swann, A.C., Soares, J.C., 2013.

Overdiagnosis of bipolar disorder: a critical analysis of the literature.

*ScientificWorldJournal.* 2013, 297087. doi:10.1155/2013/297087

Hammersley, M., 2007. The issue of quality in qualitative research. *Int. J. Res. Method Educ.*

30, 287–305. doi:10.1080/17437270701614782

Harper, D., Moss, D., 2003. A different kind of chemistry? Reformulating “formulation.”

*Clin. Psychol.* 25, 6–10.

Hayne, Y.M., 2003. Experiencing psychiatric diagnosis: client perspectives on being named

- mentally ill. *J. Psychiatr. Ment. Health Nurs.* 10, 722–729. doi:10.1046/j.1365-2850.2003.00666.x
- Health & Care Professions Council, 2015. *Practitioner Psychologists: Standards of Proficiency*. Available from: [http://www.hpc-uk.org/assets/documents/10002963SOP\\_Practitioner\\_psychologists.pdf](http://www.hpc-uk.org/assets/documents/10002963SOP_Practitioner_psychologists.pdf)
- Hinton, D.E., Lewis-Fernández, R., 2011. The cross-cultural validity of posttraumatic stress disorder: implications for DSM-5. *Depress. Anxiety* 28, 783–801. doi:10.1002/da.20753
- Jablensky, A., 1999. The conflict of the nosologists: views on schizophrenia and manic-depressive illness in the early part of the 20th century. *Schizophrenia Research* 39(2), 95-100. doi:10.1016/S0920-9964(99)00106-1
- Johnstone, L., 2006. *Controversies and debates about formulation*. Routledge, London, New York.
- Kendell, R., Jablensky, A., 2003. Distinguishing Between the Validity and Utility of Psychiatric Diagnoses. *Am. J. Psychiatry* 160, 4–12. doi:10.1176/appi.ajp.160.1.4
- Kim, Y.-R., Tyrer, P., 2010. Controversies surrounding classification of personality disorder. *Psychiatry Investig.* 7, 1–8. doi:10.4306/pi.2010.7.1.1
- Kinderman, P., Read, J., Moncrieff, J., Bentall, R.P., 2013. Drop the language of disorder. *Evid. Based. Ment. Health* 16, 2–3. doi:10.1136/eb-2012-100987
- Link, B.G., Struening, E.L., Neese-Todd, S., Asmussen, S., Phelan, J.C., 2001. Stigma as a Barrier to Recovery: The Consequences of Stigma for the Self-Esteem of People With Mental Illnesses. *Psychiatr. Serv.* 52, 1621–1626. doi:10.1176/appi.ps.52.12.1621
- Macneil, C.A., Hasty, M.K., Conus, P., Berk, M., 2012. Is diagnosis enough to guide interventions in mental health? Using case formulation in clinical practice. *BMC Med.* 10, 111. doi:10.1186/1741-7015-10-111
- Maj, M., 2014. DSM-5, ICD-11 and “pathologization of normal conditions.” *Aust. New Zeal.*

- J. Psychiatry 48, 193–197. doi:10.1177/0004867413520254
- May, R., 2007. Working outside the diagnostic frame. *Psychologist* 20, 300–301.
- Meyrick, J., 2006. What is Good Qualitative Research? A First Step towards a Comprehensive Approach to Judging Rigour/Quality. *Public Heal. Spec. Res. Consult. UK J. Heal. Psychol.* www.sagepublications.com 11, 799–808.  
doi:10.1177/1359105306066643
- Moncrieff, J., 2007. Diagnosis and Drug Treatment. *Psychologist* 20, 296–297.
- Morton, W.A., 1999. Cocaine and Psychiatric Symptoms. *Prim. Care Companion J. Clin. Psychiatry* 1, 109–113.
- Reyna, V.F., Mills, B.A., 2014. Theoretically Motivated Interventions for Reducing Sexual Risk Taking in Adolescence: A Randomized Controlled Experiment Applying Fuzzy-Trace Theory. *J. Exp. Psychol. Gen.* 143, 1627–1648. doi:10.1037/a0036717
- Reyna, V.F., Rivers, S.E., 2008. Current Theories of Risk and Rational Decision Making. *Dev. Rev.* 28, 1–11. doi:10.1016/j.dr.2008.01.002
- Reyna, V.F., Weldon, R.B., McCormick, M., 2015. Educating Intuition: Reducing risky decisions using fuzzy trace theory. *Curr. Dir. Psychol. Sci.* 24, 392–398.  
doi:10.1177/0963721415588081
- Rivers, S.E., Reyna, V.F., Mills, B., 2008. Risk Taking under the Influence: A Fuzzy-Trace Theory of Emotion in Adolescence. *Dev. Rev.* 28, 107–144.  
doi:10.1016/j.dr.2007.11.002
- Rüsch, N., Müller, M., Lay, B., Corrigan, P.W., Zahn, R., Schönenberger, T., Bleiker, M., Lengler, S., Blank, C., Rössler, W., 2013. Emotional reactions to involuntary psychiatric hospitalization and stigma-related stress among people with mental illness. *Eur Arch Psychiatry Clin Neurosci* 264, 35–43. doi:DOI 10.1007/s00406-013-0412-5
- Sherwood Brown, E., Suppes, T., Adinoff, B., Rajan Thomas, N., 2001. Drug abuse and

bipolar disorder: comorbidity or misdiagnosis? *J. Affect. Disord.* 65, 105–115.

doi:10.1016/S0165-0327(00)00169-5

The British Psychological Society, 2014. Standards for Doctoral programmes in Clinical Psychology. Available from:

[http://www.bps.org.uk/system/files/Public%20files/PaCT/dclinpsy\\_standards\\_approved\\_may\\_2014.pdf](http://www.bps.org.uk/system/files/Public%20files/PaCT/dclinpsy_standards_approved_may_2014.pdf)

The British Psychological Society, 2011. Good Practice Guidelines on the use of psychological formulation. Available from:

<http://www.bps.org.uk/system/files/Public%20files/DCP/cat-842.pdf>

Vieta, E., Phillips, M.L., 2007. Deconstructing bipolar disorder: a critical review of its diagnostic validity and a proposal for DSM-V and ICD-11. *Schizophr. Bull.* 33, 886–92.

doi:10.1093/schbul/sbm057

Volkow, N.D., Koob, G., Harhay, M., al., et, Nakamura-Palacios, E., 2015. Brain disease model of addiction: why is it so controversial? *The Lancet Psychiatry* 2, 677–679.

doi:10.1016/S2215-0366(15)00236-9

Wong, S.E., 2014. A Critique of the Diagnostic Construct Schizophrenia. *Res. Soc. Work Pract.* 24, 132–141. doi:10.1177/1049731513505152

Yanos, P.T., Roe, D., Lysaker, P.H., 2010. The Impact of Illness Identity on Recovery from Severe Mental Illness. *Am. J. Psychiatr. Rehabil.* 13, 73–93.

doi:10.1080/15487761003756860

Zorumski, C.F., Rubin, E., 2011. Bipolar Spectrum Disorder: A Problematic Concept.

Available from: <https://www.psychologytoday.com/blog/demystifying-psychiatry/201105/bipolar-spectrum-disorder-problematic-concept>

Zwarenstein, M., Treweek, S., Gagnier, J.J., Altman, D.G., Tunis, S., Haynes, B., Oxman, A.D., Moher, D., Marusic, A., Overbeke, A., Schroeder, T., Sox, H., Weyden, M. Van



Der, Cook, D., Erwin, P., Sood, A., Sood, R., Lo, B., Thompson, C., Zhou, Q., Mills, E., Guyatt, G., 2008. Improving the reporting of pragmatic trials: an extension of the CONSORT statement. *BMJ* 337, a2390–a2390. doi:10.1136/bmj.a2390

Section 4: Ethics Section

Anna Chiara Sicilia

Trainee Clinical Psychologist

Doctorate in Clinical Psychology

Lancaster University

**Faculty of Health and Medicine Research Ethics  
Committee (FHMREC) Lancaster University**

**Application for Ethical Approval for  
Research involving direct contact  
with human participants**

**Instructions [for additional advice on completing this form, hover PC mouse over 'guidance'  
]**

1. Apply to the committee by submitting:
  - a. A **hard copy** of the University's **Stage 1 Self Assessment (part A only)** and **Project Questionnaire**. These are available on the Research Support Office website: [LU Ethics](#)
  - b. The completed application **FHMREC form**
  - c. Your full research proposal (background, literature review, methodology/methods, ethical considerations)
  - d. All accompanying research materials such as, but not limited to,
    - 1) Advertising materials (posters, e-mails)
    - 2) Letters/emails of invitation to participate
    - 3) Participant information sheets
    - 4) Consent forms
    - 5) Questionnaires, surveys, demographic sheets
    - 6) Interview schedules, interview question guides, focus group scripts
    - 7) Debriefing sheets, resource lists

**Please note that you DO NOT need to submit pre-existing handbooks or measures which support your work, but which cannot be amended following ethical review. These should simply be referred to in your application form.**

2. Submit the FHMREC form and all materials listed under (d) by email as a **SINGLE attachment in PDF format** by the deadline date. **Before converting to PDF ensure all comments are hidden by going into 'Review' in the menu above then choosing *show markup>balloons>show all revisions in line*.**
3. Submit one collated and signed paper copy of the full application materials in time for the FHMREC meeting. If the applicant is a student, the paper copy of the application form must be signed by the Academic Supervisor.
4. Committee meeting dates and application submission dates are listed on the [FHMREC website](#). Applications must be submitted by the deadline date, to:

Dr Diane Hopkins B14, Furness College Lancaster University,

LA1 4YG

[d.hopkins@lancaster.ac.uk](mailto:d.hopkins@lancaster.ac.uk)

5. Prior to the FHMREC meeting you may be contacted by the lead reviewer for further clarification of your application.
6. Attend the committee meeting on the day that the application is considered, if required to do so.

1. **Title of Project:** Decision making and risk in people diagnosed with bipolar disorder.  
2. **Name of applicant/researcher:** Anna Chiara Sicilia

3. **Type of study**  
 Includes *direct* involvement by human subjects.     Involves existing documents/data only, or the evaluation of an existing project with no direct contact with human participants.  
  
Please complete the University Stage 1 Self Assessment part B. This is available on the Research Support Office website: [LU Ethics](#). Submit this, along with all project documentation, to [REDACTED]

4. If this is a student project, please indicate what type of project by marking the relevant box/deleting as appropriate: (please note that UG and taught PG projects should complete **FHMREC form UG-tPG**, following the procedures set out on the [FHMREC website](#))

PG Diploma     Masters dissertation     PhD Thesis     PhD Pall. Care

PhD Pub. Health     PhD Org. Health & Well Being     PhD Mental Health     M D

DClinPsy SRP     [if SRP Service Evaluation, please also indicate here:     DClinPsy Thesis

**Applicant Information**

<p><b>5. Appointment/position held by applicant and Division within FHM</b> Trainee Clinical Psychologist – Doctorate in Clinical Psychology, Lancaster University</p> <p><b>6. Contact information for applicant:</b></p> <p><b>E-mail:</b> a.sicilia@lancaster.ac.uk</p> <p><b>Telephone:</b> 07402232214 (please give a number on which you can be contacted at short notice)</p> <p><b>Address:</b> C34, Furness College, Lancaster University, LA1 4YG, Lancaster</p> <p><b>7. Project supervisor(s), if different from applicant:</b> Dr Guillermo Perez-Algorta</p> <p><b>8. Appointment held by supervisor(s) and institution(s) where based (if applicable):</b> Lecturer in Mental Health &amp; Academic Supervisor, Lancaster University</p> <p><b>9. Names and appointments of all members of the research team (including degree where applicable)</b></p> <p>Professor Steven Jones, Director of the Spectrum Centre for Mental Health Research, Lancaster University</p>
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**The Project**

**NOTE:** In addition to completing this form you must submit a detailed research protocol and all supporting materials.

**10. Summary of research protocol in lay terms (indicative maximum length 150 words):**

The current study aims at clarifying the processes behind risky decision making in bipolar disorder using Fuzzy- Trace Theory (FTT), a dual process theory of cognition based on the idea that people process and store the daily experiences using two parallel processes of gist and verbatim representations. The aim of the study is to determine the links between constructs of

FTT with measures of impulsivity, risk perception, risk taking, response to punishment and reward and mood state.

This research will help to gain a better insight into risky decision making processes that often characterise bipolar disorder and offer important clinical implications for issues such as medication adherence and psychological therapy. It is aimed to recruit between 60-100 people diagnosed with bipolar disorder. Participants will be recruited online through Spectrum Connect (a database managed by the Spectrum Centre for Mental Health Research at Lancaster University), Twitter (a research account will be set up for the purpose of this study and deleted with all its content once the study is complete) as well as through national charities (e.g., Bipolar UK, Mind UK), national support and advocacy groups and adverts in periodicals managed by national charities (e.g., Pendulum for Bipolar UK; subject to funding). Participants will be asked to complete a series of anonymous online questionnaires as well as some individual screening questions to collect demographic information (age, gender, current employment) as well as clinical information (e.g. current medication, history of previous episodes of bipolar, duration of previous episodes, any other diagnosis).

#### **11. Anticipated project dates**

Start date: July 2016                      End date: May 2017

#### **12. Please describe the sample of participants to be studied (including maximum & minimum number, age, gender):**

Adults (18+) diagnosed with bipolar disorder (participants will be screened through the use of the Mood Disorder Questionnaire and the 7up and 7down inventory). It is aimed to recruit between a minimum of 60 and a maximum of 100 participants. There will be no gender restrictions. Participants must be English speakers to take part in the project.

#### **13. How will participants be recruited and from where? Be as specific as possible.**

Recruitment will happen in two stages. First participants will be recruited online through Spectrum Connect (a database managed by the Spectrum Centre for Mental Health Research aimed at linking researchers with service users) and social media (Twitter; a research account will be set up and deleted with all its content once the study is complete). If not enough participants are recruited online, then the second stage of recruitment will involve advertising the study through national charities (e.g., Bipolar UK, Mind UK), national support groups and advocacy groups and adverts in local and national periodicals (e.g. Pendulum – Bipolar UK; subject to funding).

#### **14. What procedure is proposed for obtaining consent?**

No written consent will be used for the current study as anonymised online questionnaires will be used for data collection. Participants will have access to an online information sheet before proceeding to take part in the study, where it will be made clear that by continuing with the study they will be considered to have given consent to take part.

#### **15. What discomfort (including psychological eg distressing or sensitive topics),**

**inconvenience or danger could be caused by participation in the project? Please indicate plans to address these potential risks. State the timescales within which participants may withdraw from the study, noting your reasons.**

Due to the nature of the study (online questionnaires) no discomfort to participants is anticipated. However, participants will be informed to contact their GP and/or care team in case of distress, and additional contact information (e.g., Samaritans UK) will be provided on the information sheet.

Participants will be informed that they will NOT be able to withdraw their data once they have completed the online study. This is because the questionnaires will be kept anonymous, therefore it will not be possible to identify their data once submitted.

**16. What potential risks may exist for the researcher(s)? Please indicate plans to address such risks (for example, noting the support available to you; counselling considerations arising from the sensitive or distressing nature of the research/topic; details of the lone worker plan you will follow, and the steps you will take).**

No risks are anticipated for the researcher as data will be collected online.

**17. Whilst we do not generally expect direct benefits to participants as a result of this research, please state here any that result from completion of the study.**

There will be no direct benefit to participants taking part in this study. However it might be a positive experience for those taking part as results of the study might be submitted for publication to inform future research.

**18. Details of any incentives/payments (including out-of-pocket expenses) made to participants:**

There will be no incentives offered for participation in this research.

**19. Briefly describe your data collection and analysis methods, and the rationale for their use. Please include details of how the confidentiality and anonymity of participants will be ensured, and the limits to confidentiality.**

Data will be collected through the use of online questionnaires on Qualtrics. Participants will be directed to a link. Before being able to proceed to the questionnaires participants will be presented with an online information sheets outlining the study and explaining confidentiality and anonymity. If participants consent to take part they will then be asked some initial questions to collect demographic information (age, gender, employment status) and clinical information (current medication, past episodes of mania and depression and their duration, other comorbid diagnoses). Following this step, participants will be directed to the Mood Disorder Questionnaire (MDQ; Twiss, Jones, & Anderson, 2008) followed by the 7up 7down scale (Youngstrom, Murray, Johnson, & Findling, 2013) to obtain information about their current mood state. They will then be able to complete the Gist and Verbatim scales (Millis, Reyna & Estrada, 2008) followed by the Barratt Impulsivity Scale (BIS; Patton, Stanford, & Barratt, 1995) and the Behavioural Inhibition Scale (BAS/BIS; Carver &

White, 1994) measuring participants' response to punishment and reward. Finally information about participants' perception of risk and risk taking will be collected through the use of the Domain-Specific Risk-Taking Scale for adult populations (DOSPERT; Blais & Weber, 2006). All questionnaires will be anonymous; participants will not be requested to provide any names or contact details. Demographic information regarding age, gender and employment status and clinical information (current medication, number of previous episodes of bipolar, duration of previous episodes of bipolar, comorbid diagnoses) will be collected through individual questions.

Data will be analysed using multiple regression analysis and correlations through SPSS.

**20. If relevant, describe the involvement of your target participant group in the design and conduct of your research.**

Service Users from the Spectrum Centre were involved in the design of information sheet and were consulted to gain feedback on the questionnaires used and the wording of individual items. This information was shared with the Spectrum Centre Advisory Panel, and the main researcher presented the study at two different meetings for the Spectrum Centre to discuss the project and its design.

**21. What plan is in place for the storage of data (electronic, digital, paper, etc.)? Please ensure that your plans comply with the Data Protection Act 1998.**

All data stored electronically will be exported from Qualtrics, encrypted, password protected and stored on the Lancaster University server. Only the main researcher will have access to this information.

Data will be kept for a maximum of 10 years and then permanently destroyed. The research director (Dr Bill Sellwood), or a member of staff designated by him, will be responsible for the storage and deletion of data.

**22.** Will audio or video recording take place? NO.

**If yes, what arrangements have been made for audio/video data storage? At what point in the research will tapes/digital recordings/files be destroyed?**

N/A

**23. What are the plans for dissemination of findings from the research? If you are a student, include here your thesis.**

A thesis project will be submitted to Lancaster University for assessment purposes and a presentation will be given to staff, trainees and services users on the DClInPsy. If appropriate, the project will be submitted to a peer reviewed journal.

**24. What particular ethical considerations, not previously noted on this application, do you think there are in the proposed study? Are there any matters about which you wish to seek guidance from the FHMREC?**



Safeguarding concerns. Due to the nature of the study, no major safeguarding concerns are anticipated. However, because anonymised online questionnaires will be used for data collection, should safeguarding concerns arise the main researcher will be limited in the actions to take to overcome these. Participants will be instructed to contact their GP and/or care team in case of distress following the study, and further information (e.g. Samaritans contact details) will be provided on the online participants' information sheet.

Confidentiality and anonymity will be maintained throughout by using anonymous online questionnaires and requiring limited demographic information (age, gender, employment status) to ensure that participants will not be identifiable.

Signatures: Applicant: .....

Date: .....

\*Project Supervisor (if applicable): ..... Date:

.....

\*I have reviewed this application, and discussed it with the applicant. I confirm that the project methodology is appropriate. I am happy for this application to proceed to ethical review.

## **Research Protocol**

### **Introduction**

Decision making and risk taking is one of the most studied topics in developmental neuroscience. It is a particularly relevant topic to people diagnosed with bipolar disorder (BD) who often show altered decision making processes that lead to a higher likelihood to engage in risky behaviours. This is not limited to the manic and depressive stages of BD, but also present during its euthymic stage (Chandler, Wakeley, Goodwin, & Rogers, 2009). Numerous theories have been developed to try to explain why people with BD are more likely to engage in risk taking behaviours compared to the general population; nonetheless researchers are yet to reach a consensus on this topic.

### **Decision Making in Bipolar Disorder**

Numerous studies have attributed risky behaviour in BD to impulsivity, a trait that has been found to be characteristic of the disorder. For example a study by Strakowski and colleagues (2010) found that people with BD were more impulsive in their responses to three behavioural tasks, compared to healthy controls. This finding was mainly observed in the manic stage of the illness, with the results normalising during the depressive or euthymic stages. However, people with BD showed elevated scores in the Barrett Impulsivity Scale (BIS-11) across all stages of the illness. Mason and colleagues (2012) also observed a preference for immediate over delayed (but often superior) rewards in people at risk for developing bipolar, which is also linked to impulsive behaviour. In fact a preference for immediate over delayed rewards often results in people making a decision that will lead to instant gratification over delayed gratification even if this decision is potentially more risky.

A more recent study by Mason and colleagues (2014), also found an increased preference for lower-order (short-term) goals, as opposed to higher-order (long-term) goals in people with BD compared to healthy controls, indicated by a hyperactivation of the ventral striatum (an area of the brain associated with shorter-term goals, as opposed to the dorsolateral prefrontal cortex associated with longer-term goals). Conversely a study conducted by Martino, Strejilevich, Torralva, and Manes (2011) found that people in an euthymic stage of BD did not show impairment in decision making abilities, and were able to make complex decision in efficient ways. Thus the authors report that the impairment in decision making observed in BD, might in fact be characteristic of the acute stages of BD rather than of BD as a whole.

Moreover, evidence suggests that, although people diagnosed with bipolar disorder often show abnormalities on self-report measures of impulsivity (consistently with the literature cited above), they do not consistently show impairment in behavioural tasks requiring planning and forethought (Holmes et al., 2009; Lombardo et al., 2012). Therefore it is possible that the processes underlying risk-taking in people diagnosed with BD might be more complex than it is hypothesised in the impulsivity literature.

Research around decision making in BD to date is fragmented, and does not offer a coherent explanation for the nature and manifestation of the observed decision making impairments in

people diagnosed with BD. Clarifying risky decision making in BD is paramount for clinical practice and to improve clinical outcomes in this population. In fact research in BD also reports poor adherence to both psychological (e.g., Busby and Sajatovic, 2010) and pharmacological interventions (e.g., Gonzalez-Pinto et al., 2010) in the majority of people diagnosed with BD. Despite the availability of studies attempting to clarify the reasons why people diagnosed with BD often show poor adherence to intervention (e.g., Arvilommi et al., 2014), only a limited number of studies has attempted to offer suggestions to improve adherence/attendance in clinical practice.

### **Fuzzy trace theory**

Historically, developmental theories of decision making have predicted an improvement in reasoning ability from childhood to adulthood (e.g., Bjorklund, 2012), implying that reasoning becomes more analytical (verbatim) and less intuitive (gist-based) in adulthood (Byrnes, 2002; Stanovich, Toplak,

& West, 2008). Nonetheless, the idea that adults reason better than children has been challenged by studies showing developmental reversals indicating that adults are more susceptible to bias and that children surprisingly have better reasoning abilities than adults (De Neys & Vanderputte, 2011; Reyna & Farley, 2006).

For instance, if it is true that more advanced thinking is based on the thorough considerations of risks and rewards, advanced thinkers (e.g. adults), would choose a risky option if this presented favourable odds. However evidence suggests that adults are often risk-averse even when presented favourable odds (Reyna & Brainerd, 2011) thus suggesting that the development of decision-making from childhood to adulthood (or from less to more advanced) is not as straightforward as originally hypothesised.

A recent theory developed by Reyna (2008), called fuzzy-trace theory (FTT), tried to clarify the processes behind decision making and risk-taking behaviours in non-clinical populations, and offered interesting links to clinical practice that could be highly relevant to clinical psychology. FTT suggests that people record their experiences by creating verbatim and gist representations of their experiences.

Verbatim representations are mental representations of daily experiences that are recorded as similar as possible to the 'original' experience, thus capturing the information in the exact form it was originally presented (i.e. it is a literal, or a verbatim representation). A gist representation is a more vague representation that captures what the person perceives as the 'bottom line' meaning of the information recorded; it is subjective, and it is influenced by different factors (e.g., emotional state, educational and cultural background, developmental stage).

Reyna's theory is in contrast with the traditional understanding of the development of decision-making processes across the life span. According to Reyna (2008, 2015), more efficient (or advanced) decision making processes are characterised by gist-based thinking rather than verbatim based thinking, thus a more advanced thinker will base their decisions on

a more intuitive process rather than on the thorough trade-off between risks and rewards. For example in a situation involving sexual risk, in verbatim-based thinking the following decision-making process is triggered:

- 1) the benefits of sex are large
- 2) the objective risks of contracting HIV while engaging in unprotected sex are very small
- 3) Decision: it is ok to have unsafe sex, as I will most likely not contract HIV.

Conversely in gist-based thinking, the decision-making process is different as follows:

- 1) It only takes once to contract HIV
- 2) Decision: I must use condoms/unsafe sex is not a good option.

As shown in the two examples above, people who are more likely to take risks, tend to rely on verbatim representations rather than gist representations, thus implying the idea of a “reasoned route” to risk taking. The research around FTT (e.g., Reyna et al., 2011) also found that gist representations are typical of more mature and experienced decision makers; for example when comparing adolescents and adults, they found that adolescents (who are also more likely to take risks) relied largely on verbatim representations in their decision making processes, while adults were more reliant on gist representations. These findings were confirmed by neuroimaging data, which showed that when faced with the question ‘is it a good idea to swim with sharks?’, adolescents showed a higher activation of areas of the brain associated with reasoning and deliberation (representative of verbatim thinking), while adults showed activation in areas associated with intuition and gut responses (gist-based thinking) (Reyna & Farley, 2006).

FTT also tried to offer some clarification on the observed relationship between emotion and decision making. For instance a paper by Rivers, Reyna and Mills (2008) suggests that positive and negative feelings states impact, in contrasting ways, on the way information is encoded (i.e., on the way mental representations are formed), and subsequently on decision-making processes. The authors propose that positive feelings states (e.g. optimism) direct the decision maker’s attention to more global information, thus eliciting gist-based thinking and resulting in more efficient decisions. Conversely, negative feeling states (e.g. depression) direct the decision maker’s attention to detail, thus eliciting verbatim-based thinking and often resulting in risky decisions by prompting the more computational way of thinking discussed above, where there is a trade-off of risks and benefits.

Similarly, the authors (Rivers, Reyna & Mills, 2008) also report evidence for the significant impact on arousal on decision-making. Arousal is believed to heighten the motivational effects of rewards, thus in a verbatim-based thinking process, where there is a trade-off of risks and benefits, decision-makers are even more likely to take risks as they tend to over-estimate the benefits over the risks of their decision. Interestingly, gist-based thinking was found to not be impacted by arousal, thus explaining why less advanced thinkers (e.g.

adolescents) are found to be more susceptible to arousal than more advanced thinkers (e.g. adults).

The idea of a reasoned route to risk taking proposed in FTT offers an interesting framework to understand risk taking in bipolar disorder. In fact if high negative emotion, which characterises BD (Wessa, Kanske, & Linke, 2013), leads to a more analytical/verbatim thinking (as suggested by Rivers, Reyna and Millis, 2008), it is likely that risk taking in people diagnosed with BD is not simply due to impulsivity, but rather related to what appears to be a strong link between emotion and verbatim-based thinking. Clarifying where BD is placed on the continuum between verbatim and gist-based thinking could offer an innovative insight into the processes leading to risk taking in this population. This could potentially help to shift the idea that risk taking in BD is a result of impulsivity - which is often characterised almost as an intrinsic personality trait that cannot be overcome - to a less stigmatising idea that risk taking occurs on a normal continuum between verbatim and gist-based thinking.

### **The current study**

The aim of the current study is to characterise a group of people in an euthymic stage of BD, using FTT gist and verbatim measures, and evaluate the associations of FTT styles (gist or verbatim – depending on results) in BD with self-report measures of risk perception, risk taking, impulsivity and response to punishment and reward, controlling for current mood. Research conducted to date on decision making in BD indicates the lack of a coherent framework for understanding decision making processes in people diagnosed with this condition. Moreover the majority of the studies cited above either lack, or are very limited in their clinical implications.

FTT offers a good insight into decision-making processes as well as a link to possible interventions and clinical implications of the findings observed thus far. For example Reyna and colleagues (2015) were able to demonstrate that adolescents (who rely on verbatim representations) can be successfully trained to rely on gist representations, which results in an improvement in decision-making and a reduced likelihood to engage in risk-taking behaviours. This project would help to clarify the processes of decision making in people diagnosed with BD, as well as offer recommendations to improve adherence to medication and attendance in clinical practice.

**Clinical implications:** the effectiveness of medication and psychological therapies for BD is still limited, especially in relation to risk-taking behaviours in this clinical group. Clarifying the process behind decision making and risk-taking in BP would be highly beneficial for clinical practice as it could lead to the development of new and more effective clinical alternatives. In fact interventions based on FTT models have been proved to be effective in improving decision-making processes by training people to use more ‘gisty’ or abstract representations (e.g. Reyna et al., 2015).

### **Method**

#### **Participants**

Participants must be over 18 years of age to take part in the study and must have a diagnosis of Bipolar Disorder. Participants will be screened for bipolar disorder using the Mood Disorder Questionnaire, and their current mood state will be captured using the 7up and 7down inventory. It is aimed to recruit between a minimum of 60 and a maximum of 100 participants. There will be no gender restrictions. Participants must be English speakers to take part in the current project.

### **Design**

This is a quantitative study, which will use anonymised online questionnaires on Qualtrics for data collection. Demographic and clinical information will be collected through individual items. Participants will be asked to report their age, gender, current employment (including voluntary employment), ethnic background, marital status and education level. Clinical information about current medication, past episodes of mania and depression and their duration, information about any comorbid diagnosis, age at diagnosis of bipolar, diagnosis type, number of episodes, current mood state, any other medical diagnosis (including HIV and STD) and any psychological therapy participants might have received, will also be collected.

### **Procedure**

*Ethical Approval.* This project will not need ethical approval by the NHS Ethical Committee, as participants will be recruited online and through national charities. The project will be reviewed by the Faculty of Health and Medicine Research Ethics Committee (FHMREC) and submitted for approval to the University Research Ethics Committee (UREC).

*Recruitment.* Recruitment will happen in two stages. First participants will be recruited online through Spectrum Connect (a database managed by the Spectrum Centre for Mental Health Research aimed at linking researchers with service users) and social media (Twitter; a research account will be set up and deleted with all its content once the study is complete). If not enough participants are recruited online, the second stage of the recruitment strategy will involve advertising the research through national charities (e.g., Bipolar UK, Mind UK), national support groups and advocacy groups and adverts in local and national periodicals (e.g. Pendulum – Bipolar UK). It is aimed to recruit between minimum of 60 and maximum of 100 participants.

*Consent.* Potential participants will be directed to a link where they will be able to read an online information sheet before proceeding to the online questionnaires. Confidentiality and anonymity will be explained, and participants will be informed that no incentive will be provided. Consent will be obtained online: participants will be informed that by proceeding to the questionnaire they will be considered to have consented to take part in the study. No signed consent will be requested to protect participants' anonymity.

*Data collection.* Data will be collected through the use of online questionnaires on Qualtrics.

Participants will be directed to a link. Before being able to proceed to the questionnaires participants will be presented with an online information sheet outlining the study and explaining confidentiality and anonymity. If participants' consent to take part they will then be asked some initial questions to collect demographic information (age, gender, employment status) and clinical information (current medication, past episodes of mania and depression and their duration, other comorbid diagnosis). Following this step, participants will be directed to the Mood Disorder Questionnaire (MDQ; Twiss, Jones, & Anderson, 2008) followed by the 7up 7down scale (Youngstrom, Murray, Johnson, & Findling, 2013) to obtain information about their current mood state. They will then be able to complete the Gist and Verbatim scales (Millis, Reyna & Estrada, 2008) followed by the Barratt Impulsivity Scale (BIS; Patton, Stanford,

& Barratt, 1995) and the Behavioural Inhibition Scale (BAS/BIS; Carver & White, 1994) measuring participants' response to punishment and reward. Finally information about participants' perception of risk and risk taking will be collected through the use of the Domain-Specific Risk-Taking Scale for adult populations (DOSPERT; Blais & Weber, 2006).

### **Practical Issues (e.g. costs/logistics)**

*Costs.* The only costs anticipated for the current study are the potential costs associated with adverts in periodicals.

### **Ethical concerns**

*Participants' Confidentiality, anonymity and safeguarding concerns.* Participants' confidentiality and anonymity will be ensured by using anonymous online questionnaires. Participants will be asked to provide some demographic information (e.g. age, gender, ethnic group), however names will not be required and no handwritten consent form will be required.

*Safeguarding concerns.* Due to the nature of this study it is unlikely that safeguarding concerns will arise. However participants will be informed to contact their GP and/or care team (if involved with services) in case of distress. Further resources will be provided on the information sheet (e.g. Samaritans contact information).

### **Timescale**

Submit ethics proposal July 2016

Data Collection September 2016 – November 2016 Data analysis October 2016 – November 2016 First Draft of literature review – September 2016 Second draft of literature review – October 2016 First Draft of empirical paper - January 2017 Second draft of empirical paper – February 2017 First Draft of critical review – March 2017

Second draft of critical review – April 2017 Submit thesis – May 2017

Submit papers for publication – June/July 2017

If accepted, submit final manuscript to research coordinator – July/August 2017

## References

- Arvilommi, P., Suominen, K., Mantere, O., Leppamaki, S., Valtonen, H., & Isometsa, E. (2014). Predictors of adherence to psychopharmacological and psychosocial treatment in bipolar I or II disorders– an 18-month prospective study. *Journal of affective disorders*, *155*, 110-117.
- Bjorklund, D. F. (2012). *Children’s thinking: Cognitive development and individual differences* (5th ed.). Belmont, CA: Wadsworth.
- Blais, A.R., & Weber, E.U. (2006). A domain specific risk taking (DOSPERT) scale for adult populations. *Judgement and Decision Making*, *1*(1), 33-47.
- Busby, K.K.,Sajatovic,M.,(2010). Review: patient, treatment, and systems-level factors in bipolar disorder nonadherence: a summary of the literature. *CNS Neurosci.Ther.* *16*,308–315.
- Byrnes, J.P. (2002). The development of decision-making. *Journal of adolescent health*, *31*,208-215.
- Carver CS, & White TL.(1994) Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS scales. *Journal of Personality and Social Psychology*, *67*, 319–333.
- Chandler, R. A., Wakeley, J., Goodwin, G. M., & Rogers, R. D. (2009). Altered risk-aversion and risk-seeking behaviour in bipolar disorder. *Biol Psychiatry*, *66*, 840-846.
- De Neys, W., & Vanderputte, K. (2011). When less is not always more: Stereotype knowledge and reasoning development, *Developmental Psychology*, *47*, 432–441.
- Gonzalez-Pinto, A.,Reed,C.,Novick,D.,Bertsch,J.,Haro,J.M.,2010.Assessmentof medication adherenceinacohortofpatientswithbipolar disorder.*Pharma- copsychiatry**43*,263–270.
- Graves, R.E., Alim, T.N., Aigbogun, N., Chrishon, K., Mellman, T.A., Charney, D.S., Lawson, W.B., 2007. Diagnosing bipolar disorder in trauma exposed primary care patients. *Bipolar. Disord.* *9*, 318–323.
- Hirschfeld, R.M.A., Williams, J.B.W., Spitzer,R.L., Calabrese, J.R., Flynn, L., ...& Zajecka, J.(2000). Development and validation of a screening instrument for bipolar spectrum disorder: the mood disorder questionnaire. *American journal of psychiatry*, *157*(11), 1873-1875.
- Hirshfeld, R.M.A., Holzer, C., Calabrese, J.R., Weissman, M., Reed, M., Fyre, M.A., Keck, P., McElroy, S., Lewis, L., Tierce, J., Wagner, K.D., Hazard, E., 2003. Validity of the



- mood disorder questionnaire: a general population study. *Am. J. Psychiatry* 160, 178–180.
- Holmes M, Bearden CE, Barguil M, Fonseca M, Monkul E, Nery FG *et al* (2009).
- Conceptualizing impulsivity and risk taking in bipolar disorder: importance of history of alcohol abuse. *Bipolar Disorders* 11: 33–40.
- Hoyle, R.H., Stephenson, M.T., Palmgreen, P., Lorch, E.P., & Donohew, R.L. (2002). Reliability and validity of a brief measure of sensation seeking. *Personality and individual differences*, 32, 401-414.
- Lombardo LE, Bearden CE, Barrett J, Brumbaugh MS, Pittman B, Frangou S (2012). Trait impulsivity as an endophenotype for bipolar I disorder. *Bipolar Disorders* 14: 565–570
- Martino, D.J., Strejilevich, S.A., Torralva, T., & Manes, F. (2011). Decision making in euthymic bipolar I and bipolar II disorders. *Psychological Medicine*, 41, 1319-1327.
- Mason, L., O’Sullivan, N., Blackburn, M., Bentall, R., & El-Deredy, W. (2012). I want it now! Neural correlates of hypersensitivity to immediate reward in hypomania. *Biological Psychiatry*, 71, 530- 537.
- Mason, L., O’Sullivan, N., Montaldi, D., Bentall, R.P., & El-Deredy, W. (2014). Decision-making and trait impulsivity in bipolar disorder are associated with reduced prefrontal regulation of striatal reward valuation. *Brain*, 137, 2346-2355.
- Mills, B., Reyna, V. F., & Estrada, S. (2008). Explaining contradictory relations between risk perception and risk taking. *Psychological Science*, 19(5), 429-435.
- Patton, J.H., Stanford, M.S., & Barratt, E.S. (1995). Factor structure of the Barratt Impulsiveness Scale. *Journal of Clinical Psychology*, 51, 768-774.
- Reyna, V. F. (2008). A theory of medical decision making and health: fuzzy trace theory. *Medical decision making*, 28, 850-865.
- Reyna, V.F., & Brainerd, C.J. (2011). Dual processes in decision making and developmental neuroscience: A fuzzy-trace model. *Developmental Review*, 31, 180-206.
- Reyna, V. F., Estrada, S. M., DeMarinis, J. A., Myers, R. M., Stanisiz, J. M., & Mills, B. A. (2011). Neurobiological and memory models of risky decision making in adolescents versus young adults. *Journal of experimental psychology: learning, memory and cognition*, 37(5), 1125-1142.
- Reyna, V. F., Weldon, R. B., & McCormick, M. (2015). Educating intuition: reducing risky decisions using fuzzy-trace theory. *Current directions in Psychological Science*, 24(5), 392-398.

- Reyna, V.F., & Farley, F. (2006). Risk and rationality in adolescent decision making: Implications for theory, practice and public policy. *Psychological science in the public interest*, 7, 1-44.
- Stanovich, K. E., Toplak, M. E., & West, R. F. (2008). The development of rational thought: A taxonomy of heuristics and biases. *Advances in Child Development and Behavior*, 36, 251–285.
- Strakowski, S.M., Fleck, D.E., DelBello, M.P., Adler, C.M., Shear, P.K., Kotwal, R., & Arndt, S. (2010). Impulsivity across the course of bipolar disorder. *Bipolar Disorder*, 12, 285-297.
- Twiss, J., Jones, S., & Anderson, I. (2008). Validation of the mood disorder questionnaire for screening for bipolar disorder in a UK sample. *Journal of Affective Disorders*, 110, 180-184.
- Weber, E.U., Blaise, A.R., & Betz, E. (2002). A domain specific risk-attitude scale: measuring risk perceptions and risk behaviors. *Journal of Behavioural Decision Making*, 15, 263-290.
- Wessa, M., Kanske, P., & Linke, J. (2013). Bipolar disorder: a neural network perspective on a disorder of emotion and motivation. *Restorative Neurology and Neuroscience (in press)*, 1-11.
- Youngstrom, E.A., Murray, G., Johnson, S.L., & Findling, R.L. (2013). The 7up 7down inventory: a 14-item measure of manic and depressive tendencies carved from the General Behavior Inventory, *Psychol Assess*, 25(4), 1377-1383.

**Appendix A: Qualtrics material (please note that the following information will all be in electronic format on the Qualtrics website).**

**Step 1: Participants information sheet Participant Information Sheet**

Project Title: Decision making and risk in people diagnosed with bipolar disorder.

My name is Anna Chiara Sicilia and I am conducting this research as a student on the Doctorate in Clinical Psychology programme at Lancaster University.

What is the study about?

The purpose of this study is to explore the links between the way in which people diagnosed with bipolar disorder make sense of their daily experiences and make decisions and their likelihood of taking risks in everyday life.

Bipolar disorder has been associated with a higher likelihood of engaging in risky behaviour, particularly during periods of mania. This often leads to negative consequences both in the short and long-term. Understanding the reasons why bipolar disorder is associated with a higher likelihood of taking risks will help to obtain a deeper understanding of the condition as well as its clinical management.

The study will involve eight (8) brief questionnaires focused around people's perception of risk and risk taking, impulsivity and their current mood state. As you will see, some of the questionnaires ask about risks related to sexual activity; BUT the aim of the study is not to find out about your sexual life. Risk associated with sexual life is just one example of many candidate risk behaviours. We are only interested in your attitudes and thinking around "the risks" associated with engaging in sexual activity.

Please note that it is possible to pause and save at any time during the study, therefore if you feel like you need a break, you will be able to continue the study at a later time.

### Why have I been approached?

You have been approached because the study requires information from people who have been diagnosed with bipolar disorder.

### Do I have to take part?

No. It's completely up to you to decide whether or not you take part. There will be no negative consequences if you decide not to participate.

### What will I be asked to do if I take part?

If you decide you would like to take part, you would be asked to complete eight (8) online questionnaires. This will last approximately 35-50 minutes and can be done from home at a time that is suitable for you.

### Will my data be Identifiable?

The information you provide is anonymous. No identifiable information (e.g. any names, date of birth

and other information that might identify you) will be reported in the final report. The data collected for this study will be stored securely and only the researchers conducting this study will have access to these data.

The files on the computer will be encrypted (that is no-one other than the researcher and her university supervisors will be able to access them) and the computer itself password protected. All your personal data will be confidential and will be kept separately from your questionnaire responses.

Please note that due to data being anonymous, it will not be possible to withdraw your data once your responses have been submitted through the online portal.

### What will happen to the results?

The results will be summarised and reported in a final report for my thesis, which will be submitted for examination as part of my clinical psychology training. This may also be submitted for publication in an academic or professional journal.

Are there any risks?

There are no risks anticipated with participating in this study. However, if you experience any distress following participation you are encouraged to inform the researcher and contact the resources provided at the end of this sheet.

Are there any benefits to taking part?

Although you may find participating interesting, there are no direct benefits in taking part.

Who has reviewed the project?

This study has been reviewed by the Faculty of Health and Medicine Research Ethics Committee, and approved by the University Research Ethics Committee at Lancaster University.

Where can I obtain further information about the study if I need it?

If you have any questions about the study, please contact the main researcher:

Anna Chiara Sicilia [a.sicilia@lancaster.ac.uk](mailto:a.sicilia@lancaster.ac.uk) Room C34, Furness Building Lancaster  
University Lancaster

LA1 4YG

**Complaints**

If you wish to make a complaint or raise concerns about any aspect of this study and do not want to speak to the researcher, you can contact:

Dr Bill Sellwood (Research Director, Doctorate in Clinical Psychology, Lancaster  
University) [b.sellwood@lancaster.ac.uk](mailto:b.sellwood@lancaster.ac.uk)

+441524593998

Division of Health Research Furness Building

Lancaster University

Lancaster LA1 4YG

If you wish to speak to someone outside of the Clinical Psychology Doctorate Programme, you may also contact:

Professor Roger Pickup Tel: +44 (0)1524 593746 Associate Dean for Research

Email: [r.pickup@lancaster.ac.uk](mailto:r.pickup@lancaster.ac.uk)

Faculty of Health and Medicine Division of Biomedical and Life Sciences

Lancaster University Lancaster

LA1 4YG

[Resources in the event of distress](#)

We are not expecting this study to cause you any distress. However, if you do experience distress following your participation in the study, we advise you to contact your GP and/or your care team, who can offer guidance and advice to best manage this.

Here are also some useful resources you can access in case of distress:

**Mind UK**

You can contact Mind UK via email, phone, post or by visiting your local branch.

**Email:** [supporterservices@mind.org.uk](mailto:supporterservices@mind.org.uk)

**Telephone:** 020 8519 2122

**Fax:** 020 8522 1725

**Address:**

15-19 Broadway

Stratford

London

E15 4BQ

Find **your local branch** at the following link: <http://www.mind.org.uk/information-support/local-minds/>

**Thank you for taking the time to read this information sheet.**

## Step 2: Consent

By proceeding to the next page you confirm that:

- 1) You have read the information sheet and fully understand what is expected of you within this study;
- 2) that your participation is voluntary and that there are no incentives for taking part in the study;
- 3) you confirm that you understand that any information you give will remain anonymous;
- 4) you consent for the data to be discussed with my supervisor at Lancaster University;
- 5) you consent to Lancaster University keeping the anonymised data for a period of 10 years after the study has finished;
- 6) You consent to taking part in the current study.

### Demographic information

Thank you very much for consenting to participate in this study. The following set of questions will ask about demographic and clinical information.

Please remember that if you need to take a break you can save your progress by closing the page and re-opening the study from the original link from which you accessed it. **It is important that you have access to the original link as otherwise your progress may be lost.**

If you close and reopen the study from the original link, this should automatically take you back where you left off, and you should be able to continue with the next question

#### Item 1: Gender

Male Female Other

#### Item 2: Please indicate your date of birth using the following format (DD/MM/YYYY)

Numerical Value

#### Item 3: Please indicate your current employment status

Unemployed

Student

Disabled

Paid: Part-time or Full-Time

Voluntary: Part-time or Full-time

Other (please specify)

**Item 4: Please indicate your marital status**

Single

In a relationship

Married/civil partnership

Widowed

Divorced/Separated

Other (please specify)

**Item 5: What is your highest education level**

GCSEs

A-levels (or similar)

Undergraduate degree

Masters degree (or similar)

PhD/Doctorate

Other (please specify)

**Item 6: Please indicate your ethnic background**

White British/White Other

Asian/Asian British

Mixed

Black/African/Caribbean

Black British

Other ethnic group (please specify)

**Item 7: Is English your native language?**

Yes

No (please specify)

**Clinical information**



**Item 1: When did you receive a diagnosis of bipolar disorder (or similar)?**

In the past year

In the past 2-5 years

In the past 6-10 years

In the past 11-15 years

More than 16 years ago (please specify)

**Item 2: Please specify your diagnosis type**

Bipolar Type I

Bipolar Type 2

Bipolar Disorder Not Otherwise Specified

Schizoaffective Disorder

Other (please specify)

**Item 3: Since when do you think these problems with depression and mania started?**

Since I was 0-5 years old

Since I was 6-13 years old

Since I was 14-18 years old

Since I was 19-25 years old

Since I was 26-45 years old

Since I was 46 to now

**Item 4: How many episodes of bipolar have you experienced since you were diagnosed:**

Between 0-5 episodes

Between 6-10 episodes

Between 11-20 episodes

More than 20 episodes

**Item 5: Are you currently receiving any psychological intervention?**

Yes (please specify if known)

No

**Item 6: Are you currently on any medication for bipolar disorder and/or any other mental health condition (if YES, please indicate name and dosage, if known)**

Yes (please specify)

No

**Item 7: Do you believe that you are currently experiencing a mood episode (depression, mania or both)?**

Yes

No

**Item 7a (if YES to question 7): When did this start?**

In the past week In the past month

In the past 3 months

In the past 6 months In the past year

Other (please specify)

**Item 7b (if NO to question 7): When did you last mood episode (depression, mania or both) terminate?**

A week ago

A month ago

3 months ago

6 months ago

A year ago

Other (please specify)

**Item 8: Do you have any other mental health diagnoses?**

Yes (please specify)

No

**Item 9: Do you have any medical conditions? (please select more than one option if applicable)**

HIV/AIDS

Sexually transmitted disease (STD)

Heart disease

Pulmonary disease

Gastrointestinal disorder

Autoimmune disorder (e.g. lupus)

Neurologic disorder

Head trauma

Chronic Pain disorder

Endocrine disorder (e.g. Thyroid disease)

Metabolic disorder (e.g. diabetes)

Kidney disease

Cancer

Other (please specify)

**If HIV or STD are selected then the system will show the following message:**

Thank you very much for being honest in your responses and informing us of your medical condition. As you remember from the information sheet provided at the start of the study, we are interested in risk related to sexual activity.

As you reported to have either HIV/AIDS or an STD, some of the questions specifically relating to HIV or STD may not be applicable to you.

**We ask that you please try to answer these questions in an hypothetical manner**, i.e. as if you DID NOT already have HIV/AIDS or an STD.

**Thank you for your hard work so far.**

You may now proceed to the next section.

**Thank you message:**

The next section of the study will contain the first of the eight (8) brief questionnaires.

If you need a break, please remember that it is possible to save and continue later. If you are ok continuing with the study, then please proceed to the next section.

**Thank you.**

**The mood disorder questionnaire (MDQ)**

**Instructions:** Please answer each question to the best of your ability.

**Answers are scored on a YES or NO scale.**

1. Has there ever been a period of time when you were not your usual self and...

...you felt so good or so hyper that other people thought you were not your normal self or you were so hyper that you got into trouble?

...you were so irritable that you shouted at people or started fights or arguments?

...you felt much more self-confident than usual?

...you got much less sleep than usual and found you didn't really miss it?

...you were much more talkative or spoke much faster than usual?

...thoughts raced through your head or you couldn't slow your mind down?

...you were so easily distracted by things around you that you had trouble concentrating or staying on track?

...you had much more energy than usual?

...you were much more active or did many more things than usual?

...you were much more social or outgoing than usual, for example, you telephoned friends in the middle of the night?

...you were much more interested in sex than usual?

...you did things that were unusual for you or that other people might have thought were excessive, foolish, or risky?

...spending money got you or your family into trouble?

2. If you checked YES to more than one of the above, have several of these ever happened during the same period of time?

3. How much of a problem did any of these cause you – like being unable to work; having family, money or legal troubles; getting into arguments or fights?

*Please circle one response only.*

No Problem

Minor Problem

Moderate Problem

Serious Problem

4. Have any of your blood relatives (i.e. children, siblings, parents, grandparents, aunts, uncles) had manic- depressive illness or bipolar disorder?

5. Has a health professional ever told you that you have manic-depressive illness or bipolar disorder?

**Thank you message:**

Well done for completing the first questionnaire.

**Thank you** very much for your hard work, we really appreciate your efforts in answering the questions so far.

Please proceed to the next page for the **next questionnaire**.

**The 7 Up 7 Down Inventory**

Below are some questions about behaviors that occur in the general population. Using the scale below, select the number that best describes how often you have experienced these behaviours during **the past two weeks**. Please only select one number per item. For each item please choose between the following four options:

0 – Never or hardly ever 1 – Sometimes 2 – Often 3 – Very often or almost constantly

1.	Have you had periods of extreme happiness and intense energy lasting several days or more when you also felt much more anxious or tense (jittery, nervous, uptight) than usual (other than related to the menstrual cycle)?	0	1	2	3
2.	Have there been times of several days or more when you were so sad that it was quite painful or you felt that you couldn't stand it?	0	1	2	3
3.	Have there been times lasting several days or more when you felt you must have lots of excitement, and you actually did a lot of new or different things?	0	1	2	3
4.	Have you had periods of extreme happiness and intense energy (clearly more than your usual self) when, for several days or more, it took you over an hour to get to sleep at night?	0	1	2	3
5.	Have there been long periods in your life when you felt sad, depressed, or irritable most of the time?	0	1	2	3
6.	Have you had periods of extreme happiness and high energy lasting several days or more when what you saw, heard, smelled, tasted, or touched seemed vivid or intense?	0	1	2	3
7.	Have there been periods of several days or more when your thinking was so clear and quick that it was much better than most other people's?	0	1	2	3
8.	Have there been times of a couple days or more when you felt that you were a very important person or that your abilities or talents were better than most other people's?	0	1	2	3
9.	Have there been times when you have hated yourself or felt that you were stupid, ugly, unlovable, or useless?	0	1	2	3
10.	Have there been times of several days or more when you really got down on yourself and felt worthless?	0	1	2	3
11.	Have you had periods when it seemed that the future was hopeless and things could not improve?	0	1	2	3
12.	Have there been periods lasting several days or more when you were so down in the dumps that you thought you might never snap out of it?	0	1	2	3

13. Have you had times when your thoughts and ideas came so fast that you couldn't get them all out, or they came so quickly that others complained that they couldn't keep up with your ideas?	0	1	2	3
14. Have there been times when you have felt that you would be better off dead?	0	1	2	3

### Thank you message:

Well done for completing the second questionnaire.

Thank you very much for your hard work, we really appreciate your efforts in answering the questions so far.

Please proceed to the next page for the next questionnaire.

### Gist Scales

#### Categorical Risk Scale

Each item of this questionnaire is a statement that a person may either agree with or disagree with. For each item, please choose the response that best represents your position about the risks of sexual activity. Please respond to all the items; do not leave any blank. Choose only one response to each statement.

Please be as accurate and honest as you can be. Respond to each item as if it were the only item. That is, don't worry about being "consistent" in your responses. Choose from the following five response options:

0 = strongly disagree 1 = disagree 2 = neither agree nor disagree 3 = agree 4 = strongly agree

1. Even low risks happen to someone	0	1	2	3	4
2. It only takes ONCE to get pregnant or get an STD	0	1	2	3	4
3. Once you have HIV-AIDS, there is no second chance	0	1	2	3	4
4. Even if you use condoms, eventually you'll get an STD if you have sex enough	0	1	2	3	4
5. Even low risk adds up to 100% if you keep doing it	0	1	2	3	4
6. If you keep having unprotected sex, risk adds up and you WILL get an STD	0	1	2	3	4
7. If you can't handle getting protection, you are not ready for sex	0	1	2	3	4
8. When in doubt about having sex, delay or avoid it	0	1	2	3	4
9. If you keep having unprotected sex, risk adds up and you WILL get pregnant or get someone pregnant	0	1	2	3	4

### Gist Principles Scale

Each item of this questionnaire is a statement that a person may either agree with or disagree with. For each item, please choose the response that best represents your position about the risks of sexual activity. Please respond to all the items; do not leave any blank.

Choose only one response to each statement.

Please be as accurate and honest as you can be. Respond to each item as if it were the only item. That is, don't worry about being "consistent" in your responses.

1.	Avoid risk	Agree	Disagree
2.	Better to be safe than sorry	Agree	Disagree
3.	I have a responsibility to myself to wait to have sex	Agree	Disagree
4.	I have a responsibility to my parents/family to not have sex	Agree	Disagree
5.	Better to not have sex than hurt my parents/family	Agree	Disagree
6.	I have a responsibility to my partner to not put him/her at risk	Agree	Disagree
7.	I have a responsibility to God to wait to have sex	Agree	Disagree
8.	Better to not have sex than risk getting HIV/AIDS	Agree	Disagree
9.	Better to not have sex than risk getting pregnant or getting someone pregnant	Agree	Disagree
10.	Better to focus on school than have sex	Agree	Disagree
11.	Better to wait than to have sex when you are not ready	Agree	Disagree
12.	Better to have fun (sex) while you can (R)	Agree	Disagree
13.	Having sex is better than losing a relationship (R)	Agree	Disagree
14.	Having sex is worth risking pregnancy (R)	Agree	Disagree
15.	Known partners are safe partners (R)	Agree	Disagree

### Global Risk Question

Please choose the response that best represents your position about your current behaviour regarding sexual activity. Overall for YOU which of the following best describes the RISK of having sex (circle one):

Low                      Medium                      High

**Verbatim Scales**

**Specific Risk Scale**

Each item of this questionnaire is a statement that a person may either agree with or disagree with. For each item, please choose the response that best represents your position about the risks of sexual activity. Please respond to all the items; do not leave any blank. Choose only one response to each statement.

Please be as accurate and honest as you can be. Respond to each item as if it were the only item. That is, don't worry about being "consistent" in your responses. Choose from the following five response options: 0 = strongly disagree

1 = disagree

2 = neither

agree nor

disagree 3 =

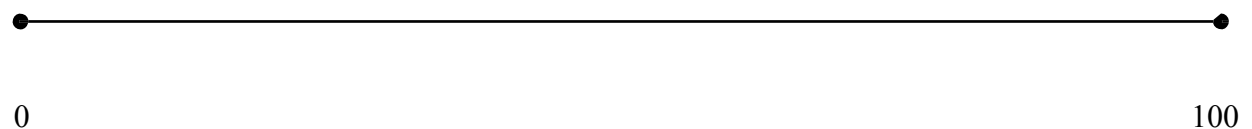
agree

4 = strongly agree

1. I am likely to get pregnant (or get someone pregnant) in the next 6 months	0	1	2	3	4
2. I am likely to have an STD in the next 5 years	0	1	2	3	4
3. I am likely to have an STD in the next 6 months	0	1	2	3	4
4. I am likely to have HIV-AIDS in the next 5 years	0	1	2	3	4
5. I am likely to have HIV-AIDS in the next 6 months	0	1	2	3	4

**Quantitative Risk Question (from 0 to 100)**

What are the chances that you have an STD? Please indicate by drawing a line where appropriate.



**Thank you message:**

Well done for completing the questionnaires so far.

**Thank you** very much for your hard work, we really appreciate your efforts in answering the questions so far.

If you feel like you need a break, please remember that you can save and continue the study later by closing this page and re-opening the study from the original link from which you accessed it. **It is important that you have access to the original link before closing the study, otherwise your progress may be lost.**

If you don't need a break, then please proceed to the next page for the **next questionnaire**.



**BIS-11 Simplified (Barratt Impulsivity Scale)**

People differ in the ways they act and think in different situations. This is a test to measure some of the ways in which you act and think. Read each statement and select the answer that is most appropriate for you. Do not spend too much time on any statement. Answer quickly and honestly.

Items will be scored using the following scale:

1= Rarely/Never      2=Occasionally      3=Often      4=Almost Always/Always

1. I act on impulse.
2. I act on the spur of the moment.
3. I do things without thinking.
4. I say things without thinking.
5. I buy things on impulse.
6. I plan for job security.
7. I plan for the future.
8. I save regularly.
9. I plan tasks carefully.
10. I am a careful thinker.
11. I am restless at lectures or talks.
12. I concentrate easily.
13. I don't pay attention.
14. I am easily bored solving thought problems.

**DOSPERT – Risk Taking Subscale**

For each of the following statements, please indicate the likelihood that you would engage in the described activity or behavior if you were to find yourself in that situation. Provide a rating from *Extremely Unlikely* to *Extremely Likely*, using the following scale:

1	2	3	4	5	6	7
Extremely Unlikely	Moderately Unlikely	Somewhat Unlikely	Not Sure	Somewhat Likely	Moderately Likely	Extremely Likely

1. Admitting that your tastes are different from those of a friend. (S)
2. Going camping in the wilderness. (R)
3. Betting a day's income at the horse races. (F)
4. Investing 10% of your annual income in a moderate growth mutual fund. (F)
5. Drinking heavily at a social function. (H/S)
6. Taking some questionable deductions on your income tax return. (E)
7. Disagreeing with an authority figure on a major issue. (S)
8. Betting a day's income at a high-stake poker game. (F)
9. Having an affair with a married man/woman. (E)
10. Passing off somebody else's work as your own. (E)
11. Going down a ski run that is beyond your ability. (R)
12. Investing 5% of your annual income in a very speculative stock. (F)
13. Going whitewater rafting at high water in the spring. (R)
14. Betting a day's income on the outcome of a sporting event (F)
15. Engaging in unprotected sex. (H/S)
16. Revealing a friend's secret to someone else. (E)
17. Driving a car without wearing a seat belt. (H/S)
18. Investing 10% of your annual income in a new business venture. (F)
19. Taking a skydiving class. (R)
20. Riding a motorcycle without a helmet. (H/S)
21. Choosing a career that you truly enjoy over a more secure one. **11** (S)
22. Speaking your mind about an unpopular issue in a meeting at work. (S)
23. Sunbathing without sunscreen. (H/S)
24. Bungee jumping off a tall bridge. (R)
25. Piloting a small plane. (R)
26. Walking home alone at night in an unsafe area of town. (H/S)
27. Moving to a city far away from your extended family. (S)
28. Starting a new career in your mid-thirties. (S)
29. Leaving your young children alone at home while running an errand. (E)
30. Not returning a wallet you found that contains \$200. (E)

Note. E = Ethical, F = Financial, H/S = Health/Safety, R = Recreational, and S = Social.

**DOSPERT – Risk Perception Subscale**

People often see some risk in situations that contain uncertainty about what the outcome or consequences will be and for which there is the possibility of negative consequences. However, riskiness is a very personal and intuitive notion, and we are interested in your gut level assessment of how risky each situation or behavior is. For each of the following statements, please indicate how risky you perceive each situation. Provide a rating from *Not at all Risky* to *Extremely Risky*, using the following scale:

1	2	3	4	5	6	7
Not at all Risky	Slightly Risky	Somewhat Risky	Moderately Risky	Risky	Very Risky	Extremely Risky

1. Admitting that your tastes are different from those of a friend. (S)
2. Going camping in the wilderness. (R)
3. Betting a day's income at the horse races. (F)
4. Investing 10% of your annual income in a moderate growth mutual fund. (F)
5. Drinking heavily at a social function. (H/S)
6. Taking some questionable deductions on your income tax return. (E)
7. Disagreeing with an authority figure on a major issue. (S)
8. Betting a day's income at a high-stake poker game. (F)
9. Having an affair with a married man/woman. (E)
10. Passing off somebody else's work as your own. (E)
11. Going down a ski run that is beyond your ability. (R)
12. Investing 5% of your annual income in a very speculative stock. (F)
13. Going whitewater rafting at high water in the spring. (R)
14. Betting a day's income on the outcome of a sporting event (F)
15. Engaging in unprotected sex. (H/S)
16. Revealing a friend's secret to someone else. (E)
17. Driving a car without wearing a seat belt. (H/S)
18. Investing 10% of your annual income in a new business venture. (F)
19. Taking a skydiving class. (R)
20. Riding a motorcycle without a helmet. (H/S)
21. Choosing a career that you truly enjoy over a more secure one. <sup>11</sup> (S)
22. Speaking your mind about an unpopular issue in a meeting at work. (S)
23. Sunbathing without sunscreen. (H/S)
24. Bungee jumping off a tall bridge. (R)
25. Piloting a small plane. (R)
26. Walking home alone at night in an unsafe area of town. (H/S)
27. Moving to a city far away from your extended family. (S)
28. Starting a new career in your mid-thirties. (S)
29. Leaving your young children alone at home while running an errand. (E)
30. Not returning a wallet you found that contains \$200. (E)

Note. E = Ethical, F = Financial, H/S = Health/Safety, R = Recreational, and S = Social.

**Thank you message:**

Well done for completing the study so far and thank  
you for your hard work.

The next questionnaire will be the LAST questionnaire of the study. We really  
appreciate your efforts in completing the questionnaires so far.

Please continue to the next page.

**BIS/BAS**

Each item of this questionnaire is a statement that a person may either agree with or disagree with. For each item, indicate how much you agree or disagree with what the item says. Please respond to all the items; do not leave any blank. Choose only one response to each statement. Please be as accurate and honest as you can be. Respond to each item as if it were the only item. That is, don't worry about being "consistent" in your responses. Choose from the following four response options:

1 = very true for me    2 = somewhat true for me    3 = somewhat false for me    4 = very false for me

1	A person's family is the most important thing in life.	1	2	3	4
2	Even if something bad is about to happen to me, I rarely experience fear or	1	2	3	4
3	I go out of my way to get things I want.	1	2	3	4
4	When I'm doing well at something I love to keep at it.	1	2	3	4
5	I'm always willing to try something new if I think it will be fun.	1	2	3	4
6	How I dress is important to me.	1	2	3	4
7	When I get something I want, I feel excited and energized.	1	2	3	4
8	Criticism or scolding hurts me quite a bit.	1	2	3	4
9	When I want something I usually go all-out to get it.	1	2	3	4
10	I will often do things for no other reason than that they might be fun.	1	2	3	4
11	It's hard for me to find the time to do things such as get a haircut.	1	2	3	4
12	If I see a chance to get something I want I move on it right away.	1	2	3	4
13	I feel pretty worried or upset when I think or know somebody is angry at	1	2	3	4
14	When I see an opportunity for something I like I get excited right away.	1	2	3	4
15	I often act on the spur of the moment.	1	2	3	4
16	If I think something unpleasant is going to happen I usually get pretty "worked up."	1	2	3	4
17	I often wonder why people act the way they do.	1	2	3	4
18	When good things happen to me, it affects me strongly.	1	2	3	4

19	I feel worried when I think I have done poorly at something important.	1	2	3	4
20	I crave excitement and new sensations.	1	2	3	4
21	When I go after something I use a "no holds barred" approach.	1	2	3	4
22	I have very few fears compared to my friends.	1	2	3	4
23	It would excite me to win a contest.	1	2	3	4
24	I worry about making mistakes.	1	2	3	4

Thank you for completing the study.

If you would like to leave some feedback about your experience of completing this study you can do so by using the box below.

Please note that, although your feedback is valued and will be taken into account, we are unable to respond to any comments directly. This is to protect participants' anonymity throughout the research project.

**Please remember to click the 'next' button at the bottom of this screen to record your responses otherwise your progress will be lost.**

You have now completed the study.

**Thank you very much for your participation.**

If you have any questions about the study, please contact the main researcher:

Anna Chiara Sicilia [a.sicilia@lancaster.ac.uk](mailto:a.sicilia@lancaster.ac.uk) Room C34, Furness Building Lancaster  
University Lancaster

LA1 4YG

### **Resources in the event of distress**

We are not expecting this study to cause you any distress. However, if you do experience distress following your participation in the study, we advise you to contact your GP and/or your care team, who can offer guidance and advice to best manage this.

Here are also some useful resources you can access in case of distress:

## **Mind UK**

You can contact Mind UK via email, phone, post or by visiting your local branch.

**Email:** [supporterservices@mind.org.uk](mailto:supporterservices@mind.org.uk)

**Telephone:** 020 8519 2122

**Fax:** 020 8522 1725

**Address:**

15-19 Broadway

Stratford

London

E15 4BQ

Find **your local branch** at the following link: <http://www.mind.org.uk/information-support/local-minds/>

## **Complaints**

If you wish to make a complaint or raise concerns about any aspect of this study and do not want to speak to the researcher, you can contact:

Dr Bill Sellwood (Research Director, Doctorate in Clinical Psychology, Lancaster University) [b.sellwood@lancaster.ac.uk](mailto:b.sellwood@lancaster.ac.uk) +441524593998

Division of Health Research Furness Building

Lancaster University Lancaster

LA1 4YG

If you wish to speak to someone outside of the Clinical Psychology Doctorate Programme, you may also contact:

Professor Roger Pickup Tel: +44 (0)1524 593746

Associate Dean for Research

Email: [r.pickup@lancaster.ac.uk](mailto:r.pickup@lancaster.ac.uk)

Faculty of Health and Medicine

Division of Biomedical and  
Life Sciences Lancaster  
University

Lancaster

LA1 4YG

**Thank you for taking the time to read this information sheet.**

**Appendix B: Email to charity/support/advocacy group:**

To whom it may concern,

Could you please circulate the following email to members of your support and/or advocacy groups? Please don't hesitate to contact me would you require further information,

Best Wishes

Anna Chiara Sicilia

Dear participant,

I am a trainee clinical psychology on the Doctorate in Clinical Psychology at Lancaster University. I am contacting you as I am currently recruiting participants for a study aiming at **exploring the links between the way in which people diagnosed with bipolar disorder make sense of their daily experiences and make decisions and their likelihood to take risks in their everyday life.**

The study will involve **eight (8) brief questionnaires** focused around people's perception of risk and risk taking, impulsivity and their current mood state. As you will see, some of the questionnaires ask about risks related to sexual activity; BUT the aim of the study is not to find out about your sexual life. Risk associated with sexual life is just one example of many candidate risk behaviours. We are only interested in your **attitudes and thinking** around "the risks" associated with engaging in sexual activity.

Please note that it is possible to pause and save at any time during the study, therefore if you feel like you need a break, you will be able to continue the study at a later time.

If you would like to participate, please click on the link below:

[https://lancasteruni.eu.qualtrics.com/jfe/form/SV\\_b7tap9F1Mvq5mFn](https://lancasteruni.eu.qualtrics.com/jfe/form/SV_b7tap9F1Mvq5mFn)

Thank you very much for your collaboration,

**Anna Chiara Sicilia**  
Trainee Clinical  
Psychologist Lancaster  
University





### **Appendix C: Approval Letter from Lancaster University Ethics Committee**

Applicant: Anna Sicilia  
Supervisor: Guillermo Perez  
Algora Department: Health  
Research FHMREC Reference:  
FHMREC15136

15 August 2016

Dear Anna,

**Re: Decision making and risk in people diagnosed with bipolar disorder.**

Thank you for submitting your research ethics amendment application for the above project for review by the **Faculty of Health and Medicine Research Ethics Committee (FHMREC)**. The application was recommended for approval by FHMREC, and on behalf of the Chair of the Committee, I can confirm that approval has been granted for this research project.

As principal investigator your responsibilities include:

- ensuring that (where applicable) all the necessary legal and regulatory requirements in order to conduct the research are met, and the necessary licenses and approvals have been obtained;
- reporting any ethics-related issues that occur during the course of the research or arising from the research to the Research Ethics Officer at the email address below (e.g. unforeseen ethical issues, complaints about the conduct of the research, adverse reactions such as extreme distress);
- submitting details of proposed substantive amendments to the protocol to the Research Ethics Officer for approval.

Please contact me if you have any queries or require further

information. Tel:- 01542 592838

Email:- [fhmresearchsupport@lancaster.ac.uk](mailto:fhmresearchsupport@lancaster.ac.uk)

Yours sincerely,



Dr Diane Hopkins  
Research Integrity and Governance Officer, Secretary to FHMREC.

