Published in final edited form as:

Int J Cogn Ther. 2011 June ; 4(2): 187–196. doi:10.1521/ijct.2011.4.2.187.

Measuring Intrusive Prospective Imagery using the Impact of Future Events Scale (IFES): Psychometric properties and relation to risk for Bipolar Disorder

Catherine Deeptrose, Aiysha Malik, and Emily A. Holmes

Department of Psychiatry, University of Oxford, UK.

Abstract

We define intrusive prospective imagery as the experience of mental imagery of events that may happen in the future and which come to mind involuntarily. This everyday phenomenon may be exacerbated in psychological disorders such as bipolar disorder (Holmes, Geddes, Colom, & Goodwin, 2008) although specific measures to assess this have been lacking. We recently developed the Impact of Future Events Scale (IFES; Deeptrose & Holmes, 2010), which is further examined in the current paper. In Study 1, adults volunteers (N=50) completed the IFES on two occasions, with 1-week between measurements. This revealed acceptable test-retest reliability. In Study 2, (N=90) IFES showed good internal consistency and confirmed two predictions. First, in the total sample risk for bipolar disorder (MDQ; Hirschfeld et al., 2000) and IFES Total Score correlated positively. Second, when the sample was split into high (MDQ ≥ 7) and low (MDQ < 6) bipolarity risk groups, higher IFES Total Scores were observed in the high risk group. We conclude that 1) IFES presents a useful measure for assessing intrusive prospective imagery with acceptable test-retest reliability and good internal consistency and 2) risk for bipolar disorder is associated with elevated IFES Total Scores with potentially important clinical implications.

Keywords

Mental imagery; intrusion; prospective cognition; Impact of Future Events Scale; IFES; bipolar disorder

Research in the last few years has emphasised the role of mental imagery across psychological disorders; see Holmes and Hackmann (2004) and Holmes, Arntz and Smucker (2007). Experimental psychopathology research has shown that imagery has a stronger impact on emotion than does verbal processing (Holmes, Coughtrey, & Connor, 2008; Holmes, Lang, & Shah, 2009; Holmes & Mathews, 2005; Holmes, Mathews, Dalgleish, & Mackintosh, 2006). This body of research has culminated in a model of the role of mental imagery in emotional disorders (Holmes & Mathews, 2010). In psychopathology, the literature has focused on intrusions of the past rather than the future, such as trauma memory flashbacks in PTSD (e.g. Ehlers, Hackmann, & Michael, 2004; Grey & Holmes, 2008; Hellawell & Brewin, 2004; Krans, Naring, Becker, & Holmes, 2009) and intrusive memories in depression (e.g. Kuyken & Brewin, 1994; Moulds, Kandris, Williams, & Lang, 2008). There is an increasing interest in future, prospective cognition (Schacter, Addis, & Buckner, 2008). Whereas memories can be “re-experienced”, imagined events in the future can be “pre-experienced” (Schacter, Addis and Buckner, 2007).

Clinical experience shows that just as past memories can intrude to mind unbidden, future events can also intrude in an involuntary, and at times, distressing way. One example is “flashforwards” to suicide (Holmes, Crane, Fennell, & Williams, 2007). Such flashforward imagery may occur more widely in anxiety (Engelhard, van den Hout, Janssen, & van der Beek, In press; Eysenck, Payne, & Santos, 2004) and other conditions. We have defined intrusive prospective imagery in psychopathology as “the experience of involuntary, distressing mental images of events in the future that come to mind unbidden” (Deepröse & Holmes, 2010).

The Impact of Future Events Scale

Until recently, scales to measure intrusive prospective imagery appear to have been lacking. We therefore developed the Impact of Future Events Scale (IFES; Deepröse & Holmes, 2010) based on a measure of post-trauma symptomatology, the Impact of Events Scale (IES; Horowitz, Wilner, & Alvarez, 1979; Weiss & Marmar, 1997). In the one study to date on this measure (Deepröse & Holmes, 2010), participants completed the IFES and measures of depression, anxiety and tendency to use mental imagery. As predicted, the IFES Total Score was positively correlated with depression. Compared to a non-dysphoric group, a mild-dysphoric group had significantly higher IFES Total Scores. It was concluded that the IFES provided a measure of the impact of “pre-experiencing” in the form of intrusive prospective, personally-relevant imagery, with sensitivity to group differences on the basis of depression scores. However, we also concluded that further investigation was required to explore the psychometric properties of the IFES. In addition, we wanted to extend the utility of IFES to disorders beyond depression, and in particular to bipolar disorder. The investigation of intrusive prospective imagery in the context of bipolar disorder is pertinent given the predicted contribution of such imagery towards the mood fluctuations which characterise the disorder (Holmes, Geddes, Colom & Goodwin, 2008). Second, prospective imagery regarding suicide - suicidal “flashforwards” - has been associated with the severity of suicidal ideation in a depressed sample (Holmes, Crane, Fennell & Williams, 2007). Given that bipolar disorder is associated with the highest suicide rate of all psychiatric conditions (Hawton, Sutton et al., 2005), we predict that such prospective imagery is of particular relevance in bipolar disorder. Importantly, the model of the role of mental imagery in bipolar disorder (Holmes, Geddes et al., 2008) suggests that not only suicidal imagery, but prospective “flashforwards” to a variety of topics will be prevalent in bipolar disorder.

Summary and Present Research

We had two main aims in conducting this research. First, we explored the psychometric properties of the IFES with respect to test-retest reliability (Study 1) and to internal consistency (Study 2). Second, we tested two key predictions relating to IFES Total Score and risk for bipolar disorder (Study 2). Our hypotheses were: 1) IFES Total score would significantly correlate with risk for bipolarity (MDQ score) in the overall sample and this would remain significant when controlling for current depression symptoms (BDI-II), trait anxiety (STAI-T) and general imagery use (SUIS); and 2) Significantly higher IFES Total scores would be observed in the High-risk bipolar group compared to the Low-risk bipolar group using clinically established cut-offs for risk for bipolarity (Calabrese et al., 2006).

Study 1

Method

Participants and Procedures—Participants were 50 adults who participated in this two-session study, separated by an interval of 1-week, at the University of Oxford. The Impact of Future Events Scale was completed by participants on both sessions. Participants were

recruited from advertisements placed online and in the local community. Informed consent was obtained prior to completion of the pen and paper questionnaire measures. Participants were tested individually, with the experimenter present in a quiet testing laboratory and received a small sum as reimbursement. Participants were 40% female and aged between 18 – 58 years (Mean = 27.24, SD = 9.60). Of these, 46% were full-time students.

Measures

Intrusive prospective imagery: We measured the impact of intrusive prospective, personally-relevant imagery using the Impact of Future Events Scale (IFES; Deepröse & Holmes, 2010). To encourage participants to respond on IFES in relation to idiosyncratic future events, participants were firstly asked “Please identify three future events which you have been thinking about by imagining over the past seven days (e.g. positive or stressful life events). For each event, please indicate whether your imagining of it was positive or negative”. Participants then responded to 24-items aiming to assess intrusive pre-experiencing, avoidance and hyper-arousal with the instructions “*Below is a list of comments made by people about imagining events in the future. Please read each item, indicating how frequently each comment was true for you during the past 7 days due to imagining the future*”. Items included “Pictures about the future popped into my mind” (intrusive pre-experiencing), “I tried not to think about the future” (avoidance) and “I had waves of strong feelings about the future” (hyperarousal). Each item was anchored on a 5-point scale.

In scoring the IFES, the primary variable is IFES Total Score which is the summation of responses to the 24-items. The secondary variable is the number of negative events per individual, which is summed to create “IFES Negative Events” i.e. the total number of events rated by the participant as negative. The total number of events provided by each participant is three.

Results

Participants readily identified three individual intruding future events on the IFES. Inspection of the content of individual events confirmed that participants consistently reported credible future events rather than overtly past events. Table 1 shows that the three events reported were predominantly positive rather than negative with participants typically reporting one negative event compared to two positive events. Examples rated as positive by participants included “performing at the local theatre festival” and “teaching English on an upcoming trip to Taiwan”. An example of a negative event was “going back to university”.

Test-retest reliability of IFES—The data revealed two multivariate outliers ($> 2 SD$) and these were removed from subsequent analyses (Tabachnick & Fidell, 1996). Using Pearson’s correlation, the results indicated a test-retest reliability for the IFES Total Score of $r = .73, p < .001, n = 48^1$. A chi squared test indicated no significant difference in IFES Negative Events (i.e. the total number of the three events rated by the participant as negative) at the two time points, $\chi^2(9, N = 48) = 6.89, p = .65$.

Discussion

Using a sample of healthy volunteers who completed the IFES twice at a 1-week interval, Study 1 shows that the IFES Total Score has acceptable test-retest reliability based on the established psychometric criteria of $r = 0.8$ or greater being good and $r = 0.7$ or greater being acceptable (see Barker, Pistrang, & Elliot, 1996; Kraemer, 1981; Nunnally, 1978). The test-

¹When the outliers were included in the analyses, similar results emerged, $r = .62, p < .001, N = 50$.

retest reliability of IFES Total Score may be compared to other measures that assess clinically-relevant phenomena. The state scale of the State-Trait Anxiety Inventory has a test-retest reliability ranging from $r = 0.16$ to 0.6 , whereas the trait scale has a test-retest reliability ranging from $r = 0.68$ to 0.86 (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). The BDI, which is anchored to depressive symptoms over the past 2-weeks, has a test-retest reliability of $r = 0.93$ (Beck, Steer, & Brown, 1996). Thus IFES provides test-retest reliability comparable to the higher reliability coefficients observed for the state scale of the State-Trait Anxiety Inventory, and as expected, lower than the more stable trait scale of the State-Trait Anxiety Inventory and the BDI.

Assessment of the reliability of a given measure often also includes investigation of internal consistency. Therefore, we conducted a second study which sought to examine the internal consistency of the IFES in a larger sample as well as to explore the IFES in relation to key predictions regarding risk for bipolarity.

Study 2

Method

Participants and Procedures—Participants were 90 adults who participated in this single-session study at the University of Oxford. Participants were recruited as in Study 1. Informed consent was obtained prior to completion of the pen and paper questionnaire measures. Participants were tested individually and with the experimenter present in a quiet testing laboratory. All participants received a small sum as reimbursement. Participants were 53% female, aged between 18 – 59 years ($M = 23.5$, $SD = 8.04$) and 80% of participants were full-time students.

Measures—*Intrusive prospective imagery* was assessed using IFES (Deepröse & Holmes, 2010) as in Study 1

Risk for Bipolar Disorder: We measured risk for bipolar disorder using the Mood Disorder Questionnaire (MDQ; Hirschfeld et al., 2000). Participants responded to three groups of questions: (1) 13 questions indexing lifetime manic and hypomanic symptoms (2) one question regarding co-occurrence of symptoms i.e. symptoms which occur at the same time and (3) 1 question regarding symptom severity. Scores to the 15 questions were summed. The current study employed a cut-off of 7 or greater endorsed items out of all 15 items (Calabrese et al., 2006). Participants scoring 7 and above were classed as high risk to bipolar disorder, and those scoring 6 and below were classed as low risk (Calabrese et al., 2006). The MDQ has a sensitivity of 0.87 and a specificity of 0.61 in a patient sample, and a sensitivity of 0.57 and a specificity of 0.82 in a general population (Hirschfeld et al., 2003). The MDQ is cited in the NICE guidelines as a questionnaire for assessing bipolar disorder in secondary care (National Institute for Health and Clinical Excellence, 2006, no.38, p.15). Internal consistency for the MDQ is good, with Cronbach's alpha coefficient = 0.84 (Hirschfeld et al., 2003). The MDQ is established as a predictor of bipolar risk (Calabrese et al., 2006).

Current Depression Symptoms: Current symptoms of depression were assessed using the Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996). Participants responded to 21 depression-related questions with respect to how they had been feeling during the past two weeks. The BDI-II has good 1-week test-retest reliability, $r = 0.93$ (Beck, Steer, & Brown, 1996) and good internal consistency with an alpha level of 0.90 (Beck, Steer, Ball, & Ranieri, 1996).

Trait Anxiety: The State-trait anxiety inventory – Trait version (STAI; Spielberger et al., 1983) was used to measure trait anxiety. STAI-T consists of 20 anxiety-related items on which participants rated how they “generally feel” on a 4-point scale anchored from “almost never” to “always”. The STAI-T has acceptable test-retest reliability (ranging from $r = 0.73 - 0.86$) and good internal consistency which an alpha level above 0.90 (Spielberger et al., 1983).

Trait Imagery Use: General imagery use was assessed using the Spontaneous Use of Imagery Scale (SUIS; Reisberg, Pearson, & Kosslyn, 2003). The SUIS is a 12-item measure in which participants rated their use of imagery in day to day situations, for example, “When I think about visiting a relative, I almost always have a clear mental picture of him or her”. Responses were made on a 5-point scale, anchored from “never appropriate” to “always appropriate”. A significant positive relationship between scores on the SUIS and the Vividness of Visual Imagery Questionnaire (VVIQ; Marks, 1973) has been demonstrated (Reisberg et al., 2003), suggesting they measure a related construct.

Results

Inspection of the individual events on the IFES confirmed participants reported credible future events. The three events reported were predominantly positive rather than negative. Participants typically reported one negative event and two positive events (mean IFES Negative Events for the total sample = 0.84, $SD = 0.73$). This is consistent with Study 1 reported here and previous research (Deepröse & Holmes, 2010). Examples rated as positive by participants included “my flatmate’s birthday party next weekend” and “spending Christmas eve with my family”. In contrast, an example of a negative event provided was “my exams starting next week”.

Internal consistency of IFES—The first aim was to investigate internal consistency of the IFES Total Score in this population. Cronbach’s alpha = 0.87, indicating good internal consistency (Barker et al., 1996; Kraemer, 1981; Nunnally, 1978), and suggesting that the items measure the same construct i.e. intrusive prospective imagery.

IFES and risk for Bipolar Disorder—As predicted by Hypothesis 1, IFES Total Score significantly and positively correlated with MDQ score, $r(88) = .48$, $p < .001$, in the overall sample. Partial correlations confirmed that the correlation between IFES Total Score and MDQ score remained significant when controlling for current depression, $r(87) = .37$, $p < .001$, trait anxiety, $r(87) = .43$, $p < .001$ and general imagery use, $r(87) = .48$, $p < .001$.

Participants were divided into two groups for risk for bipolar disorder as described above. In the Low-risk Bipolar group ($n = 40$), the participants were 63% female and aged between 18 – 59 years ($M = 24.7$, $SD = 9.9$). In the High-risk Bipolar group ($n = 50$), the participants were 46% female and aged between 18 and 47 years ($M = 22.6$, $SD = 6.1$). Independent samples t-tests did not reveal any difference between the bipolarity groups in terms of age or trait imagery use (SUIS) ($t < 0.5$). Chi-square analysis did not reveal any difference between groups in terms of gender, $\chi^2(1, N = 90) = 2.43$, $p = .12$. However, as expected, significantly higher scores for current depression symptoms (BDI-II) and trait anxiety (STAI-T) were observed in the high-risk group. Characteristics of the Low-risk and High-risk Bipolar groups are shown in Table 2.

As predicted by Hypothesis 2, comparison between the groups confirmed there were significantly higher IFES Total Scores in the High-risk than Low-risk Bipolar group with a large effect size, $t(88) = 3.96$, $p < .001$, $d = .78$ (see Table 3). There was no difference

between the Low and High-risk bipolarity groups in terms of IFES Negative Events, $\chi^2(3, N = 90) = 4.30, p = .23$.

Discussion

Consideration of key results—First, the IFES Total Score demonstrated adequate test-retest reliability and good internal consistency. These levels are similar to the equivalent psychometric properties reported for the IES-R (Sundin & Horowitz, 2002), from which the IFES was adapted in order to assess symptomatic response to prospective rather than previous events (Deepröse & Holmes, 2010). IFES is also comparable to other commonly used clinical measures, with a test-retest reliability similar to that seen for the State-Trait Anxiety Inventory (Spielberger et al., 1983) and an internal consistency comparable to the Beck Depression Inventory (BDI-II; Beck & Steer, 1993) as reported in Method Section. The IFES thus offers a reliable scale with which to investigate prospective, intrusive imagery.

Second, the IFES Total Score was investigated in relation to differing levels of bipolarity in the current study. As predicted, risk for bipolar disorder was associated with increased intrusive prospective imagery i.e. IFES Total Score. Meanwhile, there was no difference in general imagery use (assessed using the SUIIS) between the Low and High-risk bipolarity groups, suggesting the IFES is not simply tapping into a general tendency to use imagery in everyday life but distinct, potentially clinically-relevant phenomena. We have previously demonstrated that IFES Total Score is sensitive to group differences on another measure of psychopathology, namely, current depression symptomatology (Deepröse & Holmes, 2010). This is the first study to support predictions regarding prospective imagery and bipolarity, supporting the recent cognitive model in which imagery has been described as an emotional amplifier in bipolar disorder (Holmes, Geddes et al., 2008). In particular, this model suggests that bipolarity may be associated with an excess of imagining the future. Imaging appetitive future acts (e.g. shopping for desired objects) may both fuel related emotions and likelihood of engaging in the specific behaviour. Future work should seek to replicate findings in at-risk sample as well as extend findings to a clinical sample, and in particular, explore the potential relationship between the content and valence of the three future events provided by each participant on IFES and current mood state in bipolar disorder. We predict that investigation of current manic symptomatology and IFES would be particularly interesting in this regard.

Directions for future research—Further research, including factor analysis on a large sample of respondents to confirm individual subscales, is required to elucidate the psychometric properties of IFES. Given the good but not overwhelming correlations between IFES Total Score and risk for bipolarity as reported here, and between IFES Total Score and depression scores (Deepröse & Holmes, 2010), we believe IFES measures related but distinct phenomena although further research is required to specifically address divergent validity. Relatedly, convergent validity could usefully be explored in relation to alternative measures of involuntary prospective cognition, such as the diary methodology as used by Berntsen and Jacobsen (2008).

Intrusive images of *past* negative events have been studied in the laboratory using the trauma film paradigm (Holmes & Bourne, 2008) – a subject of the current special edition. A critical issue for experimental psychopathology research will be to develop laboratory paradigms to modulate intrusive prospective imagery. A recent study has shown that even verbal narrations of traumatic events can generate intrusive images (Krans, Naring, Holmes, & Becker, 2009) similar to those generated by a stressful film. It is possible that verbal narrations, specifically designed to elucidate “flashforwards” to *future* events may provide a

useful tool to generate, and thus experimentally manipulate, intrusive prospective imagery in the laboratory.

There are many other exciting studies of intrusive cognition, hitherto largely focussing on past memories. For example, the elegant experiments by Ehling and colleagues exploring the effects of abstract versus concrete thinking on modulating analogue intrusive memories (Ehling, Fuchs, & Klasener, 2009; Ehling, Szeimies, & Schaffrick, 2009) may be extended to encompass manipulation of involuntary prospective intrusions. We also predict that the critical investigations of cognitive load and thought suppression, as explored by Nixon and colleagues (Nixon, Cain, Nehmy, & Seymour, 2009; Nixon, Nehmy, & Seymour, 2007) may also provide a fruitful experimental methodology for further understanding involuntary prospective imagery and importantly, how this may be modulated.

Our specific interest in intrusive imagery stems from clinical observation that imagery may play an important role across psychological disorders (Holmes & Mathews, 2010). Targeting intrusive imagery of past events has provided a critical treatment target in PTSD (Ehlers & Clark, 2000). Likewise, addressing intrusive imagery of current events is key to cognitive behaviour therapy for social phobia (Clark et al., 2006). If intrusive *prospective* imagery is shown to be a particular feature in disorders such as bipolar disorder, then with further examination this might also provide a useful target for cognitive-based treatment development.

Acknowledgments

Emily Holmes is supported by the Wellcome Trust. Aiysha Malik is supported by a Medical Research Council PhD Studentship.

We would like to thank Emma Kilford and Katie Grimwood for assistance in data collection and Guy Goodwin for thoughtful discussion.

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Table 1
Study 1 IFES Scores at Two Separate Timepoints – Means and Standard Deviations

	Time 1 (<i>n</i> = 48)	Time 2 (<i>n</i> = 48)
IFES Total Score	22.67 (13.30)	21.56 (13.64)
IFES Negative Events	1.06 (.88)	0.87 (.80)

Note: IFES = Impact of Future Events Scale; IFES Negative Events = the total number of events rated by the participant as negative; the total number of future events provided each timepoint was three. Time 2 is 6 days after Time 1.

Table 2
Study 2 Participant Demographics – Means and Standard Deviations for both Low and High-risk Bipolar Groups

	Low-risk (<i>n</i> = 40)		High-risk (<i>n</i> = 50)	
	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)
MDQ	3.20	(2.32)	10.35**	(2.59)
BDI-II	4.53	(5.83)	8.48**	(5.24)
STAI	34.18	(9.63)	39.68*	(8.78)
SUIS	39.43	(7.39)	38.72	(8.36)

Note: MDQ = Mood Disorder Questionnaire; BDI-II = Beck Depression Inventory; STAI = State Trait Anxiety Inventory – Trait; SUIS = Spontaneous Use of Imagery Scale

*
 $p < .01$.

**
 $P = .001$.

Table 3
Study 2 IFES Scores – Means and Standard Deviations for both Low and High-risk Bipolar Groups

	Low-risk (<i>n</i> = 40)		High-risk (<i>n</i> = 50)	
	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)
IFES				
Total Score	21.85	(10.56)	31.86**	(13.12)
IFES				
Negative Events	0.68	(0.69)	0.98	(0.75)

Note: IFES = Impact of Future Events Scale. IFES Negative Events = the total number of events rated by the participant as negative; the total number of future events provided was three.

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P .001.