

Research article

Open Access

The Bipolar Affective Disorder Dimension Scale (BADDs) – a dimensional scale for rating lifetime psychopathology in Bipolar spectrum disorders

Nick Craddock*^{1,2}, Ian Jones^{1,2}, George Kirov¹ and Lisa Jones^{1,2}

Address: ¹Department of Psychological Medicine, University of Wales College of Medicine, Heath Park, Cardiff CF14 4XN, UK and ²Department of Psychiatry, University of Birmingham, Queen Elizabeth Psychiatric Hospital, Edgbaston, Birmingham B15 2QZ, UK

Email: Nick Craddock* - craddockn@cardiff.ac.uk; Ian Jones - JonesIR1@cardiff.ac.uk; George Kirov - kirov@cardiff.ac.uk; Lisa Jones - l.a.jones@bham.ac.uk

* Corresponding author

Published: 05 July 2004

Received: 23 September 2003

BMC Psychiatry 2004, 4:19 doi:10.1186/1471-244X-4-19

Accepted: 05 July 2004

This article is available from: <http://www.biomedcentral.com/1471-244X/4/19>

© 2004 Craddock et al; licensee BioMed Central Ltd. This is an Open Access article: verbatim copying and redistribution of this article are permitted in all media for any purpose, provided this notice is preserved along with the article's original URL.

Abstract

Background: Current operational diagnostic systems have substantial limitations for lifetime diagnostic classification of bipolar spectrum disorders. Issues include: (1) It is difficult to operationalize the integration of diverse episodes of psychopathology, (2) Hierarchies lead to loss of information, (3) Boundaries between diagnostic categories are often arbitrary, (4) Boundaries between categories usually require a major element of subjective interpretation, (5) Available diagnostic categories are relatively unhelpful in distinguishing severity, (6) "Not Otherwise Specified (NOS)" categories are highly heterogeneous, (7) Subclinical cases are not accommodated usefully within the current diagnostic categories. This latter limitation is particularly pertinent in the context of the increasing evidence for the existence of a broader bipolar spectrum than has been acknowledged within existing classifications.

Method: We have developed a numerical rating system, the Bipolar Affective Disorder Dimension Scale, BADDs, that can be used as an adjunct to conventional best-estimate lifetime diagnostic procedures. The scale definitions were informed by (a) the current concepts of mood syndrome recognized within DSMIV and ICD10, (b) the literature regarding severity of episodes, and (c) our own clinical experience. We undertook an iterative process in which we initially agreed scale definitions, piloted their use on sets of cases and made modifications to improve utility and reliability.

Results: BADDs has four dimensions, each rated as an integer on a 0 – 100 scale, that measure four key domains of lifetime psychopathology: Mania (M), Depression (D), Psychosis (P) and Incongruence (I). In our experience it is easy to learn, straightforward to use, has excellent inter-rater reliability and retains the key information required to make diagnoses according to DSMIV and ICD10.

Conclusions: Use of BADDs as an adjunct to conventional categorical diagnosis provides a richer description of lifetime psychopathology that (a) can accommodate sub-clinical features, (b) discriminate between illness severity amongst individuals within a single conventional diagnostic category, and (c) demonstrate the similarity between the illness experience of individuals who have been classified into different disease categories but whose illnesses both fall near the boundaries between the two categories. BADDs may be useful for researchers and clinicians who are interested in description and classification of lifetime psychopathology of individuals with disorders lying on the bipolar spectrum.

Background

During the course of our family-genetic studies of Bipolar Disorder we became aware of the need for a relatively simple dimensional rating scheme that can be used to provide summary measures of several key areas of lifetime psychopathology relevant to characterization of individuals with Bipolar spectrum illness.

The operational diagnostic systems, such as RDC [1], DSMIV [2] and ICD10 [3], that have been developed over the last 30 years are widely used by clinicians and researchers and have been an important methodological advance over earlier, non-structured approaches [4]. Although open to a variety of criticisms and unlikely to map directly onto the pathophysiology of the disorders, the operational approach is relatively simple, provides acceptable levels of reliability and is useful for communication and decision making regarding management, research and service provision. In most cases the categories defined are informed by a broad range of research data and are revised at regular intervals to take account of new findings and concepts as they emerge.

However, for clinicians and researchers, such as ourselves, interested in disorders lying within the Bipolar spectrum there are several problems in using the current systems for lifetime diagnosis. These include:

1) *It is difficult to operationalize the integration of diverse episodes of psychopathology* – The operational systems perform best for categorizing a discrete, well-delineated single episode of psychopathology – for example, there are clear-cut criteria to define episodes of mania and major depression. However, a lifetime diagnosis requires integration of the lifetime experience of psychopathology and the criteria used are much less easy to operationalize, typically requiring judgements about the balance between different types of episode [4].

2) *Hierarchies lead to loss of information* – The existence of explicit, or implicit, hierarchies creates the situation in

which certain symptoms "trump" others. For example, an individual can have a diagnosis of DSMIV Schizophrenia despite having had more episodes of mania during his or her lifetime than another individual with a diagnosis of Bipolar I Disorder. For those interested in Bipolarity, this results in a serious loss of important information.

3) *Boundaries between diagnostic categories are often arbitrary* – Although there is usually a plausible evidence base and/or conceptual basis to support the separation into distinct diagnostic categories, the criteria used to define the boundaries between categories is almost always arbitrary. For example, the level of impairment defines the boundary between Bipolar I and II Disorders – it is most implausible that any specific level of impairment could neatly carve the boundary between distinct disorders. Similarly, in DSMIV the boundary between Bipolar I Disorder and Schizoaffective Disorder, Bipolar Type is defined by the precise timing of occurrence of psychotic symptoms outside of an affective episode. Table 1 lists some key diagnostic boundaries relating to bipolar spectrum disorders and the criteria used in making diagnostic decisions at these boundaries.

4) *Boundaries between categories usually require a major element of subjective interpretation* – Most of the key boundaries for diagnoses within the Bipolar spectrum require judgements about severity and/or the balance of symptomatology. This substantial subjective element reduces reliability and, as commonsense suggests and everyone who has ever participated in formal reliability exercises knows, cases lying near diagnostic boundaries contribute most of the diagnostic disagreements.

5) *Available diagnostic categories are relatively unhelpful in distinguishing severity* – No distinction is made between an individual that just meets the threshold for a specific category and another individual that has had multiple severe episodes.

Table 1: Some key boundaries in Bipolar Spectrum Disorders. The table lists some of the important diagnostic boundaries in bipolar spectrum disorders and the criteria used in making diagnostic decisions at these boundaries.

Boundary	Criteria on which decision based
Major Depression (with Sub-clinical hypomanias) v. Bipolar II Disorder	Number and duration of hypomanic-like symptoms
Bipolar I v. Bipolar II Disorder	Impairment and duration
Bipolar I v. Schizoaffective Disorder, Bipolar Type	Occurrence and timing of psychotic symptoms
Schizophrenia v. Schizoaffective Disorder, Bipolar Type	Balance of psychotic and affective symptoms

6) *Subclinical cases are not accommodated usefully within the current diagnostic categories* – An individual who has a DSMIV Diagnosis of Major Depressive Disorder may have experienced multiple mild sub-hypomanic episodes. Indeed, it is being increasingly recognized that the bipolar spectrum extends well beyond the traditional Bipolar I and II categories and includes many individuals with formal diagnoses of unipolar major depression under current operational systems [5,6]. For those interested in bipolarity this is wasteful of information.

7) *"Not Otherwise Specified (NOS)" categories are highly heterogeneous* – Because of the need for a catch-all category that can accommodate the set of cases not fitting the other operational criteria, the NOS categories in operational systems may include a wide range of types of case ranging between the mild and the severe. Thus, such categories provide little information about the lifetime psychopathology of individuals having the diagnosis.

Dimensional classifications offer an alternative to the conventional categorical approach and have the potential to address many of the issues listed above [7]. Dimensional classifications are not a new idea but have not in the past been widely adopted by either the clinical or research community. Some of the disadvantages, which have impeded widespread use in clinical and research settings in psychiatry, stem from their relative complexity – leading to difficulty in use and interpretation in areas such as communication and decisions regarding management and services.

No suitable dimensional instrument was already available for us to use within our own research on bipolar spectrum disorders. During the course of our ongoing family-based clinical research projects that involved assessment and classification of the lifetime experience of psychopathology of Bipolar probands and their relatives we, therefore, developed and piloted a simple dimensional rating scheme that was informed by the beneficial aspects of current operational categorical systems but addressed several of the limitations inherent in the use of discrete categories and provides a richer description of each individual's lifetime experience of psychopathology. We describe the development, structure and characteristics of this system within the current paper.

Methods

In developing a dimensional scheme our aim was to use a small number of numerical measures that would usefully *extend* the existing diagnostic schemes – specifically, to retain the key information required to make diagnoses whilst maximizing the richness of the additional descriptive information and minimizing the problems inherent in the categorical approach. In using the current classifica-

tions for diagnosis of individuals within the Bipolar spectrum, the following key issues are considered within the decision-making process:

- 1) The presence and severity of manic syndromes.
- 2) The presence and severity of depressive syndromes.
- 3) The presence of psychotic symptoms and the balance of mood and psychotic symptomatology.
- 4) The mood congruence of psychotic symptoms and the temporal relationship between affective and psychotic symptomatology.

In order to capture information relating to the 4 key issues above, we, therefore, chose to use 4 dimensions, one for each issue. Each dimension was set up to provide an ordered (not necessarily linear) measure of the relevant lifetime experience of psychopathology for the individual such that those scoring higher on the scale would have experienced more clinically important and convincing psychopathology – typically a mix of severity and frequency/duration. Ranges and anchor points in the scales were initially decided after discussion by the senior investigators and informed by (a) the current concepts of severity and type of mood syndrome recognized within DSMIV and ICD10, (b) the literature regarding severity of episodes [8-10], and (c) our own experience in clinical work and research with patients with bipolar spectrum disorders. We undertook an iterative process in which we initially agreed scale definitions and rating guidelines, piloted their use on sets of cases and modified the scale and guidelines to improve utility and reliability. The scale – the Bipolar Affective Disorders Dimension Scale, BADDs – has been under development by our group since 1996 and has gone through several iterations. We describe the most recent iteration, Version 3.0 which has been used by our group and collaborators since 1999. All individuals who were assessed with BADDs as part of the diagnostic assessment provided written informed consent to participate in family-genetic studies of mood disorder and our protocols received approval from relevant ethical review committees.

Results

Basic structure of BADDs

BADDs comprises four dimensions that provide a quantitative measure of lifetime experience of psychopathology in each of four domains: Manic-like episodes (the Mania dimension, M), Depression-like episodes (the Depression dimension, D), Psychotic symptomatology (the Psychosis dimension, P) and the relationship (in both congruence of content and in timing) between psychotic features (if present) and mood episodes (the Incongruence dimen-

sion, I) (see supporting material, appendix A for the BADDs rating guidelines). Each dimension provides a composite measure that takes account of both severity and frequency of relevant psychopathology and is rated using integers in the range 0 to 100, inclusive. As with conventional lifetime best-estimate categorical diagnosis, the dimensional ratings are made on the basis of all available information – which typically would include semi-structured lifetime psychiatric interview and review of psychiatric case notes. The criteria used for bipolar spectrum diagnoses is similar within DSMIV and ICD10. We have used ICD10 as the primary source for episode definitions because it provides a clearer differentiation of severity for depressive episodes. Basic background information and general rating guidelines are provided in pages 1 and 2 of the BADDs rating guidelines (see Appendix A). The specific characteristics of each dimension are described below.

Mania dimension, M

The severity of the lifetime worst (ie. most severe) episode of manic spectrum psychopathology identifies a range of scores on the M dimension to be considered (see table 2 and the rating guidelines for the scale: Appendix A). The lifetime "amount" of manic spectrum psychopathology experienced then determines the score within the range according to clear guidelines that attach weight to the number and severity of episodes but allow sufficient flexibility that ratings can take account of other factors where appropriate (such as length of episodes).

Once the range for rating has been decided by considering the severity of the worst episode, the score is determined by starting at the lowest score in the range and adding 2 points for each additional episode of equal severity, up to, but not exceeding, the maximum score in the range. Thus, an individual who has experienced 7 episodes of incapacitating mania would be rated $M = 92$ (the range is 80–100 with 12 points being added to the initial 80 because there have been 6 incapacitating episodes over and above the worst episode that identified the range). Similarly an individual who has experienced 3 episodes of hypomania would be rated as $M = 44$. An individual who has experienced 50 near-hypomanic episodes (ie. episodes that closely approach, but do not meet, criteria for hypomania) would be rated as $M = 39$. For individuals who (as is common) have also experienced episodes of lower severity than the worst ever episode, points can be added – but with a substantially lower weighting than for additional episodes at the same severity. Thus, an individual who has experienced 2 episodes of mania (none incapacitating) and 10 episodes of hypomania would receive a rating of $M = 67$ (the range is 60–79; the worst episode of mania provides a starting score of 60 to which is added 2 points for the second manic episode and 5 points for the 10

hypomanic episodes). An individual who has experienced 2 episodes of mania (none incapacitating) and 10 episodes of near-hypomania would receive a rating of $M = 62$ or 63 depending upon the judgement of the rater as to the importance of the near-hypomanic episodes (the range is 60–79; the worst episode of mania provides a starting score of 60 to which is added 2 points for the second manic episode and up to one point for the 10 sub-hypomanic episodes).

Depression dimension, D

The principles for this dimension follow closely those for the M dimension. The severity of the lifetime worst (ie. most severe) episode of depression spectrum psychopathology identifies a range of scores on the D dimension to be considered (see table 3 and the rating guidelines for the scale: Appendix A). The lifetime "amount" of depression spectrum psychopathology experienced then determines the score within the range according to clear guidelines that attach weight to the number and severity of episodes and allows sufficient flexibility that ratings can take account of other factors where appropriate (such as length of episodes).

Once the range for rating has been specified by considering the severity of the worst episode, the score is determined by adding 1 point for each additional episode of equal severity for the mild and moderate depression ranges (each of which spans 10 points) and 2 points for each additional episode of equal severity for the other ranges (each of which spans 20 points). Thus, an individual who has experienced 11 or more episodes of incapacitating depression would be rated $D = 100$ (the range is 80–100 with 20 points being added to the initial 80 because there have been 10 or more incapacitating episodes over and above the worst episode that identified the range). An individual who has experienced 3 episodes of moderate depression would be rated as $D = 52$ (the range is 50–59 with 2 points being added to the initial 50 because there have been 2 episodes over and above the worst episode that identified the range). As with the M dimension, for individuals who have also experienced episodes of lower severity than the worst ever episode, points can be added but with a substantially lower weighting than for additional episodes at the same severity.

Psychosis dimension, P

This dimension is concerned with lifetime occurrence of psychotic and near-psychotic features. It provides a measure of the proportion of functional psychotic illness in which psychotic symptoms (delusions, hallucinations, positive formal thought disorder, catatonia or grossly disorganized behaviour) have been present. The rating takes account of both the number and duration of episodes with and without psychotic features (see table 4 and the

Table 2: Outline of Mania dimension scale. Table shows key points and ranges on the M dimensions together with the criteria defining the ranges. More details including explicit guidelines for ratings can be found in page 3 of the BADDs rating guidelines (Appendix A).

Range on M dimension	Criterion defining range
0	No evidence of manic features during lifetime
1-19	Elation or irritability and 1+ associated manic symptoms for a distinct period
20-39	Elation or irritability and 3+ associated manic symptoms for at least 1 day
40-59	At least one hypomanic episode
60-79	At least one manic episode but never experienced a manic episode meeting criteria for "incapacitating mania" (as defined in BADDs guidelines)
80-100	At least one manic episode meeting criteria for "incapacitating mania" (as defined in BADDs guidelines)

Table 3: Outline of Depression dimension scale. Table shows key points and ranges on the D dimensions together with the criteria defining the ranges. More details including explicit guidelines for ratings can be found in page 4 of the BADDs rating guidelines (Appendix A).

Range on D dimension	Criterion defining range
0	No evidence of depressive features during lifetime
1 - 19	At least one sub-minor depression episode (as defined in BADDs guidelines)
20-39	At least one minor depression episode (as defined in BADDs guidelines)
40-49	At least one major depression episode of mild severity (as defined in BADDs guidelines)
50-59	At least one major depression episode of moderate severity (as defined in BADDs guidelines)
60-79	At least one major depression episode of severe severity (as defined in BADDs guidelines) but never experienced incapacitating depressive episode (as defined in BADDs guidelines).
80-100	At least one incapacitating major depression episode (as defined in BADDs guidelines)

rating guidelines for the scale: Appendix A). Near-psychotic schizotypal features (specifically the following DSMIV schizotypal items: ideas of reference; odd beliefs or magical thinking that influences behaviour and is inconsistent with sub-cultural norms; unusual perceptual experiences including bodily illusions; odd thinking and speech; suspiciousness or paranoid ideation; behaviour or appearance that is odd eccentric or peculiar), in the absence of clear-cut psychotic features, can be rated in the lowest range of the dimension if there have been no clear-cut psychotic features.

Rating of 0 and 1 have specific definitions. The severity and amount of relevant psychopathology are rated within the ranges 2-9 (for near-psychotic features), 10-20 (for relatively brief single or multiple psychotic features) and 21-100 (for individuals having multiple episodes where psychotic symptoms are a prominent feature). Thus, an individual for whom psychotic features have been present and prominent in each episode of illness would be rated P = 100 (whether this is a single episode or 20 episodes). An individual for whom psychotic features have been present and prominent in one third of episodes of illness would be rated P = 33. An individual for whom multiple psychotic features have been present but were brief and

non-prominent would be rated P = 20. An individual who has never experienced clear-cut psychotic features but has had frequent near-psychotic features would be rated P = 9, and such a person who has had only occasional near-psychotic features would be rated P = 2.

Incongruence dimension, I

This dimension is the most complex and provides lifetime information about the relationship between psychotic and affective psychopathology, specifically in three areas: (a) the mood congruence of any psychotic features that occur, (b) the occurrence of specific symptoms that have special diagnostic weight in the diagnosis of schizophrenia and schizoaffective disorder within current operational classifications (which we denote for convenience, the "S set": thought echo, insertion, withdrawal or broadcasting; passivity experiences; hallucinatory voices giving running commentary, discussing subject in third person or originating in some part of the body; bizarre delusions; catatonia), and (c) the temporal relationship between mood and psychotic psychopathology (see table 5 and the rating guidelines for the scale: Appendix A). The dimension is rated only if the P dimension has been rated at P > 9 (ie. occurrence of definite psychotic symptoms at some time during lifetime); otherwise, it is left blank.

Table 4: Outline of Psychosis dimension scale. Table shows key points and ranges on the P dimension together with the criteria defining the ranges. More details including explicit guidelines for ratings can be found on page 5 of the BADDs rating guidelines (Appendix A).

Range on P dimension	Criterion defining range
0	No evidence of psychotic or near-psychotic schizotypal features
1	Uncertainty about presence of psychotic-spectrum symptoms (ie. Suspected but not definite)
2-9	Presence of near-psychotic schizotypal features but never any clear-cut psychotic symptoms
10-20	Brief, clear-cut psychotic symptoms that are not a prominent feature of the illness
21 - 100	Clear-cut psychotic symptoms that are a prominent feature of one or more episodes of illness

Table 5: Outline of Incongruence dimension scale. Table shows key points and ranges on the I dimension together with the criteria defining the ranges. The S set of psychotic symptoms are those recognized as having special weight in the diagnosis of schizophrenia and schizoaffective disorder (thought echo, insertion, withdrawal or broadcasting; passivity experiences; hallucinatory voices giving running commentary, discussing subject in third person or originating in some part of the body; bizarre delusions; catatonia). More details including explicit guidelines for ratings can be found on page 6 of the BADDs rating guidelines (Appendix A).

Range on I dimension	Criterion defining range
0-40	Psychotic symptoms occur only during affective episodes and do not include any of the S set. Rating 0 – virtually completely mood congruent. Rating 20 – approximate balance between mood congruent and incongruent. Rating 40 – virtually completely mood incongruent
43	Psychotic symptoms occur only during affective episodes and include one or more of the S set which have not definitely been present for 2 weeks.
47	Psychotic symptoms occur only during affective episodes and include one or more of the S set which have definitely been present for 2 weeks.
50-59	Psychotic symptoms probably present for at least 2 weeks either side of an affective episode. Rating 50 – on at least one occasion. Ratings of 51-59 used to reflect recurrence and/or certainty.
60-100	Psychotic symptoms definitely present for at least 2 weeks either side of an affective episode. Rating 60 – on at least one occasion. Rating 80 – on many occasions. Rating 100 – Psychotic symptoms predominate illness and occur chronically outside (or in absence of) affective episodes.

Thus, an individual who has psychotic features only during affective episodes and for whom the psychotic symptoms are mainly, but not exclusively mood congruent, would be rated I = 10. An individual who has psychotic features only during affective episodes and for whom the psychotic symptoms are exclusively mood incongruent, would be rated I = 40. An individual who has psychotic features including passivity lasting at least 2 weeks at some time during the illness and only during affective episodes would be rated I = 47. An individual who has had psychotic features for at least 2 weeks outside of an affective episode on several occasions would be rated I = 70.

Utility of BADDs

Our group has substantial experience in use of BADDs within the context of lifetime psychiatric assessment in family-genetic studies of Bipolar Disorder, unipolar depression and puerperal psychosis. It has been used as part of the diagnostic procedure in over 1100 patients. Within our group it has been used by 16 researchers including psychiatrists, psychologists and sociologists. We

have found it to be user-friendly, simple to learn and straightforward to incorporate within the usual lifetime best-estimate consensus procedures.

Reliability studies of BADDs

In order to examine the reliability of BADDs within the context of our typical spectrum of cases we undertook a reliability study using written case vignettes containing interview and case notes data for 20 cases selected as a representative sample with a mix of diagnoses from our ongoing studies of mood disorder. Nine raters with experience of the conventional lifetime diagnostic process participated (2 psychiatrists and 7 psychologists) and made ratings on the BADDs dimensions. A meeting of all raters was then held to agree a consensus for each rating that was then used as the gold standard against which agreements were measured. Mean agreements, measured by intraclass correlations, were excellent for all dimensions (M: 0.96; D: 0.90; P: 0.86; I: 0.89).

A second exercise was undertaken in order to examine the performance of BADDs with diagnostically difficult cases. A different, non-overlapping, set of seven raters (4 psychiatrists and 3 psychologists) with experience of the conventional lifetime diagnostic process undertook a reliability study using written case vignettes containing interview and case notes data for 20 cases selected from those recruited for our on going studies of functional psychosis over-represented with diagnostically challenging cases representing a mix of diagnoses. Raters made lifetime best estimate diagnoses according to DSMIV and ICD10 and ratings on the BADDs dimensions. A meeting of all raters was then held to agree a consensus for each rating that was then used as the gold standard against which agreements were measured. DSMIV consensus diagnoses were Bipolar I Disorder – 6; Bipolar II Disorder – 3; Bipolar Disorder Not Otherwise Specified – 3; Schizoaffective Disorder, Bipolar Type – 2; Recurrent major Depression – 2; Single episode major depression – 1; Depression Not Otherwise Specified – 2; Schizophrenia – 1. Mean categorical agreement across raters, measured by Cohen's κ was 0.68 for DSMIV and 0.62 for ICD10. Mean agreements on the BADDs dimensions, measured by intraclass correlations were: M: 0.91; D: 0.86; P: 0.96; I: 0.78.

Prediction of DSMIV and ICD10 diagnoses from dimension scores

In order to test the assumption that most of the categorical diagnostic information is preserved within the dimensions, one rater (NC), experienced in use of BADDs, predicted diagnoses according to DSMIV and ICD10 based solely upon the dimension scores on BADDs for 50 representative cases selected by LJ from amongst those recruited for our genetic studies of Bipolar spectrum mood disorders (both categorical diagnoses and dimension scores for each case had been made by 2 independent raters according to best estimate lifetime procedures on the basis of semi-structured interview and psychiatric case note data). The sample comprised a mix of cases with DSMIV categorical diagnoses of Bipolar I Disorder (10), Bipolar II Disorder (10), Bipolar Disorder Not Otherwise specified (10), Schizoaffective Disorder (10) and Recurrent Major Depressive Disorder (10). Correct prediction was made for both DSMIV and ICD10 for all cases.

Discussion

We have described a new dimensional rating scheme that can be used as an adjunct to conventional categorical diagnosis in order to provide a richer description of some of the basic features of an individual's lifetime experience of psychopathology relevant to the bipolar spectrum. The scheme uses the same data sources as conventional best-estimate lifetime diagnosis and is straightforward to use at the same time as the conventional procedure. It retains several key pieces of information that are lost in the sim-

ple diagnostic process. In particular it avoids hierarchical loss of information; it retains a measure of severity; it accommodates sub-clinical cases. We have demonstrated that it is straightforward to learn and incorporate within the usual lifetime diagnostic procedures for use by a range of researchers including those from psychiatry and psychology backgrounds. We have demonstrated excellent levels of inter-rater agreement even with diagnostically challenging sets of cases. Further, we have shown that the key information required for correct diagnostic decisions according to DSMIV and ICD10 is retained within the dimensional ratings.

Our group and our collaborators have extensive experience of use of BADDs as an adjunct to conventional operational diagnosis and it has been part of our standard assessment approach for over 5 years. We have found that it is straightforward to use and adds little to the time taken to complete the consensus diagnostic process.

For researchers, such as ourselves, wishing to establish a measure of "caseness" BADDs can easily be used to define thresholds – for example, a study of mania might require that cases be included only for $M > 64$. This would allow inclusion of all cases with the equivalent of 3 or more episodes of mania, irrespective of diagnosis. In a study of psychotic Bipolar spectrum illness it might be important to distinguish between cases in which psychotic features were a prominent, recurrent feature of illness (rather than an occasional relatively minor feature). Such individuals could be selected using BADDs as having $P > 50$, together with $M > 60$. BADDs can also easily be used in conjunction with categorical diagnoses for case selection.

BADDs was developed within the context of family studies and it lends itself to providing a substantially more useful description of the milder ("sub-clinical") end of the Bipolar spectrum which is frequently encountered within members of families of probands with full-blown Bipolar illness. Conventional categorical approaches often lead to unsatisfactory diagnoses such as "Never ill", "Major Depressive Disorder" or some form of mild "Not Otherwise Specified" category when it is clear that there is some definite, albeit mild, degree of bipolarity. Within the context of family studies it is extremely wasteful to discard such quantitative information about the presence and extent of bipolar features and BADDs provides a simple approach to making simple but efficient use of such data.

Directly related to this issue, there is currently great interest in delineating the breadth and frequency of expression of the bipolar illness spectrum in the population. Recent research, championed by Akiskal and Angst, provides evidence that many cases that have been regarded as being "unipolar major depression" actually have subtle (or not

so subtle) bipolar features [5,6] and classifications have been suggested that recognize several categories of milder bipolarity in addition to the conventional DSMIV categories of Bipolar I and II Disorders [eg. [5]]. BADDSS provides the capability to capture information about this milder degree of bipolarity – a substantial part of the M dimensions (the range 0 – 39) is available for rating sub-clinical hypomanic features.

The dimensional approach is particularly beneficial for cases close to diagnostic boundaries. As any researcher or clinician knows who has undertaken formal diagnostic assignment using operational classifications such cases may be associated with a substantial investment of time in order to make a finely balanced decision between two (or occasionally more) discrete diagnostic groups. It is common that different raters come down on different sides of the finely balanced decision process leading to a split of diagnoses with eventual agreement on a consensus but often with further agreement that it is a "difficult case" and that the single category chosen does not quite do justice to the complexity of the case. In contrast, the dimensional approach of BADDSS provides a scheme which can reflect that different ratings of such cases are relatively close on the quantitative scale. An example is provided by a case considered in the formal reliability exercise in which the subject experienced several severe (but not incapacitating) major depressive episodes and also mild recurrent sub-hypomanic episodes. Of the 7 raters, 4 made a diagnosis of DSMIV Bipolar Disorder, Not Otherwise Specified (the consensus) and 3 a diagnosis of Recurrent major Depressive Disorder. In contrast the dimensional ratings were very similar across all raters (means for those raters making diagnosis of Bipolar Disorder Not Otherwise Specified: M 27.3; D 70.3; P 0; I blank; means for those raters making diagnosis of Recurrent Major Depression: M 23; D 74.7; P 0; I blank).

The primary purpose in developing BADDSS was to use it as an adjunct to better describe some key features of cases and provide a simple mechanism for case selection on the basis of these features. BADDSS has already been used within family-based studies to investigate intra-familial resemblance for lifetime experience of mania and psychosis [11] as well as investigating the relationship between smoking and psychosis in Bipolar Disorder [12]. We are currently using BADDSS to explore genotype-phenotype correlations within the context of both classical and molecular genetic studies of large samples of patients with functional psychosis and mood disorder.

There are several limitations in use of BADDSS, most of which are common to other lifetime diagnostic procedures. First, and most obvious, is that the ratings are entirely dependent upon the quality of the data. Poor data

will inevitably lead to poor dimensional ratings as well as poor categorical diagnoses. It is essential that multiple data sources are used whenever possible that provide adequate description of an individual's lifetime experience of psychopathology (not just one or two representative episodes). As for any type of rating, poor data would be expected to affect both the validity and reliability of ratings. Second, ratings can only reflect what is known of the lifetime experience of psychopathology up to the time the ratings are made. In the light of new episodes of illness scores on the M and D dimensions may increase; those on the P and I dimensions may increase or decrease. Third, subjective judgments are required in integrating multiple data sources and matching data to the criteria within the guidelines. Within the context of our current approaches to psychiatric classification this is inevitable. Judgements must still be made about the range for a rating – this can be equivalent to making a categorical judgement, except that the different categories lie contiguous with one another on an ordered dimension. Fourth, there are features of Bipolar spectrum illness that BADDSS was not designed to capture – examples include the presence and extent of rapid cycling and the extent of mixed episodes (although if all manic episodes are mixed this is denoted in BADDSS by adding an "m" qualifier to the M dimension – see rating guidelines in Appendix A). It is possible for additional dimensions to be added to capture additional features. Fifth, BADDSS was not developed for use in the general population. It was designed for use in clinical populations likely to contain patients with Bipolar spectrum diagnoses. The dimensions have meaning in providing an ordered measure of specific domains of psychopathology. The distributions remain to be tested in non-clinical populations but will certainly not conform to normal distribution. Sixth, for the M and D dimensions there is a ceiling effect in that these dimensions do not allow discrimination between individuals having more than 11 episodes of incapacitating mania, or depression, respectively. In practice, however, for the populations of patients that we have studied relatively few patients score M = 100 or D = 100. Seventh, BADDSS is relatively poor at characterizing cases where the majority of episodes are at a lower level of severity than the most severe.

Our justification for developing BADDSS was that no dimensional scale was already available that adequately addressed the issues (1) – (7) discussed in the background section. However, several researchers have described approaches relevant to dimensional ratings of psychopathology including bipolar features. Depue has described a quantitative scale for screening for Bipolar and Unipolar disorders within a non-clinical university population [13]. This derived a bipolar and a unipolar dimension from a modified version of the General behaviour Inventory [14] and focused on screening for affective psychopa-

thology at the milder end of the spectrum. Brockington and colleagues have described a complex procedure for lifetime psychopathological assessment that includes a detailed interview schedule and case note review (taking 9 hours per patient) and produces lifetime summary scores on 30 scales covering a wide range of psychopathology [15]. One popular approach to lifetime rating of psychopathology for functional psychosis is provided by OPCRIT, a computer-based 92 item checklist that includes symptoms over a range of domains including positive, negative and disorganized psychotic symptoms, course variables, depressive symptoms and manic symptoms [16]. OPCRIT can be used in a variety of ways but was primarily developed as a diagnostic system. It performs best for schizophrenia spectrum disorders, although it can be used satisfactorily in diagnosis of Bipolar Disorder [17]. However, OPCRIT does not provide a dimensional measure of severity or frequency/duration of the domains of psychopathology and, in its unmodified form, is much less satisfactory for use with disorders having a predominantly episodic course. However, within these constraints, OPCRIT has been used by several groups for investigating factor structures of patient sets with functional psychotic illness [eg. [18,19]]. Several groups working on the genetics of psychosis have described dimensional approaches that focus on the psychotic domains of psychopathology. Maziade et al have examined lifetime ratings of psychotic symptom dimensions in patients with schizophrenia and Bipolar Disorder [20]. There was no coverage of mood symptoms and assessments were confined to predominant symptoms in acute episodes and predominant symptoms "between" episodes. Kendler et al [21] have used clinical judgement to make ratings on a 4 point scale that reflected severity and duration for each of 9 symptom and 2 course variables which included depressive symptoms and manic symptoms. Levinson and colleagues [22] have recently described a lifetime dimension scale for use in psychosis research, the Lifetime Dimensions of Psychosis Scale (LDPS). This was developed within the context of family-genetic studies of schizophrenia and motivated by several of the same concerns and aims that motivated us in developing BADDs. Ratings are made on a 39 item scale that reflect severity (on a 5 point scale) and duration (on a 5 point scale) for lifetime occurrence of a range of psychotic features encompassing positive, bizarre, negative and disorganized domains plus depressive and manic syndromes. As with the approach taken by Maziade and Kendler, the focus of LDPS is schizophrenia spectrum disorders and a chronic course. There is relatively little attention to the milder mood psychopathology, episodic course and to the relationship between mood and psychotic symptomatology. These are all issues of key importance to study of bipolar spectrum illness and are a focus of BADDs.

A further useful approach in characterization of episodic disorders such as Bipolar Disorder is the life chart method [23] which provides a visual schematic representation of illness using a time-line on which is charted key events, illness episodes and treatments during an individual's life. We find this an invaluable component of our own assessments but in general it is necessary for quantitative and qualitative information about illness type, frequency and severity to be abstracted from the life chart for use in research or clinical settings. BADDs clearly does not provide the full richness of individual description of the life chart method but is designed to capture some of the important features of an individual's lifetime experience of illness.

Finally, it is important to emphasize that BADDs is a dimensional system developed on the basis of existing data about the nosology of bipolar spectrum disorders in order to provide a description of domains recognized as important in classification. This is an entirely distinct approach to that of researchers who have undertaken factor analyses of symptoms during *acute* episodes of functional psychotic illness – generally identifying factors or clusters that represent the features of episodes (mania, depression etc) [eg. [24-26]].

Conclusions

Current operational diagnostic systems have substantial limitations for classification of bipolar spectrum disorders. We have described a relatively simple dimensional rating system, BADDs, that can be used as an adjunct to conventional best-estimate lifetime diagnostic procedures [27] in order to provide information about four key domains of lifetime psychopathology: Mania (M), Depression (D), Psychosis (P) and Incongruence (I). In our experience BADDs is easy to learn, straightforward to use, has excellent inter-rater reliability and retains the key information required to make diagnoses according to DSMIV and ICD10. Use of BADDs as an adjunct to conventional categorical diagnosis provides a richer description of lifetime psychopathology that (a) can accommodate sub-clinical features, (b) discriminate between illness severity amongst individuals within a single conventional diagnostic category, and (c) demonstrate the similarity between the illness experience of individuals who have been classified into different disease categories but whose illnesses both fall near the boundaries between the two categories. BADDs may be useful for researchers and clinicians who are interested in description and classification of lifetime psychopathology of individuals with disorders lying on the bipolar spectrum.

Competing interests

None declared.

Authors' contributions

NC was the overall principal investigator for the work and had primary responsibility for development of BADDs and writing the manuscript. IJ and GK were closely involved in development and piloting of BADDs and contributed to writing the manuscript. LJ was involved in supervision of researchers using BADDs, data analysis and contributed to writing the manuscript.

Additional material

Additional File 1

A Word file is provided that includes Version 3.0 of the BADDs rating guidelines as an appendix.

Click here for file

[<http://www.biomedcentral.com/content/supplementary/1471-244X-4-19-S1.doc>]

Acknowledgements

We are grateful to Fiona McCandless, Alastair Cardno, Michael Gill, Ed O'Mahony, Aiden Corvin, Jess Heron and Emma Robertson for comments and contributions to piloting the use of BADDs. Funding for this work was provided by the Wellcome Trust. We are grateful to all individuals who have participated in our studies of mood disorder.

References

- Spitzer RL, Endicott J, Robins E: **Research Diagnostic Criteria. Rationale and reliability.** *Archives of General Psychiatry* 1978, **35**:773-782.
- APA: *Diagnostic and statistical manual of mental disorders, (DSM-IV)* Fourth edition. Washington, DC: American Psychiatric Association; 1994.
- WHO: *The ICD10 classification of mental and behavioural disorders. Diagnostic criteria for research* Geneva: World Health Organization; 1993.
- Farmer AE, Williams J, Jones I: **Phenotypic definitions of psychotic illness for molecular genetic research.** *American Journal of Medical Genetics (Neuropsychiatric Genetics)* 1994, **54**:365-371.
- Akiskal H, Pinto O: **The evolving bipolar spectrum. Prototypes I, II, III, and IV.** *The Psychiatric Clinics of North America* 1999, **22**:517-534.
- Angst J, Gamma A, Benazzi F, Ajdacic V, Eich D, Rossler W: **Toward a re-definition of sub-threshold bipolarity: epidemiology and proposed criteria for bipolar-II, minor bipolar disorders and hypomania.** *J Affective Disorders* 2003, **73**:133-146.
- Kendell RE: **Diagnosis and classification of functional psychosis.** *Br Med Bull* 1987, **43**:499-513.
- Goodwin FK, Jamison KR: *Manic-depressive illness* New York, Oxford University Press; 1990.
- Endicott NA: **Psychophysiological correlates of "bipolarity".** *Arch Gen Psychiatry* 1989, **17**:47-56.
- Carlson GA, Goodwin FK: **The stages of mania. A longitudinal analysis of the manic episode.** *Arch Gen Psychiatry* 1973, **28**:221-8.
- O'Mahony E, Corvin A, O'Connell R, Comerford C, Larsen B, Jones R, McCandless F, Kirov G, Cardno AG, Craddock N, Gill M: **Sibling pairs with affective disorders: resemblance of demographic and clinical features.** *Psychological Medicine* 2002, **32**:55-61.
- Corvin A, O'Mahoney ED, O'Regan M, Comerford C, O'Connell R, Craddock N, Gill M: **Cigarette smoking and psychotic symptoms in bipolar affective disorder.** *British Journal of Psychiatry* 2001, **179**:35-38.
- Depue RA, Krauss S, Spooont MR, Arbisi P: **General behavior inventory identification of unipolar and bipolar affective conditions in a nonclinical university population.** *Journal of Abnormal Psychology* 1989, **98**:117-126.
- Depue RA, Klein D: **Identification of unipolar and bipolar affective conditions by the general Behavior Inventory.** In *Relatives at risk for mental disorder* Edited by: Gershon E, Barrett J. New York: Raven Press; 1988:257-282.
- Brockington I, Roper A, Edmunds E, Kaufman C, Meltzer HY: **A longitudinal psychopathological schedule.** *Psychological Medicine* 1992, **22**:1035-1043.
- McGuffin P, Farmer A, Harvey I: **A polydiagnostic application of operational criteria in studies of psychotic illness. Development and reliability of the OPCRIT system.** *Archives of General Psychiatry* 1991, **48**:764-770.
- Craddock N, Asherson P, Owen MJ, Williams J, McGuffin P, Farmer AE: **Concurrent validity of the OPCRIT diagnostic system: comparison of OPCRIT diagnoses with consensus best-estimate lifetime diagnoses.** *British Journal of Psychiatry* 1996, **169**:58-63.
- Van Os J, Gilvarry C, Bale R, Van Horn E, Tattan T, White I, Murray RM: **A comparison of the utility of dimensional and categorical representations of psychosis.** *Psychological Medicine* 1999, **29**:595-606.
- Cardno AG, Jones LA, Murphy KC, Sanders RD, Asherson P, Owen MJ, McGuffin P: **Dimensions of psychosis in affected sibling pairs.** *Schizophr Bull* 1999, **25**:841-50.
- Maziade M, Roy MA, Martinez M, Cliche D, Fournier JP, Garneau Y, Nicole L, Montgrain N, Dion C, Ponton AM: **Negative, Psychoticism, and Disorganized Dimensions in Patients With Familial Schizophrenia or Bipolar Disorder: Continuity and Discontinuity Between the Major Psychoses.** *American Journal of Psychiatry* 1995, **152**:1458-1463.
- Kendler KS, Glazer WM, Morgenstern H: **Dimensions of Delusional Experience.** *American Journal of Psychiatry* 1983, **140**:466-469.
- Levinson DF, Mowry BJ, Escamila MA, Faraone SV: **The lifetime dimension of psychosis scale (LDPS): description and inter-rater reliability.** *Schizophr Bull* 2002, **28**:683-95.
- Denicoff KD, Leverich GS, Nolen WA, Rush AJ, McElroy SL, Keck PE, Suppes T, Altshuler LL, Kupka R, Frye MA, Hater J, Brotman MA, Post RM: **Validation of the prospective NIMH-Life-Chart Method (NIMH-LCM-p) for longitudinal assessment of bipolar illness.** *Psychological Medicine* 2000, **30**:1391-7.
- Cuesta MJ, Peralta V: **Integrating psychopathological dimensions in functional psychoses: a hierarchical approach.** *Schizophrenia Research* 2001, **52**:215-229.
- Cassidy F, Forest K, Murry E, Carroll BJ: **A factor analysis of the signs and symptoms of mania.** *Arch Gen Psychiatry* 1998, **55**:27-32.
- Kitamura T, Okazaki Y, Fujinawa A, Yoshino M, Kasahara : **Symptoms of Psychoses, A factor – analytic study.** *British Journal of Psychiatry* 1995, **166**:236-240.
- Leckman JF, Sholomskas D, Thompson D, Belanger A, Weissman MM: **Best estimate lifetime psychiatric diagnosis. A methodological study.** *Archives of General Psychiatry* 1982, **39**:879-883.

Pre-publication history

The pre-publication history for this paper can be accessed here:

<http://www.biomedcentral.com/1471-244X/4/19/prepub>