Journal of Behavioral Decision Making, *J. Behav. Dec. Making*, **26**: 174–184 (2013)
Published online 15 March 2012 in Wiley Online Library (wileyonlinelibrary.com) **DOI:** 10.1002/bdm.1754

Am I Abnormal? Relative Rank and Social Norm Effects in Judgments of Anxiety and Depression Symptom Severity

KAREN L. MELROSE[1]*, GORDON D. A. BROWN[1] and ALEX M. WOOD[2]
[1]*Department of Psychology, University of Warwick, Coventry, UK*
[2]*School of Psychological Sciences, University of Manchester, Manchester, UK*

ABSTRACT

Overdetection and underdetection of depression and anxiety in primary care are common and may partly reflect individuals' misperceptions of the severity of symptoms they experience. Here, we explore how people's judgments about the severity of their own symptoms are influenced by their beliefs about the distribution of symptoms experienced by the rest of the population. We apply the rank-based decision by sampling cognitive model of judgment to symptom severity. The model proposes that judgments depend on the relative rank of an item within a mental sample of comparable items. It is predicted that judgments of symptom severity will be context dependent and more specifically that an individual's judgments will be invalid to the extent that the individual has inaccurate beliefs about the relevant social context. Two studies found that participants' assessments of symptom severity were rank based. Study 1 elicited participants' beliefs about the social distribution of symptoms and found that participants' judgments of whether they were depressed or anxious were mainly predicted not by their symptoms' objective severity but rather by where participants ranked the severity of their symptoms in comparison with the believed symptoms of others. Study 2 varied symptom distributions experimentally and again found relative rank effects as predicted. It is concluded that the real-world application of contextual models of judgment requires investigation of individual differences in participants' background beliefs.

KEY WORDS rank; decision by sampling; social norms; anxiety; depression; symptom severity

The lifetime prevalence of anxiety and mood disorders across the globe ranges from 4.8% to 31.0% and from 3.3% to 21.4%, respectively (Kessler et al., 2007). However, only around one-third of anxiety cases and under half of depression cases are identified by primary care physicians giving an unassisted diagnosis (i.e., unaided by diagnostic instruments or severity scales, etc.) (Lecrubier, 2001; Mitchell, Vaze, & Rao, 2009). Moreover, individuals without clinically significant symptoms may be diagnosed with depression (false positives) at rates up to 50%—higher than both the rate of missed cases (false negatives) and the rate of correctly identified cases (true positives) (Mitchell et al., 2009).

Much research on this topic has focused on errors in physician judgment (e.g., flawed logic, biases and faulty reasoning; for a review, see Harding, 2004) rather than on patient-related factors such as the beliefs that patients hold about their symptoms. These factors may be extremely important as it is the patient that initiates most consultations in primary care (Kessler, Lloyd, Lewis & Gray, 1999), so for any diagnosis to occur, the patient needs to judge whether their symptoms are clinically significant or not and then actively seek help if they are. Furthermore, the outcome of consultation is influenced by what is presented by the patient and how (Weich, Lewis, Donmall, & Mann, 1995), so a correct diagnosis is somewhat reliant on patients being able to accurately recount symptoms, their occurrence, and perhaps most essentially, their severity as correct assessment of this is important not only for decisions on diagnosis but also for decisions about treatment (Kroenke, Spitzer, & Williams, 2001).

In the diagnosis of anxiety and depression, accurate judgment of symptom severity is very important; there is evidence to suggest that overestimations and underestimations of symptom severity may play a significant role in the occurrence of false positive and false negative cases (e.g., Thompson, Ostler, Peveler, Baker & Kinmonth, 2001). Indeed, one study showed that errors in severity judgments accounted for 37 out of the 104 (39.7%) false negative cases and 27 out of the 76 (20.3%) false positive cases (Tiemens, VonKorff & Lin, 1999). This seems logical—if a clinician is making an unaided diagnosis on the basis of a patient's presentation of their symptoms, then they may be likely to falsely diagnose if the patient reports their symptoms as being more severe than they are and not diagnose at all if they report them as being less.

How might patients make such inaccurate judgments of symptom severity in the first place? It is argued here—on the basis of cognitive models of contextual influences on judgment—that individuals can hold incorrect beliefs about the severity of their symptoms because of misperceived norms of symptom occurrence. We propose that the same cognitive mechanisms are used to judge symptom severity as those used in psychophysical (Riskey, Parducci, & Beauchamp, 1979), economic (Brown, Gardner, Oswald, & Qian, 2008; Wood, Boyce, Moore & Brown, 2012), and social judgments (Wood, Brown, & Maltby, 2011) and explain, using a rank-based cognitive model, how this can lead to misjudgments. The Decision by Sampling model (DbS: Stewart, Chater & Brown, 2006) offers a process-level interpretation of the frequency principle of Range–Frequency Theory (Parducci, 1963; 1995) and proposes that judgments are constructed from a number of binary, ordinal comparisons of

*Correspondence to: Karen L. Melrose, Department of Psychology, University of Warwick, Coventry, CV4 7AL, UK. E-mail: k.l.melrose@warwick.ac.uk

a target item with other similar items in a mental sample leading to a judgment in terms of the item's relative ranked position within the sample. In its pure form, this approach suggests that the absolute magnitude of the target item, in this case the objective severity, may have no bearing on the judgment made that is instead entirely relative (Vlaev, Chater, Stewart & Brown, 2011). The DbS model assumes that people are able to encode, manipulate, and recall frequencies with relative ease, which has long been assumed in humans and animals (see Sedlmeier & Betsch, 2002, for a review). It is also based on the assumption that comparisons are ordinal, which is consistent with research suggesting that people are much better at discriminating between stimuli than they are at assessing their magnitude (Miller, 1956; Stewart, Brown & Chater, 2005).

As applied to the current context, it is hypothesized that to judge their symptom severity, individuals will draw upon a sample of other people they know or have heard about who experience the same symptom to construct a comparison set. They will then compare their symptom with all of those in their sample, and the severity associated with it will be determined by the percentile rank of the symptom amongst the sample (i.e., the proportion of pair-wise comparisons that are equal or smaller). The symptom will be considered to be severe if it ranks relatively highly within the sample. For example, an individual who feels depressed, sad, blue, and tearful on 15 days each month and who believes that only 10% of people feel depressed on more than 15 days a month may be likely to classify themselves as depressed. Errors in judgments will occur when the sample constructed is not representative of the relevant population. For example, if the aforementioned individual believes that 80% of people feel depressed on more than 15 days a month they may judge that their own symptoms are normal when in fact they are severe enough to warrant diagnosis. In this case, rank effects have led to their perception of "severe" being distorted.

This approach contrasts with adaptation-level theory (Helson, 1964), a well-known model of relative judgment, which also states that judgments are made in relation to a mental sample constructed of previously encountered stimuli in the context for judgment. However, in its simplest form, adaptation-level theory states that new stimuli are judged partly in relation to the average stimuli in the sample (the adaptation level), whereas DbS proposes that judgments are based on the rank of the new stimuli within the sample. We aim to test both these theories in the present studies and hypothesize that judgments of symptom severity will be based solely on rank and not on the distance from the adaptation level, here operationalized as the mean of the sample.

The research aims both to provide the first application of DbS to a clinical domain and to provide a novel test of core aspects of the DbS theory. Regarding the application of DbS to the understanding of anxiety and depression, we aim to show how decisions of symptom severity are made and how this may affect help-seeking behavior. We thus focus on people's general perception of the nature of depression and anxiety rather than the kind of judgments that arise from the tight application of actual diagnostic criteria as it is precisely these personal definitions of illness beliefs that greatly influence help-seeking behavior (King, 1983). In doing so, our research may also be of relevance to the literature on the social construction of mental disorders (e.g., Eisenberg, 1988), which focuses on how people label a behavior as "abnormal" (such as depressed, anxious, or mentally ill) on the basis of the deviation of the behavior from social norms rather than any objective criteria. We contribute to this literature through providing a cognitive account of the mechanisms underlying the process of the social construction of mental disorder including how people compare a given symptom with their perceptions of the distributions of the symptoms in the population.

Context effects have been found in judgments of the severity of other people's psychopathology made by trained experts (Campbell, Hunt, & Lewis, 1957; Perrett, 1972) and the general population (Manis & Paskewitz, 1984; Wedell, Parducci, & Lane, 1990), and previous research applying DbS has shown relative rank effects in a range of contextual judgments, for example, in wage satisfaction (Brown et al., 2008), life satisfaction (Boyce, Brown & Moore, 2010), and gratitude (Wood et al., 2011). These studies testing DbS have either directly manipulated the rank position of stimuli in a context or focused on the position of stimuli in real-world environments. However, this previous research does not directly test a core claim of DbS, which is that people's judgments are affected by the rank position of a stimulus within distributions that they "sample" or retrieve from memory. This assumption distinguishes DbS from the rank principle of Range–Frequency Theory and forms a focus of the present study. This research also presents an advance for DbS theory: Study 1 focuses on individual differences in retrieved context (beliefs about the world) and consequent individual differences in the decision samples that provide the context for judgment. We aim to show that individuals all make judgments in accordance with the same model of context-based judgment yet come to different judgments of the same quantities (here, symptom severity) because of retrieval of different contexts. The aims of the current study are thus twofold, to advance testing of the DbS model by using a novel methodology to investigate rank effects in retrieved context and to apply DbS to a new and important domain, clinical judgment. In doing so, we hope to provide support for DbS as a global model of judgment and an understanding of how individuals can misjudge the severity of their symptoms that could help to explain the prevalence of false positive and false negative cases in the diagnosis of depression and anxiety.

STUDY 1

Study 1 used a novel methodology to elicit participants' beliefs about the distribution of symptoms within the general population. It aimed to show that such beliefs (which are often highly inaccurate) provide the context against which participants made judgments about the severity of their own symptoms in a manner consistent with the DbS model. According to the Diagnostic and Statistical Manual of Mental Disorders (fourth edition, text revision: DSM-IV-TR, APA, 2000), the presence of specified symptoms and

DOI: 10.1002/bdm

their occurrence (for example, depressed mood most of the day, nearly every day) is central to the diagnosis of depression and anxiety, and therefore judgments were based on the context of the number of days a month the symptom is experienced. It was hypothesized that judgments of symptom severity would be determined by the relative ranked position of the number of days per month the symptom is experienced within the assumed distribution of days a month other people from the general population are believed to experience the same symptom. These judgments will not, it is predicted, be determined by the number of days the symptom is experienced (the objective severity) or the distance of this number from the mean of the distribution as proposed by adaptation-level theory.

METHOD

Participants

The 144 participants who fully completed this online study were recruited through Maximiles (www.maximiles.co.uk), a company who e-mail questionnaires to registered users who complete them in return for points to redeem against goods. The participants had a mean age of 47.0 years (SD = 12.7, range: 24–73 years, 62% male), were predominantly White (95%) and came from a variety of educational backgrounds (18% school: compulsory education up to age 16, 29% college: age 16–18, and 53% university: age 18+). Participants received 150 points on completion of the study. These do not have a monetary value but can be redeemed for items such as CDs and DVDs on the website (at around 2000 points).

Design and procedure

An online questionnaire was designed, and participants were e-mailed a link to one of the two versions of the questionnaire that differed only in the presentation order of the items for the purpose of counterbalancing. Just over half of the participants ($n = 76$) completed the first version, and the rest ($n = 68$) completed the second.

Participants were asked how many days a month they felt "depressed, sad, blue, tearful" and experienced "excessive anxiety about a number of events or activities." These symptoms were based on the DSM-IV-TR diagnostic criteria for depression and anxiety, respectively. They were then given instructions (and an example applied to height) on how to answer a further set of questions eliciting their beliefs about how many days a month other people from the general population experience these symptoms. There were 11 of these questions for each symptom, and the answers given were used to construct the participants' assumed distribution of the symptom's occurrence in the general population. The questions were in the following format: "*x* out of 100 adults feel *y* on at least this many days per month ____," where *x* was one of the 11 different percentiles (1, 10, 20, 30, 40, 50, 60, 70, 80, 90, and 99) and *y* was one of the two symptoms ("depressed, sad, blue, tearful," "excessive anxiety about a number of events or activities"). The line after the word "month" represents an answer box where participants were required to type in the number of days each month that they thought the different percentiles of the population suffered from the symptom. They then answered the questions "Do you think that you suffer from depression?" and "Do you think that you suffer from anxiety?" on a five-point scale: "definitely not," "probably not," "not sure," "probably," and "definitely." No information on depression or anxiety (such as diagnostic criteria) was given to the participants as we sought to elicit participant's spontaneous understanding of depression and anxiety. Demographic characteristics were also collected. On completion of the study, participants were debriefed on what the study was about and given the e-mail address of the researcher and a mental health service to request further information if they so wished.

RESULTS AND BRIEF DISCUSSION

Data for each symptom were analyzed separately. Participants were included in the analyses if their assumed distribution of the symptom occurrence within the general population could be estimated well, that is, if their rank within this distribution and the mean of it (two of the three main predictor variables used in the analysis) could be accurately calculated.

Estimation of each participant's distribution was based on their answers to the set of percentile questions outlined earlier and required them to be answered accurately, that is, with a higher number of days given in answer to the first question ("1 out of 100 adults feel depressed, sad, blue, tearful on at least this many days per month") than the last ("99 out of 100 adults feel depressed, sad, blue, tearful on at least this many days per month") and with the number of days given decreasing between the two. This is because lower proportions (for example, 1 out of 100) indicate adults within the population who experience the symptom the most, whereas higher proportions (for example, 99 out of 100) indicate adults who experience the symptom the least. It is therefore expected that people who experience the symptom the most (those with severe symptoms) will do so on more days than those who experience it the least or not at all and that the number of days the symptom is experienced will gradually decrease between the two as the severity of the symptom decreases through the proportions of the population who are experiencing it.

To exclude data from participants who had answered inappropriately, Kendall (1955) nonparametric correlation coefficients were calculated for each participant to evaluate the ranked correlation between the stimuli and their responses. Participants were excluded if the value was less than .80 or if it was greater or equal to .80, but one or more of the answers given was greater than 31 (the maximum possible number of days a month). The reasons some participants met these exclusion criteria were as follows: low range of responses or same response given for each question ($n = 10$), inconsistent responses ($n = 4$), a number above 31 was given for one answer or more ($n = 3$), or the questions were answered the wrong way round, that is, in ascending order and not descending ($n = 3$). This left data for 133 participants on the depression symptom and 135 on the anxiety symptom. It should be noted that data from all participants were analyzed, but for 11 participants,

DOI: 10.1002/bdm

only their data on depression were included, and for 9 participants, only their data on anxiety were included. For all statistical tests, an alpha level of .05 was used.

Despite the nonclinical sample, there was a good range of responses on the outcome variables: "do you think you have depression?" ("definitely not" $n = 36$, "probably not" $n = 34$, "not sure" $n = 21$, "probably" $n = 24$, and "definitely" $n = 18$) and "do you think you have anxiety?" ("definitely not" $n = 23$, "probably not" $n = 49$, "not sure" $n = 15$, "probably" $n = 27$, and "definitely" $n = 21$).

Each participant's cumulative distribution function (either lognormal or generalized pareto—whichever fitted best) was estimated for each symptom by a least-squares method, and the relative rank position of the number of days the participant experienced the symptom within that participant's elicited distribution was calculated (subjective rank) along with the mean of each participant's subjective distribution function (subjective mean).

The methodology can best be illustrated by previewing example results from two participants. Figure 1 (top panel) shows the cumulative distribution elicited from one participant (P19; filled circles), along with a best-fit cumulative density function (solid line). The data represent P19's beliefs about the number of days per month on which various percentages of people feel "depressed, sad, blue, tearful." Thus, P19 believed that 50% of people experience such feelings on 3 days a month or fewer; 80% of people experience such feelings on approximately 7 days or fewer, and so on. P19 reported as experiencing such feelings on just 5 days a month (indicated by the vertical line on the graph), and thus we infer that P19 believed that 70% of other people experience the negative feelings less often than P19. Consistent with this, P19 thought that they definitely suffered from depression.

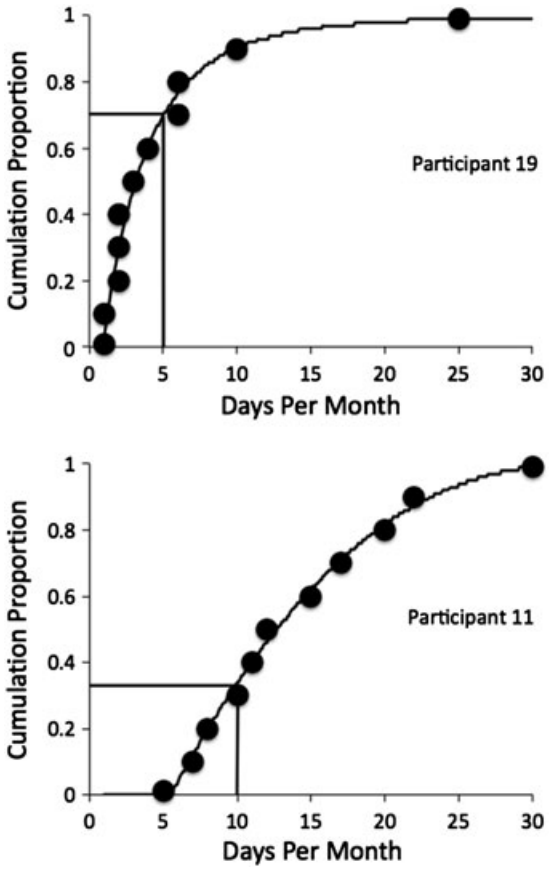

Figure 1. The cumulative distribution (filled circles) along with a best-fit cumulative density function (solid line) elicited from participants 19 (top panel) and 11 (bottom panel)

P11's beliefs, in contrast, were described by a very different cumulative density function (lower panel). P11 believed that 50% of people feel depressed on 13 days a month or fewer and that 80% of the people experience such feelings on approximately 19 days or fewer. Thus, P11 believes that feeling "depressed, sad, blue, tearful" is much more common than P19 does. P11 reported experiencing such feelings on 10 days a month; we therefore infer that P11 believed that 34% of other people experience the negative feelings less often than does P11. P11 was unsure as to whether they suffer with depression, rating themselves as less confident about their symptoms being clinically significant than P19, despite the fact that P11 experienced depression-related symptoms on twice as many days per month than P19 (10 vs 5). These observations are consistent with self-ratings of depression being determined not by the absolute number of days per month that the symptom is experienced by a participant but instead by how the number of days is believed to rank with respect to what others experience.

Participants' beliefs about the distribution of symptoms within the general population varied greatly. For example, 10% of participants thought that half the population felt depressed on at least 15 days a month; 10% thought that they felt so on 2 days or fewer. This variability was also seen for anxiety; 10% of participants though that half the population felt anxious on at least 26 days a month; 10% though that they felt so on 7 days or fewer. Given this considerable variability in beliefs about symptom distribution, it is possible to proceed to test the hypothesis that such beliefs influence participants' perceptions of the severity of their own symptoms.

Ordinal regression (using the polytomous universal model; logistic link function) was used to predict whether the participants thought they suffered from depression or anxiety from age, gender, the number of days a month they experience the symptom, subjective rank, and subjective mean. Table 1 shows the parameter estimates for all predictor variables. Four regression models were undertaken for each symptom, all with age and gender as predictors. The first regression also included the number of days a month the symptom is experienced, which was the only predictor of whether the participants thought they suffered from depression ($p < .001$) or anxiety ($p < .001$). This pattern remained the same in the second regression when subjective mean was added to the models; the inclusion of which resulted in only a slight increase in the explained variance. A third regression with number of days and subjective rank showed a greater increase in variance for both depression and anxiety, and subjective rank became the sole predictor of whether or not participants thought they were depressed ($p < .001$). Both the number of days the symptom is experienced ($p = .017$) and subjective rank ($p = .002$) are seen to predict whether or not participants

DOI: 10.1002/bdm

Table 1. Regression coefficients from Study 1

	Think they suffer from depression				Think they suffer from anxiety			
Predictor variable	Estimate	Std. error	Wald	*p*	Estimate	Std. error	Wald	*p*
Days experienced	**0.176**	**0.028**	**39.117**	**.000**	**0.210**	**0.032**	**42.545**	**.000**
Age	−0.019	0.013	2.225	.136	−0.003	0.013	0.038	.844
Gender	−0.027	0.331	0.007	.934	−0.368	0.345	1.141	.285
Nagelkerke Pseudo-R^2		0.367				0.417		
Days experienced	**0.194**	**0.031**	**39.350**	**.000**	**0.225**	**0.035**	**41.530**	**.000**
Subjective mean	−0.064	0.042	2.293	.130	−0.057	0.044	1.694	.193
Age	−0.020	0.013	2.287	.130	−0.006	0.014	0.210	.647
Gender	0.023	0.333	0.005	.945	−0.283	0.350	0.655	.418
Nagelkerke Pseudo-R^2		0.379				0.425		
Days experienced	0.064	0.041	2.515	.113	**0.106**	**0.044**	**5.657**	**.017**
Subjective rank	**3.303**	**0.924**	**12.764**	**.000**	**3.070**	**0.996**	**9.505**	**.002**
Age	−0.025	0.013	3.457	.063	−0.006	0.013	0.231	.631
Gender	0.162	0.336	0.231	.630	−0.289	0.345	0.700	0.403
Nagelkerke Pseudo-R^2		0.429				0.460		
Days experienced	0.033	0.055	0.363	.547	0.084	0.058	2.141	.143
Subjective rank	**3.888**	**1.166**	**11.110**	**.001**	**3.487**	**1.243**	**7.876**	**.005**
Subjective mean	0.044	0.053	0.686	.408	0.030	0.054	0.315	.574
Age	−0.025	0.013	3.661	.056	−0.005	0.014	0.138	.710
Gender	0.158	0.336	0.221	.639	−0.326	0.351	0.862	.353
Nagelkerke Pseudo-R^2		0.432				0.461		

Note: $n = 133$ for depression, $n = 135$ for anxiety.

thought they suffered from anxiety. However, as Table 1 shows, the effect size of rank was far greater than that of any other predictor variable. For a one unit increase in subjective rank, the expected ordered log odds increases by 3.07 with a move from one category of "do you think you suffer from anxiety" to the next (e.g., "definitely not" to "probably not"). This rises to 3.30 for "do you think you suffer from depression." For every unit increase in the number of days the symptom is experienced, we expect only a 0.11 increase in the expected log odds associated with a move to the next higher category of "do you think you suffer from anxiety." Finally, a fourth regression with all five predictor variables was conducted. The addition of subjective mean as a predictor variable resulted in only a slight increase of variance accounted for by both models and removed the effect of days a month the symptom is experienced. The effect of subjective rank remained, and the size of this effect increased (Table 1).[1]

It could be argued that the effects of the other predictor variables may have been absent because of collinearity, so two linear regressions using the enter method were performed using all five predictor variables to obtain collinearity statistics. As all tolerance values were greater than or equal to .18 for both models (depression: days/month depressed = .18, subjective mean = .56, subjective rank = .21, age = .93, gender = .96; anxiety: days/month anxious = .18, subjective mean = .58, subjective rank = .20, age = .91, gender = .95), collinearity appears not to be a major issue. It can therefore be concluded that subjective rank is the sole predictor of whether or not the participants thought they suffered from depression or anxiety consistent with the DbS model but providing no support for adaptation-level theory.

STUDY 2

Study 1 demonstrated that the perceived distributions of symptoms in the population retrieved from the memory of participants were related to their judgments of their own levels of anxiety and depression. However, the correlational design cannot show that the perceived rank position of a person's symptoms *causes* the judgments of anxiety and depression. For example, individuals who are depressed may be motivated to see their symptoms as particularly severe and underestimate the distribution of other people's symptoms as a result (reverse causality). To provide a stronger indication of causality, Study 2 uses an experimental design to directly manipulate rank and test whether rank position of days a month a symptom is experienced in a given context causally influenced severity perception.

The study tested whether simply seeing other numbers of days at the same time as rating a given "target" number (e.g., 10 days/month) influenced how severe the symptom was judged to be (i.e., if the distribution of the other days changed the rank position of the target number in the context). For example, is "feeling depressed on ten days a month" judged as being more likely to impact on a person's everyday functioning when ranking fifth in the context (i.e., when there are four other values shown below it) than when ranking second (i.e. when only one value is lower)? The methodology of this study (as outlined in the following text) also allowed for further testing of adaptation-level theory.

[1]We repeated the analyses without excluding participants for whom subjective rank could not be reliably determined because of the causes described earlier. The effect of subjective rank remained significant in all analyses, and the effects of "days per month" reached significance at the conventional level in both five-parameter models. We attribute this latter effect to the reduced accuracy of the estimate of relative rank in the excluded participants.

DOI: 10.1002/bdm

METHOD

Participants

The 52 participants had a mean age of 37.3 years (SD = 17.3, range: 18–70 years, 54% female), were predominantly White (92%), came from a variety of educational backgrounds (21% school, 15% college, and 64% university), and were recruited from several locations (the cities of Birmingham, Coventry, Newcastle, Ipswich, and London). None had prior in-depth knowledge of psychology (ascertained verbally before participants took part in the study). Participation was voluntary and unpaid.

Design and procedure

Study 2 employed a similar methodology to that used in previous studies investigating relative rank effects such as work on Range–Frequency Theory (e.g., Parducci, 1965; Wedell & Parducci, 1988 and Wedell, Santoyo & Pettibone, 2005). As explained in the following text, this methodology also allows for the measurement of both relative rank and mean effects and has proved successful in comparing the DbS and adaptation-level models in previous research (e.g., Wood, Brown & Maltby, 2012; Wood, Brown, Maltby & Watkinson, in press).

Participants were randomly assigned to one of the two groups termed "unimodal" ($n = 26$) and "bimodal" ($n = 26$), relating to the context they were given. Each context was a distribution of days a month the symptom is experienced. They each completed a questionnaire comprising a front sheet containing details of the study, a tick-box for consent and questions on demographic information and then six pages each containing the same distribution of 11 different numbers of days. The distributions that the participants were given varied between the two groups as the key experimental manipulation and were as follows: unimodal: 3, 10, 12, 13, 14, 16, 18, 19, 20, 22, and 29 days, bimodal: 3, 4, 6, 8, 10, 16, 22, 24, 26, 28, and 29 days. Participants were instructed that the numbers stood for the average number of days a month 11 hypothetical people suffered from six symptoms (one on each page) of either depression: feeling (1) depressed, sad, blue, tearful (2) tired and having no energy, and (3) worthless or excessively guilty about things you have or have not done, or anxiety: experiencing (1) excessive anxiety about a number of events or activities (2) irritability, and (3) muscle tension. These particular symptoms were chosen as a pilot study showed them to have the highest level of understanding. They were based on the symptoms outlined in the DSM-IV-TR (APA, 2000) diagnostic criteria for depression and anxiety but were worded more simply to ensure that they were fully understood by participants.

Participants were asked: "For each person, please indicate in the form of a percentage how likely you think the following statement is to be true where 100% is certain to be true:" The statement was adapted from the diagnostic criteria in the DSM-IV-TR (APA, 2000) and for symptoms of depression was: "This symptom is severe enough to upset the person's daily routine or seriously impair their work or interfere with their relationships" and for symptoms of anxiety was: "This symptom will cause significant distress or impairment in social or occupational functioning." Symptoms were presented in counter-balanced order, and half the participants received distributions in numerical order from highest to lowest, whereas the other half received them in numerical order from lowest to highest. Participants were debriefed at the end of the study and provided with contact information of the researcher and a mental health service.

The distributions were designed to test whether the rank position of the number of days a month a symptom is experienced affected how severe it was perceived to be by the participants. As Figure 2 shows, the distributions ranged from 3 to 29 and have an equal mean of 16 and three common values (10, 16 and 22) in addition to the endpoints. Values 10 and 22 are the same distance from the mean in both distributions. If the participant's perception of how severe the symptom occurrence is depends solely on the number of days the symptom was experienced in isolation to the other values seen or how far the values were from the mean of all the values seen (as predicted by a simple interpretation of adaptation-level theory), then each of these common points should elicit the same average judgment between groups. However, if judgments of symptom severity are rank dependent, the average percentage given to each of the common points should differ between groups. For example, 10 days should be seen to be more severe in the bimodal group (where rank = 5, i.e., it is the fifth lowest number of days the symptom is experienced) than in the unimodal (rank = 2). Sixteen days should be seen as equally severe across participants as rank = 6 for both groups. Twenty-two days should be seen to be more severe in the unimodal group (rank = 10) than in the bimodal group (rank = 7). This implies a main effect of common point and a crossover interaction; the bimodal group should perceive greater severity at point 1 (10 days) but lower severity at point 3 (22 days), with the crossover meeting at point 2 (16 days). These effects should be seen across all six symptoms.

RESULTS AND BRIEF DISCUSSION

Participants were excluded if the range of responses was three or less, resulting in one participant from the bimodal group being excluded. For all statistical tests, an alpha level of .05 was used. We first examined the mean ratings in both groups for each of the common points, separately for each symptom. As can be seen in Figure 3, for each of the symptoms, the expected crossover interaction was clear and consistent: Common point 1 (10 days) was rated as less severe in the

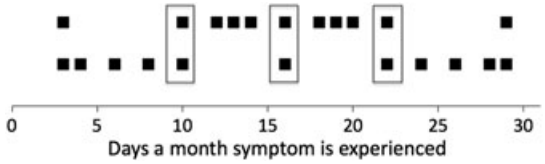

Figure 2. Illustration of stimulus distributions in Study 2

DOI: 10.1002/bdm

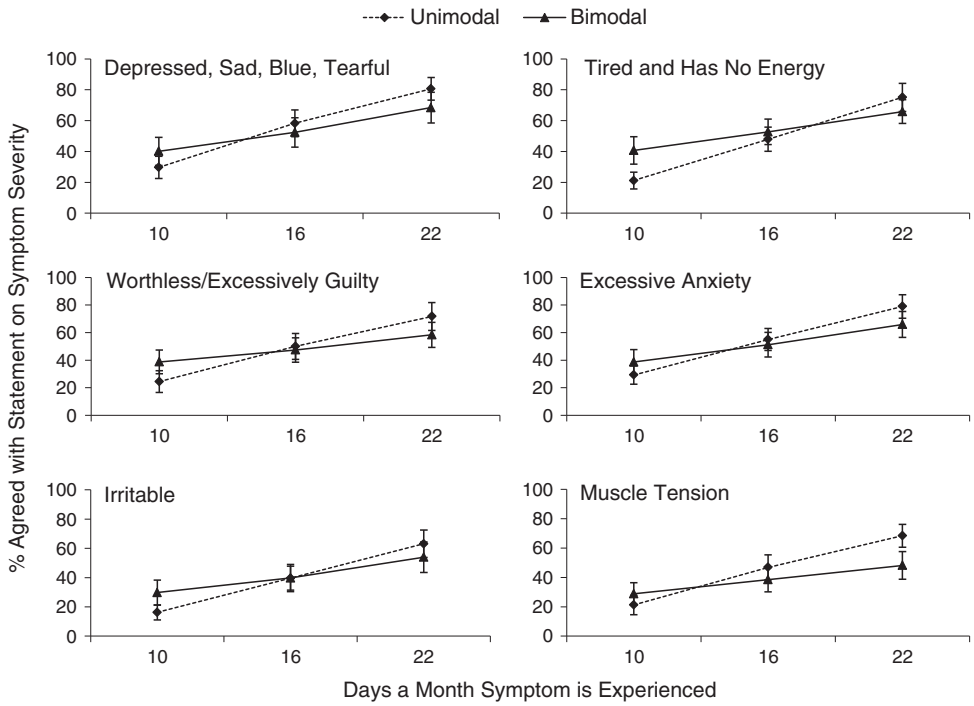

Figure 3. Interactions between common point and group for all six symptoms. Error bars represent the 95% confidence interval

unimodal group (where rank = 2) than in the bimodal group (where rank = 5); common point 2 (16 days, rank = 6 in both groups) attracted approximately equal ratings in each group; and common point 3 (22 days) was rated as more severe in the unimodal group (where rank = 10) than in the bimodal group (where rank = 7). As Birnbaum (1974) noted, the presence of these crossover interactions cannot be accounted for by adaptation-level theory, even in its most general form.

The interaction was tested with a 2 (between: group) 3 (within: common point) × 6 (within: symptom) mixed model ANOVA. As expected, there was a main effect of common point, with perceived severity increasing the more days a month the symptom was experienced (F [2,98] = 410.210, $p < .001$). The critical interaction between group and common point was highly significant (F [2,98] = 50.386, $p < .001$), suggesting that, consistent with DbS, judgments of symptom severity based on how many days a month the symptom is experienced depended on the rank of the number of days within the context given. There was also a main effect of symptom (F [5,245] = 6.518, $p < .001$), suggesting that participants thought the six symptoms themselves differed in severity in terms of how much experiencing that symptom would affect daily functioning. There was no main effect of group, common point × symptom interaction, or common point × symptom × group interaction, suggesting that the rank principle is equally applicable to each of the six symptoms.

Although the two end points (3 and 29 days) were the same in both distributions, they have not been included in the main analysis as they are both the same rank and distance from the mean, so the ratings of these endpoints should not differ according to either model (DbS and adaptation-level). However, although an absence of significant differences in these ratings would be consistent with both models, any significant differences would need to be investigated as this would indicate the involvement of a third unaccounted for parameter. Two 2 (between: distribution) 6 (within: symptom) mixed model ANOVAs, one for each endpoint, showed main effects of symptom (lower endpoint: F [5, 245] = 3.974, $p = .002$, higher endpoint: F [5, 245] = 9.895, $p < .001$) but no symptom distribution interactions and crucially no main effects of distribution indicating that there were no differences between distributions in the mean ratings of either endpoint across all symptoms.[2]

DISCUSSION

This study investigated whether and how people's judgments of their symptoms of depression and anxiety are rank based. The first study showed that individuals' judgments about whether they suffer from anxiety or depression are predicted not by their beliefs about how often they experience relevant symptoms or how much this differs from what the average person experiences but instead by their beliefs about the distribution of symptom occurrence in the general population

[2]A 2 (group) × 5 (common point) × 6 (symptom) mixed model ANOVA was undertaken yielding the same results as the 2X3X6 ANOVA; a main effect of common point (F [4,196] = 363.096, $p < .001$), an interaction between group and common point (F [4,196] = 10.676, $p < .001$) and a main effect of symptom (F [5,245] = 9.361, $p < .001$). In addition there was an interaction between symptom and common point (F [20,980] = 1.675, $p = .032$) indicating that the average rating given to each common point differed according to symptom suggesting that participants perceived the symptoms as differing in severity. There was no main effect of group or common point symptom × group interaction.

DOI: 10.1002/bdm

in combination with their use of a rank-based judgment strategy. The second study provided causal evidence of this by showing that judgments of severity differed when rank was manipulated and distance from the mean and objective severity was controlled. Participants judged the severity of a symptom that was experienced on a given number of days differently depending on where the value ranked in two different distributions where it was the same distance from the mean. Therefore, both studies provide support for the DbS model but not adaptation-level theory.

The main implication of these findings is that they can help explain why and how symptom severity can be misjudged. This in itself has a number of implications. As we have shown, judgments of symptom severity are not based upon how often the symptom is experienced but on where this occurrence ranks amongst a mental sample of other people who also experience that symptom. Therefore, if this mental sample is not representative of the actual symptom occurrence within the population, then false beliefs will lead to an underestimation or overestimation of symptom severity.

Key implications of patients misjudging their symptom severity are related to help-seeking behavior. For example, an individual who feels down a few days a month may worry that they are clinically depressed if they believe (incorrectly) that none of their friends experience this and may therefore seek help when it is not needed. Similarly, many people may be experiencing anxiety and depression but not receiving any help or treatment because they (again incorrectly) believe that their symptoms are normal simply because other people around them are also suffering but to a greater extent. This implies that the people who could be the most vulnerable to mental health disorders (i.e., from geographical regions or demographic groups where disorders such as anxiety and depression are high) may be the ones that are most at risk from nonidentification and treatment of these disorders. This highlights the need for awareness of rank effects to be raised and the tailoring of information campaigns to provide objective information on symptom severity that targets vulnerable groups and communities.

Physicians have been found to be just as susceptible to these effects when judging the severity of other people's psychopathology (Campbell et al., 1957; Perrett, 1972) and as the accuracy of clinical judgment has been found to be the same between laypersons and physicians (for a review, see Faust & Ziskin, 1988); the results seen here may be generalized. Research has shown that, compared with a standardized measure (e.g., Kendrick, King, Albertella & Smith, 2005) or the gold standard structured diagnostic interview (e.g., Tiemens et al., 1999), unaided, physicians can be poor at assessing symptom severity. The findings here can explain why this is the case; if physicians are basing their judgments of symptom severity through a comparison with previous patients encountered with that symptom, then the judgments may be distorted if that sample is not representative. For example, a physician who has recently diagnosed a number of patients with chronic symptoms of anxiety may not recognize that a patient presenting with symptoms that are milder but still severe enough to warrant diagnosis also has an anxiety disorder. This has implications in both the identification and treatment of disorders as current guidelines base the prescribing of medication on perceived symptom severity (Anderson, Nutt & Deakin, 2000). This, combined with the effects that misjudgment of symptom severity may have on patient help-seeking behavior can help to explain the prevalence of both false positive and false negative cases of anxiety and depression as well as the overprescribing and underprescribing of medication for these disorders (Kendrick et al., 2005).

The findings may also contribute to our knowledge on the development and maintenance of hypochondriasis— the preoccupation with a fear of or a belief in having a serious illness—which is prevalent in around 3% of the primary care users (Escobar, Gara, Waitzkin, Silver, Holman & Compton, 1998). The cognitive-behavioral model of hypochondriasis (Warwick & Salkovskis, 1990) acknowledges that the dysfunctional beliefs and assumptions about illnesses held by hypochondriacal individuals are developed through past experiences of illness in self and others, and the DbS model may be able to explain why some of these beliefs exist. Hypochondriacal individuals may falsely believe that their symptoms are severe because they wrongly assume that they are suffering more in comparison with others. Similarly, their fear of contracting an illness could be attributed to a false perception of the likelihood of this occurring brought about through a wrongly assumed distribution of the illness' prevalence in the general population. Interventions that incorporate normalizing a hypochondriacal individual's perceived distribution of symptom severity may prove successful in lowering their health anxiety.

Indeed, such social norm interventions have proved successful in other areas, primarily in tackling excessive alcohol consumption in university students. Misperceptions of "normal" alcohol use in this population have been well documented (for a review, see Berkowitz, 2003), and interventions with social norm components such as marketing campaigns that contain information about actual healthy norms have been in existence for over 20 years (Haines, 1996).

The findings here are consistent with the broader literature on the social norms approach that suggests that judgments of one's own behavior are made through a comparison to others. However, the literature has so far failed to define the specific processes underlying this central belief, although many studies assume that people compare their behavior with their perception of the average behavior of others (e.g., Perkins, 2002). Here, we have shown how judgments of the severity of one's own symptoms are influenced by norms and indicate the precise cognitive mechanisms whereby these norms operate. When judging their own anxiety and depression, people do, indeed, make judgments through a comparison with others, and our findings suggest that where an individual ranks amongst their comparison set may have a greater bearing on the comparison than how much they differ from the average of the set. Further research is needed into whether other relative social and medical judgments are made solely on the basis of rank comparisons, as suggested by DbS, or through other relative comparisons (such as comparison with the average). Currently, there is evidence that judgments of the risks associated with alcohol

DOI: 10.1002/bdm

consumption are solely rank dependent (Wood et al., 2012), and our findings support the conclusions of Wood et al. that interventions containing social norm components should consider presenting information on behavior that is based on rank rather than distance from the mean. It appears that these interventions have not been applied in the context of mental health, and it would be interesting to see if they may also be beneficial to those who perceive their symptoms of anxiety and depression to be more severe than they actually are as well as hypochondriacal individuals.

Our findings also add to the general literature on context effects in judgment and compliment those on other nonsocial norm-based contextual biases such as the work performed on assimilation and contrast effects by Schwarz and colleagues (for an overview, see Bless & Schwarz, 2010). For example, their research has shown that people's judgments of the frequency of their behaviors can be influenced by the context in which they are given to report them. Many questionnaires, including diagnostic measures, give a set of response categories such as "about once a month," "about once in two weeks," "about once a week," and so forth, which serve as a comparative frame of reference for the respondent who assumes that the response scale reflects the actual distribution of the behavior (Schwarz & Hippler, 1987). Both clinicians and medical students have also been found to be susceptible to these context effects, judging the same objective symptom severity differently depending on the range of the symptom's frequency response scale (Schwarz, Bless, Bohner, Harlacher & Kellenbenz, 1991). Taken together, these findings and ours show the importance in consultation of ascertaining as much objective information on symptom severity as possible and the use of aided diagnosis where a structured diagnostic interview is not possible. Measures used to assist diagnosis should also ask for objective information; the findings here would warn against those that ask for subjective judgments such as the Beck Depression Inventory-II (Beck, Steer & Brown, 1996), which, although designed for measuring the severity of depression, is also sometimes used for diagnosis (Hersen, Turner & Beidel, 2007). This measure asks patients to choose one of the four statements that most applies to how they have been feeling in the last 2 weeks, for example, "I do not feel like a failure," "I have failed more than I should have," "As I look back, I see a lot of failures," and "I feel I am a total failure as a person," These questions require the kind of judgment shown in this study to be highly dependent on prior beliefs and context.

We note that there are strengths and limitations to the designs of both studies. Study 1 investigated the effects on judgment of the context of different beliefs brought by participants to the task of judging their own symptom severity. Despite the results suggesting that these judgments were rank dependent, causality cannot be inferred because of the correlational design used. However, this design allowed exploration of rank effects in the context of the participant's own spontaneously elicited distributions, which had not been investigated in previous research applying the DbS model. Study 2 examined judgments as a function of experimentally provided context where rank was manipulated allowing for causality to be examined. It could be argued that the results seen here do not reflect natural judgment processes but instead reflect aspects of the experimental design. However, taken together, the two studies address each others' weaknesses and so provide clear and consistent evidence of a genuine effect in perception of symptom severity.

In summary, this study has shown that judgments of anxiety and depression symptom severity are context dependent providing further support for the DbS model. This has implications for diagnosis as both the patient and the physician have to make judgments of whether the presenting symptoms are severe enough to seek help (in the case of the patient) or to warrant diagnosis and treatment (in the case of the physician). Therefore, patient-related factors may have just as much a role to play in the discordance seen in the identification of depression and anxiety as physician-related ones. As this study was conducted using a community sample with a full range of clinical functioning, future research may benefit from investigating these effects in a clinical population. More research is needed to investigate ways of highlighting and limiting these effects to ensure a better chance of the identification and treatment of psychological disorders.

ACKNOWLEDGEMENT

The research was supported by the Economic and Social Research Council grant RES–062–23–2462.

REFERENCES

American Psychiatric Association. (2000). *diagnostic and statistical manual of mental disorders* (Fourth ed., text revision). Washington, DC: American Psychiatric Association Press.

Anderson, I. M., Nutt, D. J., & Deakin, J. F. W. (2000). Evidence-based guidelines for treating depressive disorders with antidepressants: a revision of the 1993 British Association for Psychopharmacology guidelines. *Journal of Psychopharmacology*, *14*, 3–20. DOI: 10.1177/026988110001400101

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Manual for the Beck Depression Inventory-II*. San Antonio, TX: Psychological Corporation.

Berkowitz, A. D. (2003). Applications of social norms theory to other health and social justice issues. In H. W. Perkins (Ed.), *The social norms approach to preventing school and college age substance abuse: A handbook for educators, counselors, clinicians (chapter 16)*. San Francisco, CA: Jossey-Bass.

Birnbaum, M. H. (1974). Using contextual effects to derive psychophysical scales. *Perception & Psychophysics*, *15*, 89–96. DOI: 10.3758/BF03205834

Bless, H., & Schwarz, N. (2010). Mental construal and the emergence of assimilation and contrast effects: The inclusion/exclusion model. *Advances in Experimental Social Psychology*, *42*, 319–374. DOI: 10.1016/S0065-2601(10)42006-7

Boyce, C. J., Brown, G. D. A., & Moore, S. C. (2010). Money and happiness: Rank of income, not income, affects life satisfaction. *Psychological Science*, *21*, 471–475. DOI: 10.1177/0956797610362671

Brown, G. D. A., Gardner, J., Oswald, A. J., & Qian, J. (2008). Does wage rank affect employees' well being? *Industrial Relations*, *47*, 355–389. DOI: 10.1111/j.1468-232X.2008.00525.x

Campbell, D. T., Hunt, W. A., & Lewis, N. A. (1957). Effects of assimilation and contrast in judgments of clinical materials.

The American Journal of Psychology, *70*, 346–360. Stable URL: http://www.jstor.org/stable/1419571

Eisenberg, L. (1988). The social construction of mental illness. *Psychological Medicine*, *18*, 1–9. DOI: 10.1017/S0033291700001823

Escobar, J. I., Gara, M., Waitzkin, H., Silver, R. C., Holman, A., & Compton, W. (1998). DSM–IV hypochondriasis in primary care. *General Hospital Psychiatry*, *20*, 155–159. DOI: 10.1016/S0163-8343(98)00018–8

Faust, D., & Ziskin, J. (1988). The expert witness in psychology and psychiatry. *Science*, 241, 31–35. Stable URL: http://www.jstor.org/stable/1701317

Haines, M. P. (1996). *A social norms approach to preventing binge drinking at colleges and universities*. Newton, MA: The Higher Education Centre for Alcohol and Other Drug Prevention.

Harding, T. P. (2004). Psychiatric disability and clinical decision making: The impact of judgment error and bias. *Clinical Psychology Review*, *24*, 707–729. DOI: 10.1016/j.cpr.2004.06.003

Helson, H. (1964). *Adaptation-level theory*. New York, NY: Harper & Row.

Hersen, M., Turner, S. M., & Beidel, D. C. (2007). *Adult Psychopathology and Diagnosis* (5th ed.). Hoboken, NJ: John Wiley & Sons.

Kendall, M. G. (1955). *Rank Correlation Methods*. New York, NY: Hafner Publishing Co.

Kendrick, T., King, F., Albertella, L., & Smith, P. W. F. (2005). GP treatments for patients with depression: an observational study. *British Journal of General Practice*, *55*, 280–286.

Kessler, R. C., Angermeyer, M., Anthony, J. C., de Graaf, R., Demyttenaere, K., Gasquet, I., de Girolamo, G., ... Ustun, T. B. (2007). Lifetime prevalence and age-of-onset distributions of mental disorders in the World Health Organisation's World Mental Health Survey Initiative. *World Psychiatry*, *6*, 168–176.

Kessler, D., Lloyd, K., Lewis, G., & Gray, D. P. (1999). Cross sectional study of symptom attribution and recognition of depression and anxiety in primary care. *British Medical Journal*, *318*, 436–39. DOI: 10.1136/bmj.318.7181.436

King, J. (1983). Attribution theory and the health belief model. In M. Hewstone (Ed.), *Attribution theory: social and functional extensions* (pp. 170–186). Oxford, England: Basil Blackwell.

Kroenke, K., Spitzer, R. L. & Williams, J. B. W. (2001). The PHQ-9: Validity of a brief depression severity measure. *Journal of General Internal Medicine*, *16*, 606–613. DOI: 10.1046/j.1525-1497.2001.016009606.x

Lecrubier, Y. (2001). Prescribing patterns for depression and anxiety worldwide. *The Journal of Clinical Psychiatry*, *62* (Suppl 13), 31–36.

Manis, M., & Paskewitz, J. R. (1984). Specificity in contrast effects: Judgments of psychopathology. *Journal of Experimental Social Psychology*, *20*, 217–230. DOI: 10.1016/0022-1031(84)90048-9

Miller, G. A. (1956). The magical number seven, plus or minus two: Some limits on our capacity for information processing. *Psychological Review*, *63*, 81–97. DOI: 10.1037/h0043158

Mitchell, A. J., Vaze, A., & Rao, S. (2009). Clinical diagnosis of depression in primary care: a meta-analysis. *Lancet*, *374*, 609–619. DOI: 10.1016/S0140-6736(09)60879-5

Parducci, A. (1963). The range-frequency compromise in judgment. *Psychological Monographs*, *77*, 565.

Parducci, A. (1965). Category judgement: A range-frequency model. *Psychological Review*, *72*, 407–418. DOI: 10.1037/h0022602

Parducci, A. (1995). *Happiness, pleasure, and judgment: The contextual theory and its applications*. Mahwah, NJ: Lawrence Erlbaum Associates Inc.

Perkins, H. W. (2002). Surveying the damage: A review of research on consequences of alcohol misuse in college populations. *Journal of Studies on Alcohol. Supplement 14*, 91–100.

Perrett, L. F. (1972). Contextual effects in clinical judgment. *Dissertation Abstracts International*, *32*, 07B.

Riskey, D. R., Parducci, A., & Beauchamp, G. K. (1979). Effects of context in judgements of sweetness and pleasantness. *Perception & Psychophysics*, *26*, 171–176. DOI: 10.3758/BF03199865

Schwarz, N., & Hippler, H. J. (1987). What response scales may tell your respondents. In H. J. Hippler, N. Schwarz and S. Sudman (Eds.), *Social information processing and survey methodology* (pp. 163–178). New York, NY: Springer Verlag.

Schwarz, N., Bless, H., Bohner, G., Harlacher, U., & Kellenbenz, M. (1991). Response scales as frames of reference: The impact of frequency range in diagnostic judgements. *Applied Cognitive Psychology*, *5*, 37–49. DOI: 10.1002/acp.2350050104

Sedlmeier, P., & Betsch, T. (2002). *Frequency processing and cognition*. Oxford, England: Oxford University Press.

Stewart, N., Brown, G. D. A., & Chater, N. (2005). Absolute identification by relative judgment. *Psychological Review*, *11*, 881–911. DOI: 10.1037/0033-295X.112.4.881

Stewart, N., Chater, N., & Brown, G. D. A. (2006). Decision by sampling. *Cognitive Psychology*, *53*, 1–26. DOI: 10.1016/j.cogpsych.2005.10.003

Thompson, C., Ostler, K., Peveler, R. C., Baker, N. & Kinmonth, A.-I. (2001). Dimensional perspective on the recognition of depressive symptoms in primary care: the Hampshire depression project 3. *The British Journal of Psychiatry*, *179*, 317–323. DOI: 10.1192/bjp.179.4.317

Tiemens, B. G., VonKorff, M. & Lin, E. H. B. (1999). Diagnosis of depression by primary care physicians versus a structured diagnostic interview: Understanding discordance. *General Hospital Psychiatry*, *21*, 87–96. DOI: 10.1016/S0163-8343(98)00077-2

Vlaev, I., Chater, N., Stewart, N., & Brown, G. D. A. (2011). Does the brain calculate value? *Trends in Cognitive Sciences*, *15*, 546–554. DOI: 10.1016/j.tics.2011.09.008

Warwick, H. M. C., & Salkovskis, P. M. (1990). Hypochondriasis. *Behaviour Research and Therapy*, *28 (2)*, 105–117. DOI: 10.1016/0005-7967(90)90023-C

Wedell, D. H., & Parducci, A. (1988). The category effect in social judgement: Experimental ratings of happiness. *Journal of Personality and Social Psychology*, *55*, 341–356. DOI: 10.1037/0022-3514.55.3.341

Wedell, D. H., Parducci, A., & Lane, M. (1990). Reducing the dependence of clinical judgment on the immediate context: Effects of number of categories and type of anchors. *Journal of Personality and Social Psychology*, *58*, 319–329. DOI: 10.1037/0022-3514.58.2.319

Wedell, D. H., Santoyo, E. M., & Pettibone, J. C. (2005). The thick and the thin of it: contextual effects in body perception. *Basic and Applied Social Psychology*, *27*, 213–228. DOI: 10.1207/s15324834basp2703_3

Weich, S., Lewis, G., Donmall, R., & Mann, A. (1995). Somatic presentation of psychiatric morbidity in general practice. *British Journal of General Practice*, *45*, 143–147.

Wood, A. M., Boyce, C. J., Moore, S. C., & Brown, G. D. A. (in press). An evolutionary based social rank explanation of why low income predicts mental distress: A 17 year cohort study of 30,000 people. *Journal of Affective Disorders*, *136*, 882–888. DOI: 10.1016/j.jad.2011.09.014

Wood, A. M., Brown, G. D. A., & Maltby, J. (2011). Thanks, but I'm used to better: a relative rank model of gratitude. *Emotion*, *11*, 175–180. DOI: 10.1037/a0021553

Wood, A. M., Brown, G. D. A., & Maltby, J. (2012). Social norm influences on evaluations of the risks associated with alcohol consumption: Applying the rank based decision by sampling model to health judgments. *Alcohol and Alcoholism*, *47*, 57–62. DOI: 10.1093/alcalc/agr146

Wood, A. M., Brown, G. D. A., Maltby, J., & Watkinson, P. (2012). How are personality judgments made? A cognitive model of reference group effects, personality scale responses, and behavioral reactions. *Journal of Personality*. DOI: 10.1111/j.1467-6494.2012.00763.x

Authors' biographies:

Karen L. Melrose is a PhD student at the University of Warwick with research interests including clinical decision making. She received her MSc from the University of Warwick in 2010. Her PhD research is further exploring relative rank effects in judgments of symptom severity.

Gordon D. A. Brown is Professor in Psychology at the University of Warwick. He received his undergraduate degree from the University of Oxford and his DPhil from the University of Sussex. His research interests include mathematical modelling of human memory and decision-making and behavioral science, especially the relation between income and wellbeing.

Alex M. Wood is a Senior Lecturer in Psychology at the University of Manchester. He received his PhD from the University of Warwick in 2008. His research improves the understanding and fostering of well-being through better integration of this area with positive, social, personality, clinical, health, and counselling psychologies, in addition to allied disciplines such as economics, medicine, and education.

Authors' addresses:

Karen L. Melrose and **Gordon D. A. Brown**, Department of Psychology, University of Warwick, Coventry, UK
Alex M. Wood, School of Psychological Sciences, University of Manchester, Manchester, UK

DOI: 10.1002/bdm