

Identifying Critical Cues in Mental Health Assessment using Naturalistic Decision-Making Techniques

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ABSTRACT

Decision cues are important components of situation assessment. The identification of seemingly critical cues has proven beneficial to training initiatives in a number of domains (e.g., fire-fighting, aviation, nursing, criminal investigation). Similarly, it is proposed that a critical cue inventory may augment training opportunities in the mental health domain (e.g., developing high-fidelity virtual patients). To date, there has been no formal identification of the cues engaged by Mental Health Practitioners (MHP). This study used the Critical Decision Method to decompose the initial stages of psychological assessment, and elucidate the cues engaged by practicing MHPs. Further, it examined MHPs' perceptions of diagnosticity (i.e., predictive value) and frequency of use, to identify those cues most critical to assessment. The results reveal that MHPs engage an array of cues, and an inventory of critical cues is presented. Findings may be used to inform training and decision support initiatives in clinical skill acquisition.

KEYWORDS

Decision Making; Health; Situation Assessment; Cognitive Task Analysis

INTRODUCTION

For Mental Health Practitioners (MHPs), decision-making is integral to competency (Vollmer, Spada, Caspar, & Burri, 2013). Decision-making in this domain requires that the MHP encode, manipulate and recall information to formulate decisions for tasks including assessment, case conceptualisation, diagnosis, risk assessment, and treatment planning for clients (Whaley & Geller, 2007). These decisions are frequently high stake, time-pressured, and uncertain, due to the complexity inherent in psychological problems.

For the MHP, decision processes often differ from physiological medical assessments in that there are rarely overt symptom data available for consideration (Broadbent, Moxham, & Dwyer, 2007), and the data on which decisions are based are often self-report with uncertain validity (Bhugra, Easter, Mallaris & Gupta, 2011). Additionally, attempts to investigate and understand the cognitive processes involved in MHP decision-making are complicated by frequent claims that clinical decisions are based largely on intuition, particularly in mental health nursing (King, 1997), general mental health care (Wittmann, Spaanjaars, & Aarts, 2012), and psychiatry (Bhugra et al., 2011).

The role of intuition in decision-making is regularly discounted in the literature, most likely due to a perceived lack of empirical evidence (Grove, Zald, Lebow, Snitz, & Nelson, 2000). However, there is evidence to suggest that MHPs combine both intuition and empirical methods in clinical decision-making, recognising that intuition produces hypotheses that require formal validation. Indeed, Welsh and Lyons (2001) offer that intuition is the combination of the MHPs formal knowledge, coupled with experience to create a store of tacit knowledge from which to draw upon during decision-making. This may offer explanation as to why MHPs are able to rationalise their decisions in diagnostic assessment in the absence of formal assessment psychometrics. The increasing recognition of intuition as a valid process within complex decision-making has seen a shift in decision-making research from the prescription of systematic optimization-based strategies, to the examination of decision-making in real-world or naturalistic settings.

Naturalistic Decision-Making (NDM) Paradigm

The NDM framework has shifted the extant conception of decision-making from one of a domain-independent and generalised approach, to that of a knowledge-based approach incorporating the individual decision-maker's previous experiences and stores of knowledge (Klein, 2008). Klein and Klinger (1991) suggest that decision-making processes may be represented on a continuum from the analytical strategies at one end to the recognition-based decision strategies at the other, and strategy engagement fluctuates between these extremities, depending on the nature of the situation. Within the NDM paradigm, processes of decision-making are extended to include constructs such as the prior stages of perception and situational recognition, in addition to the notion that individuals generate relevant responses rather than simply choosing from a given set of responses (Klein, 2008).

NDM research tends to emphasise the cognitive processes that contribute to a decision-maker identifying effective courses of action. For instance, in a range of domains, practitioners' ability to trigger meaningful associations in memory by identifying relevant environmental indicators (i.e., cues), appears to be a key differentiation in decision-making performance (Beilock, Wierenga, & Carr, 2002; Klein, 1993; Loveday, Wiggins, & Searle, 2013; Morrison, et al., 2013; Schriver et al., 2008; Perry, Wiggins, Childs, & Fogarty, 2013). As a result, cue use is viewed as a prominent avenue of interest for NDM researchers looking to model proficient processes in training programs.

Cues and Cue Diagnosticity

Cues have been found to be crucial in decision-making performance across a number of domains including medical diagnoses (Hammond, Frederick, Robillard, & Victor, 1989), courtroom judgments (Ebbesen & Konecni, 1975), aviation (Stokes, Kemper, & Marsh, 1992), airport customs (Pachur & Marinello, 2013), power control (Loveday et al., 2012), finance (Hershey, Walsh, Read, & Chulef, 1990), driving (Fisher & Pollatsek, 2007), nursing (Shanteau, 1991), and criminal investigation (Morrison et al., 2013). Much of the research examining cue use has been in domains with time constraints, high information load and serious consequences, such as power control and aviation (Loveday et al., 2012; Wiggins & O'Hare, 2003), where effective performance implies the rapid assessment of the situation to reach accurate decisions within a specified time frame. Although decisions in mental health are not necessarily rapid, Schmidt and Boshuizen (1993) suggest that in the health care domain, cues still play an important role, and are probably reflected in associations between diagnostic features and patient events or symptoms that are stored in the long-term memory of the practitioner.

As evidence for the importance of cues in accurate decision-making is mounting, more research is focussing on designing training initiatives that promote cue discovery. For example, Wiggins and O'Hare (2003) developed a computer-based training system designed to enable pilots to identify critical cues associated with deteriorating weather conditions during flight. The aim of this type of training has been to expose the learner to cues that are useful as triggers for diagnosis. One promising application for cue-based training in the mental health domain is the development of virtual patient technologies used in psychological assessment. For example, Kenny, Parsons, Gratch, and Rizzo (2008) have developed a virtual patient, Justina, designed to portray a victim of sexual assault, communicating symptoms of Post-Traumatic Stress Disorder during a clinical interview. From this simulation of the assessment process, trainee MHPs learn to formulate preliminary hypotheses and diagnoses. It is proposed that one way to improve these simulations would be to enhance their capacity to demonstrate more subtle indicators of symptomology that are invariably engaged by MHPs during practitioner-patient interactions.

Aim

The aim of this study was to identify a critical cue inventory utilised by experienced MHPs from a range of practicing approaches for use in future training initiatives. This study sought to achieve this by (a) using the Critical Decision Method (CDM) with a number of experienced MHPs to extract a range of cues used during the initial stages of psychological assessment; and b) using a survey, investigate whether there are significant differences in MHPs' ratings of perceived diagnosticity and frequency of use across the cues extracted, to determine the most critical cues.

METHOD

Participants

The participants comprised two separate purposive samples. Firstly, 12 mental health professionals; five were practicing registered psychologists, four practicing clinical psychologists, one practicing registered counsellor, one practicing forensic psychologist and one practicing registered social worker. Participants ranged in age from 31 to 57 years ($M_{age} = 42.16$, $SD_{age} = 9.25$) and years' experience ranging between 6 to 15 years ($M_{age} = 10.14$, $SD_{age} = 4.38$). Based on these factors, it was believed that this sample would produce a rich and diverse range of knowledge and skills, likely not possessed by training MHPs. Secondly, 50 mental health professionals participated in and completed the online survey advertised in the Australian Psychological Society Bulletin. There were 40 female participants and 10 male participants. The mean number of years practicing as a MHP was 8.8 years.

Materials and Procedure

The initial 12 participants participated in a 60-minute audio recorded, semi-structured interview. The interview schedule was based on a form of Cognitive Task Analysis (CTA) - the Critical Decision Method (CDM) procedure adapted from Klein, Calderwood and Macgregor (1989) - which can be used to elicit cues during decision-making (see O'Hare, Williams, Wiggins, & Wong, 2000).

Participants were asked to recall (retrospectively) and recount to the interviewer details pertaining to a non-routine case that they had assessed. Here it was assumed that the use of non-routine cases were more likely to involve greater intricacy, offering a richer source of data for analysis and elicit tacit knowledge stores (Crandall, et al., 2006). Interviews were transcribed for protocol analyses.

The next 50 participants were invited to complete an online survey designed to assess their perceptions of diagnosticity (i.e., predictive value) and frequency of use of the cues extracted from the interviews. Participants were presented with each of the extracted cues and asked to make two ratings for each regarding the two dimensions of interest; diagnosticity (i.e., How *relevant/important* is the following in the assessment of your client's mental health status?) and frequency of use (i.e., How *frequently* do you rely on/utilise the following in the assessment of your client's mental health status?).

RESULTS

Critical Decision Method

The transcribed data was analysed for the abstraction of cue-based information and decomposition into content-based coding categories. Critical Task Analysis (CTA) offers numerous coding schemes that are established based on the task domain and the purpose or goal of the analysis (Crandall et al., 2006). The categories selected to represent the task of initial assessment were based on descriptions offered by Crandall et al. (2006) and include informational cues, hypothesis formation, hypothesis testing, seeking information, sense making, mental models, and reference to knowledge.

The first level of protocol analysis was based on a content abstraction process to identify information that was relevant to the population of these categories. The aim here was to assign each interviewee's relevant verbalizations to one of the following categories; informational cues, hypothesis formation, hypothesis testing, seeking information, sense-making, mental models, and reference to knowledge. This process yielded a number of what could be described as content (e.g., medication) and perceptual (e.g., tone) cues.

The second level of protocol analysis narrowed the focus to cues further, and involved higher level coding; collapsing the cues identified in the first level of abstraction into thematic categories. For example the perceptual cues of pitch, tone, pauses, and volume were all collapsed into the general content category of *Speech*, while cues of hand gestures, fidgeting and threatening stance were summarized by the category *Body Movement*.

Overall, 73 individual cues, and 11 cue-categories were extracted from the protocol analysis. Table 1 shows a selection of cues and their respective categories.

Table 1. The 11 Cue Categories and examples of specific cues from each

| Cue Category | Examples of Cues Included |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Personal Information Cues | Gender, occupation, race, religious affiliations, socioeconomic status, appearance, lifestyle factors |
| Medical Cues | Medication prescribed, compliance, blood serology, previous diagnosis, current diagnosis, family history of diagnoses |
| Immediacy Cues | Engagement, affect, communication style, facial expressions, emotional expression, personality traits/temperament, transference |
| Speech Cues | Tone, flow, perseverative, slurred, volume, pitch, pace |
| Language Cues | Descriptors, words used, developmentally appropriate, use of humour |
| Physical Cues | Breathing, eye contact, voice, body movements |
| Cognitive Cues | Attention, memory, intelligence, intellectual disability, judgement, decision making, perceptions |
| Risk Assessment Cues | Harm, intent, means and plan |
| Collateral information Cues | Congruency between verbal and non-verbal, consistency between collateral, psychometrics and narrative |
| Overt Behavioral Cues | Behaviour in waiting room, occupation of space in therapeutic environment, feedback from client |
| Personal History Cues | Psychosocial history, relationship status, conflicts, support networks |

Cue Survey

Analysis of the survey data involved two phases. Firstly, to investigate whether there were significant differences in participants' perceived diagnosticity and frequency of use for the cues, and secondly, to identify those cues with the highest ratings of diagnosticity and frequency (i.e., the most critical cues). As the large volume of cues represented a challenge to statistical comparison, ratings from each cue were collapsed into their respective categories, resulting in grand ranked means. The assumption of normality for parametric analysis was not met for several cue categories.

Two Friedman's tests were used to determine whether significant differences existed in; 1) the perceived diagnosticity (i.e., operational relevance) of each cue category; and 2) the frequency with which participants rated their perceived use of the cues within each category. Firstly, a Friedman's test compared ranked means for frequency of use for each of the 11 cue-categories. With alpha set at .05, the results revealed a statistically significant effect, $\chi^2(10) = 210.93, p < .001$. Post hoc comparisons were performed between pair-wise means using Wilcoxon Signed-Rank tests, and a Bonferroni adjusted alpha of .001. Significant differences in perceived frequency were found between 36 of the 55 comparisons. Notably, the means for frequency of cues from the *Risk* category were significantly higher than means from all other cue categories.

Secondly, a Friedman's test compared ranked means for diagnosticity for each of the 11 cue categories. Alpha was set at .05. The Friedman's test was significant, $\chi^2(10) = 220.74, p < .001$. Post hoc comparisons were

performed between pair-wise means using Wilcoxon Signed-Rank tests, and a Bonferroni adjusted alpha of .001. Significant differences in perceived diagnosticity were found between 31 of 55 comparisons. Of note, means for perceptions of diagnosticity for *Risk* cues were significantly higher than means from all other cue categories, which is consistent with participants' perceptions of frequency for these cues.

To affirm the assumed relationship between participants' perceptions of frequency and diagnosticity, Spearman's Rho correlations were conducted between means for each cue category's frequency and the means for each cue category's diagnosticity. With alpha set at .05, strong ($r = >.5$), positive, and significant correlations were found between frequency and diagnosticity for each cue category.

Finally, to identify those cues with the highest ratings of diagnosticity and frequency (i.e., the most critical cues), mean ratings of diagnosticity and frequency for each cue were combined, and cues with a combined mean rating of greater than four (i.e., Very relevant/Almost always used) were retained as the most critical cues from the sample. The critical cue inventory is shown in Table 2. As a result of this process, 28 of 73 (38%) of the cues extracted were deemed to be critical to the practitioner sample. Further, consistent with the previous analyses, the most critical cues appeared to be related to the general risk category.

Table 2. A Critical Cue Inventory for Mental Health Professionals (including mean rankings).

| Cue | Mean Rating | Category |
|-------------------------------|-------------|------------------|
| Harm to self | 4.80 | Risk |
| Harm to others | 4.80 | Risk |
| Means | 4.80 | Risk |
| Intention | 4.80 | Risk |
| Support networks | 4.57 | Personal History |
| Conflicts in relationships | 4.48 | Personal History |
| Psychosocial | 4.46 | Personal History |
| Affect | 4.43 | Immediacy |
| Engagement | 4.34 | Immediacy |
| Emotional Expression | 4.33 | Immediacy |
| Coherence | 4.32 | Speech |
| Voice | 4.27 | Physical |
| Coping style | 4.23 | Immediacy |
| Communication style | 4.21 | Immediacy |
| Referral Question | 4.20 | Collateral |
| Lifestyle factors | 4.18 | Personal Info |
| Context appropriate | 4.14 | Speech |
| Developmental Appropriateness | 4.12 | Language |
| Relationship status | 4.11 | Personal History |
| Perceptions | 4.10 | Cognitive |
| Persaverative/Fixated | 4.06 | Speech |
| Divergent/Off topic | 4.06 | Speech |
| Personality/Temperament | 4.03 | Immediacy |
| Extent of insight | 4.02 | Collateral |
| Previous Diagnosis | 4.01 | Medical |
| Manner of narrative | 4.00 | Language |
| Attention | 4.00 | Cognitive |
| Decision-making | 4.00 | Cognitive |

DISCUSSION

The aim of this study was to identify a critical cue inventory utilised by experienced MHPs for use in future training initiatives. This study sought to achieve this aim by: (a) using the critical decision method with a number of experienced MHPS to extract a range of cues used during the initial stages of psychological assessment; and, b) using a survey, investigate whether there are significant differences in MHPs ratings of perceived diagnosticity and frequency of use across the cues extracted, to determine the most critical cues.

The analysis yielded an array of cues; 73 across 11 general categories. This demonstrates that there are a range of cues present in MHPs' memory that can be matched, at least in part, to the operational environment during a client interaction, and which may be used by the MHP to guide the process of assessment. Rasmussen (1983) suggests that cues generate the recognition of critical conditions that may restrict the decision-maker searching for additional cues and their associations. In many ways, these cues appear to guide the MHPs line of investigation for hypothesis generation and further information seeking, and appear to be predictive of certain outcomes such as disorders.

Participants' perceptions of cue diagnosticity and use were significantly correlated, with significant differences in perceptions for each pairing of cue, across both of these dimensions. This suggests that participants demonstrated a capacity to discriminate between fine gradations in the stimulus, a skill consistent with popular conceptions of expertise (Shanteau, 1991). Indeed, decision performance can be predicted by the percentage of relevant cues targeted by experts (Stokes et al., 1997) and experts attend to more relevant cues thereby improving their decision accuracy (Schrivver et al., 2008). Based on this discrimination between cues in apparent relative value and use, the sample of cues was reduced to an inventory of 28 critical cues.

The findings underlines the relative importance of recognising a client's risk of harm to self and others. MHPs rated *Risk* cues as high in diagnosticity and frequency. The ratings of diagnosticity and frequency were substantially higher than those reported for any of the other cue categories identified. This is likely a reflection of the emphasis MHPs place on this information during professional training.

The Recognition Primed Decision model is regarded as combining both the intuitive and analytical processes of decision-making (Klein, 2008) and it appears that both these are evident in initial psychological assessment. Applying Loye's (1983), Welsh and Lyons' (2001), and Wittemann et al.'s (2012) definitions of intuition, firstly as the circumvention of linear cognitive processes, and secondly as the combination of formal knowledge stores and experience that results in automated response sets, it appears that MHPs rely both on practical experience and formalised knowledge stores accumulated during their academic training and continued professional development pursuits. All 12 of the interview participants referred to the application of theoretical models, principles and evidence-based treatments and instruments that they draw upon or referred to during the assessment decision task. Importantly, all of the interview participants reported that they required more than one session with a client to formulate an accurate mental representation, despite this however, they all indicated that there were important cues and associations identified in the initial assessment that formed the basis for the overall assessment. This claim appears to be supported by the breadth and depth of the cues and cue categories elicited from the CTA.

Bhugra et al. (2011) emphasised experienced psychiatrists' reliance on intuition in guiding decisions, this may be an area that warrants further investigation to de-mystify the notion of intuition and perhaps incorporate intuitive clinical decision-making into MHP competent decision-making models and future training initiative developments. Wittemann et al. (2012) suggest that research should attempt to outline the intuitive processes rather than just encourage MHPs to reflect upon intuitive decision-making retrospectively.

The recognition that the development of expertise takes time and effortful engagement within a domain is a luxury that may not always be available. It must be remembered that trainee MHPs generally engage with, assess, and treat clients within a supervised practicum framework near the finalisation of their academic training and this is usually well before they are considered experienced in their practice. It seems reasonable therefore to promote the skill acquisition process and in this case, decision-making competency. This could be achieved through the use of cue-based training, delivered either by increasing trainee MHPs' awareness of the cues available in the operational environment, or alternatively by incorporating the cues within simulated human-systems interface designs, such as a virtual patients. Simulation, as a form of cue-based training has been successfully applied within the aviation industry for testing and training pilot ability (Hays et al., 1992; Wiggins & O'Hare, 2003) and is probably used, at least in part, because there are features of the simulated environment that facilitate, believability, immersion, and presence (Glantz, Graap, & Rizzo, 2003).

Within the context of expertise, it should be noted that a core assumption of CTA is that the discovery of how decision tasks are performed necessitates the use of individuals proficient in the domain in order to generate content rather than process knowledge. That is, knowledge that can be modelled and learned by those considered less proficient in the domain. To date research applying CTA techniques has focused on experts and novices in domains such as aviation (Schrivver et al., 2008), whitewater rafting (O'Hare et al., 1998), emergency control (Flin, Slaven, & Stewart, 1996), and criminal investigation (Morrison et al., 2013). The assessment decision task might be considered diverse from the aforementioned examples, partly because it is not always the immediate goal of the MHP to make critical decisions but rather to filter, synthesise and conceptualise substantial amounts of information presented by the client in verbal and non-verbal arrangements. Further, the current research did not aim to differentiate cue use across expertise, nor did it aim to elucidate the process knowledge of the decision task. Rather it aimed to explore the nature of MHP knowledge with a view to identify the content knowledge utilised, that is, the cues engaged during decision-making. Here it is assumed that MHPs utilise cues and their associations in the operational environment to create a synthesis to form an overall mental model of their clients. Ostensibly, both the level of expertise and the nature of the operational environment may impact decision-making performance and Beilock et al. (2002) suggest that the absence of critical cues from the operational environment results in a reduction in the expert's decision-making accuracy. This may have implications for

MHPs practicing in alternative operational technologically mediated environments such as the telephone, online email or Internet chat rooms. Psychologists have noted the increased use of technology in individuals' lives (Bee et al., 2008; Richards, 2009). As the reliance on technologically mediated methods for mental health service delivery increases and consistent with the general increase in technology use, this may imply that certain operational environments may impede or restrict the availability of critical cues. Indeed, the identification of those critical cues that are impacted due to the operational environment may be important both for the prospective adaptation or modification of alternative operational environments and for training provided to those MHPs practicing in the same. This point is underlined by the current findings, which reveal an emphasis on visual cues. Further, other more online methods of capturing the decision-making processes of MHPs (e.g., eye-tracking) should also be explored.

CONCLUSION

Decisions in mental health assessment are complex, time bound, dynamic and often have important consequences. The NDM framework offers an opportunity to gain insight into the nature of decision-making in mental health assessment from an ecologically valid perspective, which facilitates the application of the results to inform future mental health training initiatives such as virtual patients.

This appears to be the first study to investigate decision-making processes of MHPs within the NDM framework. Klein (1993) offers that NDM is appropriate for use in naturalistic settings where the decisions are challenging in the context of time constraints, high stakes, unclear goals and dynamic conditions. Congruent with the aforementioned decision characteristics, mental health assessment can be considered information-rich, dynamic, often with serious implications or consequences and time-constraints. These characteristics of assessment decisions are particularly evident in the area of risk assessment where the conditions are dynamic, and in some instances the life of the client or others is potentially at risk.

The current research affirms that cue use is an important component of mental health assessment decision-making. These findings offer promising avenues for future research and may be an important first step in developing a greater understanding of the processes involved in MHP decision-making, particularly, those described as intuitive. Importantly, it is not the intention of this research study to reduce the process of MHP decision-making to a reductionist and mechanistic explanation, but rather it is an attempt to begin to unravel the complexities of MHP decision-making within a naturalistic framework.

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