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Using self-report measures in neurobehavioural toxicology: Can they be trusted?

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Abstract

Questionnaires are one of the most common methodologies used in research on neurobehavioural effects in occupational and environmental health, most commonly for gathering information on demographic characteristics, psychological or neurological symptoms, mood state, or exposure to hazards. Questionnaires are self-report measures, so by definition are subjective, although their degree of subjectivity depends on the phenomenon they are measuring. For some phenomena questionnaires are used because they are convenient but the information can be obtained from other sources. For other phenomena questionnaire or self-report is the only way of obtaining the information, for example, feelings and experiences, mood or emotions. Questionnaires are essential tools in psychological and neurobehavioural research as they can tap into aspects of nervous system function that cannot be readily measured in other ways. Despite the obvious need for self-report measures, there are a number of serious issues that threaten their validity as effective indicators of neurobehavioural function. This paper considers the implications of some of the major problems with self-report measures, focusing particularly on current approaches to measurement of symptoms and mood. It includes issues relating to validity of measures such as demand characteristics, malingering and under or over reporting, individual differences and problems of language and question style. It also includes issues relating to the interpretation of self-report measures, the relationship between self-report and performance measures, whether they reflect primary or secondary effects and whether they can be used as diagnostic criteria for neurobehavioural functional effects of occupational or environmental exposure. The paper looks at some of the current approaches to overcoming these problems including using interviews and observational methods and improving psychometric qualities of these measures. Self-report measures are important tools in our arsenal of measures of the neurobehavioural effects of occupational and environmental exposure, but they need to be used with care.

Keywords: Self-report; Questionnaires; Symptoms; Mood state; Neurobehavioural toxicology

Self-report measures are a common component in the arsenal of measures used in studies of neurobehavioural effects. They are used for a range of purposes. These include measures of current state, such as mood or affect, trait measures such as personality, and health status such as symptom reporting. They are also used to obtain information on the demographic characteristics of respondents (e.g., age, work experience, education), and for obtaining information about respondents history of exposure to particular neurotoxicants. The reasons for using self-report measures in neurobehavioural toxicology vary according to the phenomenon being measured. For example, subjective symptoms have been argued to represent the body's first response to low level exposure to hazards (Hanninen et al., 1979; Hawkins, 1990). Furthermore, subjective symptoms may have the most disturbing or handicapping affects (Hanninen, 1989). Symptoms like persistent skin irritation, a slight tremor or on-going anxiety may have greater influence on the person's ability to cope with other demands in their life than more obvious objective symptoms. Probably the main reason for using self-report measures in neurotoxicology or, in fact in any setting, is that some states of consciousness cannot be observed directly. It is not possible to know what a person is experiencing without asking them. Phenomena like fatigue or emotional state cannot be measured directly except by obtaining subjective judgments.

On the other hand, self-report measures have a number of problems that are often overlooked in their use in neurobehavioural toxicology studies. Due to their subjective nature, these measures are potentially vulnerable to distortion due to a range of factors including social desirability, dissimulation or

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response style (Murphy and Davidshofer, 1994; Lezak, 1995). The question is whether the negative aspects of self-report measures can be overcome sufficiently to make them useful and truthful or valid measures for neurobehavioural toxicology.

The aim of this paper is to explore the implications of using self-report measures, to review their use in neurobehavioural toxicology, to examine some of the advantages and disadvantages of their use and finally to discuss potential approaches that might improve their use in these studies.

1. Using self-report measures—the respondents task

While self-report questions are seemingly very simple, a number of authors have pointed out that self-report measures involve a series of related tasks (Schwartz, 1996; Sudman et al., 1996; Tourangeau and Rasinski, 1988). Self-report measures require the respondent to interpret the question, to recall the information being asked about, to form a judgment about the information recalled, to format the response so that it is appropriate to the nature of the question and to edit it if necessary, then to make a response. Any of these steps may not be performed successfully due to a range of factors which can potentially influence the response. This is a serious problem for obtaining valid measures by self-report as typically these measures cannot be validated easily or at all. For this reason it is imperative that self-report measures are as accurate and as psychometrically sound as possible. The next section will discuss some of the major threats to obtaining valid self-report measures.

2. Threats to the validity of self-report measures

2.1. Interpreting questions/responses

Misinterpretation of the question being asked is a potential issue for self-report measures. As language is the medium for eliciting a response in self-report measures, the importance of this issue cannot be overstated. Most obviously, language differences can play a major role in the way respondents interpret self-report questions. Work by Rohlman et al. (2003) on the behavioural assessment and research system (BARS) highlights the need to consider language in designing measures and the improvement in responding that is obtained when language issues are taken into account. Simple translation of questions may not be adequate as meaning may be lost in translation due to cultural differences. Examples abound of poorly translated questions in self-report measures, and this problem can even occur with questions that do not need translation.

In addition, it cannot be assumed that the question is interpreted in the way the researcher intends nor can it be assumed that the same responses mean the same for all people. There are likely to be differences in the semantic or literal meaning of a question and the pragmatic meaning (Sudman et al., 1996). Furthermore, there is long-standing evidence that respondents may not have the same psychological reasons for the same answers. For example, work by Eisenberg (1941) on the reasons for responses on a self-report personality inventory showed that not only were there varying interpretations for the same response, but also the same reasons could be given for completely opposite responses. This could be seen in responses to the question ''Do you like to be alone?'' where nearly one-quarter of respondents reported that they liked to be alone when they were working, but not in social settings, but of these respondents, around one-third had responded Yes and one-third had responded No to the question. More recent research has strengthened the evidence on the importance of paying attention to the understandability of questions (Hunt and Bhopal, 2005; Sudman et al., 1996).

2.2. Recalling relevant information

Recall bias can be a major problem where self-report measures ask for experience over a period of time rather than the current situation. There is very good evidence that people forget experiences over surprisingly short periods of time, even very salient experiences like hospitalisation (Wagenaar, 1986). Self-report questions that ask for recall over some months, such as six or twelve months are very likely to result in invalid responses due to recall bias (Schmeir and Halpern, 2004).

2.3. Form a judgment

Judgments about a self-report question will reflect the respondent's perception of reality. Respondents may preferentially recall and use information that is consistent with beliefs about themselves. There is evidence that self-perceptions of personal characteristics may not be consistent with the perceptions of others, even people very close to the respondent. For example, Rush et al. (2004) showed poor correlations between self-reported personality characteristics and those reported by their partner or 'significant other'. Self-reported conscientiousness was higher and neuroticism was lower than reported by partners.

Respondents may also use information that is consistent with their perceived experiences. For example, they may interpret current symptoms as due to exposure in the past and this judgment may be biased by external incentives such as industrial or legal implications of reporting in a certain way. A study by Moffatt et al. (2000) for example, showed that self-reported illness in people living in the proximity of two industrial sites in the north of England was strongly affected by both worry and proximity of residence to the industry but that worry had the greatest effect on self-reported illness. Other studies have shown similar effects of awareness bias, particularly in studies of occupational or environmental exposure (Forestier and Balassi, 2005).

Furthermore, these effects are likely to vary between settings and over time. It cannot be assumed that responses will be given the same way in all settings. It might be expected that requests for some types of information will be answered differently depending on the degree of anonymity offered to respondents. Related to this, and of particular impact in neurobehavioural toxicology studies, is the potential for respondents' reactions to