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Validation of a One Item Screen for Problem Gambling

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Abstract

A valid 1 item screen (*"In the past 12 months, have you ever had an issue with your gambling?"*) is potentially important in both a primary care setting and in research applications where an extended screen is not practical or affordable. Prior research by Thomas, Jackson, Browning, and Piterman (2010) and Thomas, Piterman and Jackson (2008) found that the 1 item screen provided acceptable performance when compared to the 9-item Problem Gambling Severity Index (PGSI, Ferris & Wynne, 2001). The current study sought to replicate these findings in a different geographic area. Data were collected from a telephone survey of 1,292 respondents in Queensland. Results from the phone survey showed a very high proportion of false negatives (79%), indicating that approximately 4/5 of positively identified problem gamblers from the PGSI refused to admit to having any "issues with (their) gambling" in the last 12 months. Further investigation using Rasch analysis (Andrich, 2004) revealed that while the internal construct validity of the PGSI was good, the 1 item screen was ineffective as an indicator of those who are presently at risk for problem gambling. One possible explanation for the discrepancy with past results is that the present study employed the qualifier of "In the past 12 months" to match with the questions on the PGSI, whereas the prior research excluded this timeframe limit. Nevertheless, the

current study casts doubt on the ability or willingness of people with severe gambling problems to self-diagnose their behavior as problematic.

Validation of a 1 item Screen for Problem Gambling

One major obstacle to providing problem gamblers with support is that very few of them seek professional help (Evans & Delfabbro, 2005). Therefore, it is imperative that those individuals exhibiting at risk behaviour of problem gambling are identified by medical practitioners and other primary care providers. Once an individual is identified as at risk for problem gambling, he/she then can be referred for appropriate treatment. Therefore, it would be desirable to have a reliable, fast, and easy to administer screen that could be used to identify at risk individuals.

Thomas et al. (2008) advocated that they have identified a valid 1 item screen that can be used to identify individuals who are at risk of problem gambling behaviour. This screen comprises one question requiring a Yes or No response: "Have you ever had an issue with your gambling?" Thomas et al. found the 1-item screen to predict problem gambling status as measured by the 9-item Problem Gambling Severity Index (PGSI, Ferris & Wynne, 2001). For example, in a telephone survey conducted in Victoria, Australia, the 1 item scale had a false positive rate of 4% of the sample. Therefore, few people claim to have 'issues with (their) gambling' while at the same time the PGSI contrarily indicates few or no problems. Furthermore, the study had a false-negative rate of 21%, indicating that approximately 1/5 of the

positively identified problem gamblers contrarily indicated that they had no 'issues with (their) gambling.' Consequently, Thomas et al. (2008) recommended the 1 item screen for use by medical practitioners as a reliable and fast means of identifying problem gambling.

The purpose of the present study was to provide further evidence in support for the 1 item screen advocated by Thomas et al. (2008). Therefore, we replicated the study with a randomly selected sample from urban and rural Queensland, Australia. In addition, to more closely match the timeframe specified in the Problem Gambling Severity Index (PGSI, Ferris & Wynne, 2001), the one item measure was modified to include the timeframe qualifier, "*In the past 12 months*, have you ever had any issues with your gambling?"

Method

Participants. In total, 1,292 persons, including 648 male and 644 female respondents, with ages ranging from 18 to 91 years ($M = 53.0$, $SD = 15.9$) participated in a phone survey conducted in Queensland, Australia between July and August, 2009. The cultural identities of the respondents included: Australian (1,025 or 79.3%); English (72 or 5.6%); New Zealander (44 or 3.4%); Indigenous Australian (19 or 1.5%); Scottish (15 or 1.2%); and others (117 or 9.1%). As calculated from the 9-item Problem Gambling Severity Index (PGSI,

Ferris & Wynne, 2001), the problem-gambling status of participants included : 89.5% (1,156) no identifiable problems, 6.8% (88) low risk, 1.9% (24) moderate risk, 1.9% (24) problem gamblers.

Procedure. A random sample of residential telephone numbers was drawn from phonebook records, with completed interviews ($N = 1,292$) representing a 41.5% response rate. Potential respondents in each household were pre-selected as either male or female prior to calling to ensure a balanced representation of gender in the final sample. Respondents within household were chosen by the first birthday method if more than one respondent over 18 of the pre-selected gender resided in the household.

Measures. The PGSI is a reliable and standardised measure of at risk behaviour of problem gambling (Ferris & Wynne, 2001; Jackson, Wynne, Dowling, Tomnay, & Thomas, 2009). Scoring of the PGSI is based on 9 questions designed to measure the degrees of problem gambling involvement. The scale of responses and weightings ranged from 'never = 0', 'sometimes = 1', 'Most of the time = 2', and 'almost always = 3'. Scores of the items are added to give a final score and can range from 0 - 27. Those in the range of 1-2 are considered low-risk, 3-7 moderate risk, and 8+ as problem gambling (Ferris & Wynne). The following 1 item screen was asked of each participant immediately prior to the 9 item PGSI: *"In the last 12 months, have*

you ever had an issue with your gambling?" Unlike the interval-level scoring of the PGSI items, the response of the 1 item screen is dichotomous (Yes = 1 or No = 0).

Data Analysis. Receiver Operating Characteristics (ROC) curve analysis was utilized to examine the ability of the 1 item screen to significantly add value to identifying gamblers with problematic levels of symptoms according to the PGSI (8+) criteria. The ROC analysis additionally provided measures of the *sensitivity* and *specificity* of the 1 item screen in avoiding false negatives (gamblers with many symptoms who do not admit to "issues with (their) gambling") and false positives (gamblers with few symptom who do say they have "issues with (their) gambling"), respectively. In addition, Rasch modelling was employed to examine the performance of individual items on the PGSI screen when combined with the 1 item scale, and thus identify any misfit between items and the construct of problem gambling.

Results

Receiver Operating Characteristics (ROC). The area under the curve (0.592) represents the probability that a randomly chosen positive case of problematic gambling, as identified by the PGSI, will be a person who also admits to having "issues with (their) gambling" in the last 12 months. This statistic was only slightly above the chance

level of 0.5, and showed that the 1 item screen was not significantly better than guessing at problem gambling status ($p = .12$).

Furthermore, the ROC analysis showed that the *sensitivity* of the 1 item screen (.208) showed a high rate of false negatives, with almost 4/5ths of PGSI identified problem gamblers not admitting to having any “issues with (their) gambling” in the last 12 months. In contrast, the ROC analysis showed that the *specificity* (.976) was better, as only a very few gamblers without symptoms admitted to having issues with their gambling in the last 12 months (2.4%).

Rasch Modelling. In order to further investigate the efficacy of the 1 item screen in comparison to the PGSI, an analysis was conducted using Rasch modelling. Rasch analysis is commonly used to investigate the psychometric properties of health-status questionnaires (Barley & Jones, 2006). Rasch analysis is a particularly useful tool in this application because it can give a measure of respondents’ levels of the trait that is being measured, as well as a separate measure of how each respondent should perform relative to each item. Hence, it is a useful tool in the construction of questionnaire instruments because it can detect the presence of misfitting items (Andrich, 2004). In the present study, Rasch analysis was employed to reveal a detailed measure of the functioning of the 1 item screen in relation to the functioning of the 9 items of the PGSI.

In order to determine the psychometric properties of the PGSI instrument and the goodness of fit of the 1 item screen, a Rasch analysis was conducted using Rasch Unidimensional Measurement Modelling (RUMM) 2020 software (Andrich, Sheridan, & Luo, 2005). In this analysis, the 1 item screen was included with the nine items of the PGSI to create a composite scale. The data-analytic approach was to investigate the functioning of the 1 item screen relative to the items of the PGSI (for a description of a Rasch analysis of the PGSI independent of the 1 item screen, see Appendix). Because both the 1 item screen and the PGSI are designed to measure the same unidimensional construct (problem gambling), we predicted that the items would function well together and that no misfit for the 1 item screen would be detected.

It should be noted that the 1 item screen requires a dichotomous (yes or no) response, whereas the nine item PGSI requires a polytomous (Likert scale) response. Because prior research (e.g., Roskam & Jansen, 1989) suggests that the unidimensional polytomous Rasch model can handle dichotomous data sets better than vice versa (e.g., analysing the dichotomization of polytomous data using the dichotomous Rasch model), we analysed our mixed data set using the unidimensional polytomous Rasch model (see Andrich, 1988).

Items were considered misfitting when fit residuals exceeded + 2.5 or – 2.5. Participants with scores of 0 on the composite scale were omitted from the analysis as they indicated no signs of at risk problem gambling behaviour.

Overall fit to the model. After participants with scores of 0 on the 10 item composite scale were removed, the remaining sample consisted of 156 respondents. The Person Separation Index or PSI, which is a measure of internal consistency similar to Cronbach's α , was fair ($r_{\beta} = 0.82$). The person-fit residual indicated a good fit to the model ($M = -0.45$, $SD = 0.80$), however the items-fit residual ($M = -0.89$, $SD = 1.87$) indicated some misfits (e.g., means should be close to 0 while standard deviations should be close to 1). Furthermore, the item-trait interaction ($\chi^2 = 129$, $p < .001$) was significant, indicating misfit between the data and the model. This suggests that the questionnaire and 1 item scale measure more than one construct.

Individual item fit. Substantial misfits were found in two items, including the PGSI question: "*In the past 12 months, have you felt that you might have a problem with gambling?*" (Fit residual = -4.2) and the similarly worded 1 item screen "*In the past 12 months, have you ever had an issue with your gambling?*" (Fit residual = 3.1) (see Figure 1 for the Item Characteristic Curve (ICC) for the one item screen).

Figure 1. Item Characteristic Curve for the 1 item screen – “In the past 12 months, have you ever had an issue with your gambling?”

Note: The theoretical curve represents where expected values of the item should lie if the item is functioning properly. Those with higher levels of the trait (problem gambling) would be expected to fall higher up on the curve the further along the Person Location (degree of the trait for problem gambling) they go. The dots represent the class intervals (based on a probabilistic Guttman response pattern) and demonstrate a flat line indicating no discrimination.

Discussion

Rasch analysis revealed that the 1 item screen (“*In the past 12 months, have you ever had an issue with your gambling?*”) did not discriminate among respondents with varying levels of the trait problem gambling. Therefore, the item was not reliable as a measure of at-risk problem gambling. This can be clearly seen from the Item

Characteristic Curve (ICC) (see Figure 1). Overall, those exhibiting higher levels of the trait “problem gambling” have responded in the same way to the one item screen as those with lower levels of the trait.

This result is consistent with the item analysis which found that responses to the PGSI question, *have you felt that you might have a problem with gambling*, was highly unreliable in predicting problem gamblers (with a 79% false negative error rate). Because so few individuals who are at risk of problem gambling seek help (Evans & Delfabbro, 2005), it is possible that they do not consider themselves to have a problem at all. Alternately, some may realize that they have a problem but fail to report it due to self-presentational concerns. This may explain why the 1 item screen failed to effectively function adequately with the rest of the PGSI. It would also explain why the very similar PGSI item “*In the past 12 months, have you felt that you might have a problem with gambling?*” also fared so poorly. Clearly, the two items are very similar and rely to a large extent on respondents’ subjective interpretations of the extent of their problematic gambling.

An important limitation of this study is to recognize that the screening question was changed from Thomas, Piterman, and Jackson’s (2008) original “have you ever had an issue with your

gambling?" to "*In the last 12 months*, have you ever had an issue with your gambling?" This time-limit qualifier was introduced to more closely match the new screen with the time-frame of the 9 comparison questions drawn from the PGSI. However, it is conceivable that the qualifier also contributed to the reduced performance of the screen relative to the previously reported results. In short, gamblers may be more able or willing to admit to some "past" issues with gambling than more recent problems. The 12 month qualifier is reasonable, however, as the screen is intended to identify current gambling problems.

The continued use of the word "ever" in the screen (cf., Thomas et al., 2008) presents some potential for mixed interpretations by respondents. In the context of the current (modified) question, the term "ever" was intended to emphasize that any gambling issues within the 12 month period should indicate a "yes" answer. Exclusion of the word "ever" might incorrectly imply that the question is asking whether gambling issues were a major concern across the whole 12 month period. However, a minority of respondents may have been confused as to the timeframe of the question.

Lastly, the context of the one item question being asked in a phone survey should also provide some reasons for a cautious interpretation, as people may be more or less likely to admit gambling problems to a family doctor than an anonymous phone interviewer. A

potentially fairer test of the 1 item scale would compare it to a clinical diagnosis in the treatment setting for which it was intended.

On the basis of the present analyses the face-valid question “In the past 12 months, have you ever had an issue with your gambling?” is not demonstrably useful in determining what people need further screening. This research points to the need to find alternatives to relying on gamblers to identify themselves as having gambling problems. People with gambling problems appear to be unable or unwilling to directly admit to having issues with their gambling, despite the evidence of gambling related symptom revealed by the PGSI.

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Appendix

A Rasch analysis was also conducted on the nine items of the PGSI independent of the 1 item screen. The methods and procedure were as described.

Overall fit to the model. After participants with PGSI scores of 0 were removed, the remaining sample consisted of 136 respondents. The PSI was good ($r_{\beta} = 0.85$), indicating an acceptable internal consistency of items. The person-fit residual indicated a reasonable fit to the model ($M = -0.63$, $SD = 1.10$), however the items-fit residual ($M = -0.85$, $SD = 1.23$) indicated some possible misfit (e.g., means should be close to 0 while standard deviations should be close to 1). The item-trait interaction ($\chi^2 = 76.1$, $p < .003$) was significant, indicating overall misfit between the data and the model, suggesting that the PGSI was measuring more than one construct.

Individual item fit. Substantial misfit was found in one item: "In the past 12 months, have you felt that you might have a problem with gambling?" (Fit residual = -3.62).

Discussion. Without the 1 item screen added, the nine items of the PGSI showed an improvement in psychometric properties. The PSI, which is a measure of internal consistency similar to Cronbach's α , increased from ($r_{\beta} = 0.82$) with the 1 item screen to ($r_{\beta} = 0.85$) without. Furthermore, without the inclusion of the 1 item screen, the

item-trait interaction became less significant going from ($\chi^2 = 129, p < .001$) to ($\chi^2 = 76.1, p < .003$), indicating a better overall fit of the data to the model. When the additional misfitting item "*In the past 12 months, have you felt that you might have a problem with gambling?*" was removed from the PGSI, the item-trait interaction became even less significant ($\chi^2 = 62.8, p < .02$), indicating that the violations of unidimensionality were largely to do with the 1 item screen and the misfitting PGSI item: "*In the past 12 months, have you felt that you might have a problem with gambling?*" These two items were evidently measuring more than just the trait of problem gambling.

Unidimensionality is important in Rasch analysis because if items are to function properly they need to be measuring the same phenomenon (see Anderson, 1994).