4

5   **Abstract**

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7   **Introduction.** Public opinions concerning gambling are an important factor in shaping public

8   policy. Little empirical attention has been given to assessing gambling attitudes within the general

9   population. The aim of the present study is to validate the 8-item Attitudes Towards Gambling

10 Scale (ATGS-8) in British individuals and to investigate associations of these attitudes with

11 frequency of gambling and gambling problems.

12 **Methods.** Data were derived from 7746 individuals participating in the British Gambling

13 Prevalence Survey 2010, a comprehensive interview-based survey conducted in Great Britain

14 between November 2009 and May 2010. Confirmatory factor analysis and separate regression

15 analyses were applied.

16 **Results.** The one-dimensional structure of the ATGS-8 was confirmed in the community sample

17 and by gender. Furthermore, more positive attitudes towards gambling were positively related to

18 frequency of gambling and gambling problems.

19 **Conclusions.** The present study extends the previous evaluations of the scale by providing detailed

20 evidence for the utility and usefulness of the ATGS-8 in a community sample and across gender.

21 The ATGS-8 is a valid instrument to assess public opinion on gambling among the general

22 population.

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39 **1. Introduction**

40   Problem gambling is a public health concern in many European countries (Molinaro et al.,

41 2014; Volberg, Gupta, Griffiths, Olason, & Delfabbro, 2010) and it has been associated with

42 significant health and psychosocial problems (Abbott et al., 2013; Lorains, Cowlishaw, & Thomas,

43 2011). The widespread growth of gambling over the past 20 years has placed the regulation of

44 gambling at the foreground of social issues for many governments around the world. As a

45 consequence of a 'policy paradigm shift' concerning public policy towards gambling (Smith et al.,

46 2011), governments have to shape policy in accordance with the parameters of what the public

47 regards as acceptable (McAllister, 2014). In order to implement effective best practice for the

48 regulation of gambling, there is a need to have robust knowledge based on empirical evidence

49 concerning the opinions on gambling regulation within the general population.

50   Despite an extensive focus in gambling studies on cognitive biases and errors associated

51 with gambling (see Spurrier & Blaszczynski, 2014, for a recent review), few studies have surveyed

52 opinions on gambling regulation within the general population at a national level. Previous national

53 studies have shown that overall public attitudes towards gambling appear to be negative in Great

54 Britain (Orford, Griffiths, Wardle, Sproston, & Erens, 2009), Finland (Salonen et al., 2014) and

55 Australia (McAllister, 2014). The theory of planned behavior (Ajzen 1991; 2011) suggested that a

56 person's attitude towards behaviors, subjective norms, and perceived behavioral control influenced

57 individuals' behavioral intentions and behavior. Previous studies have found that more favorable

58 attitudes towards gambling were associated with increased gambling participation and higher

59 gambling problems (e.g., Canale, Vieno, Griffiths, Rubaltelli, & Santinello, 2015; Lee, Back,

60 Hodgins, & Lee, 2013; Orford et al., 2009).

61   Public attitudes towards gambling can be divided into attitudes to gambling in general (i.e.,

62 gambling is dangerous for family life), and more specific attitudes towards such things as the

63 government regulation of gambling (i.e., there are too many opportunities for gambling nowadays).

64 In view of the key role played by public attitudes in determining policy and legislation, it is

65 surprising how little attention has been given to assessing them. The 14-item Attitudes Towards

66 Gambling Scale (ATGS-14) (Wardle et al., 2007) was the first standardized measure of gambling

67 attitudes to be included in a large-scale national prevalence survey – the 2007 British Gambling

68 Prevalence Survey (BGPS; Wardle et al., 2007). Despite the existence of numerous measures of

69 gambling attitudes, which tend to vary depending upon the form of gambling considered (Connolly

et al. 2001; Derevensky et al. 2010; Kassinove 1998; Sutton & Griffiths, 2008), the 14-item ATGS was specifically designed to reflect broad attitudes toward gambling independently from particular forms of gambling (i.e., gambling in casinos, betting on horse races or playing a lottery) or related policy issues (public attitudes towards gambling policy issues of current or future interest in Britain or elsewhere) (Orford et al., 2009). Therefore, interpretation and generalization of findings has been made easy.

In the 2010 survey, there was a reduction of the number of attitude items on the ATGS due to space constraints. Consequently, the 2010 survey included a shortened 8-item scale, the ATGS-8[1]. Therefore, the ATGS-8 has a number of distinct advantages in that it: (i) can assess general attitudes towards gambling, rather than relative to a specific gambling activity (Orford et al., 2009); (ii) can be applied to the general population (including those with gambling problems); and (iii) can be easily embedded within large-scale epidemiological surveys given its short length.

To date, the ATGS-8 has been developed and analyzed in the BGPS population study (Wardle et al., 2011) and was also employed in the 2011 Australian National University (ANU) survey on gambling (McAllister, 2014), and in a population study conducted in 2011 in Finland (Salonen et al., 2014). The objectives of the present study were to test, validate, and further psychometrically analyze the ATGS-8 in the same sample that was used in the original BGPS study (Wardle et al., 2011). In particular, the first aim was to confirm the single-factor solution of the ATGS-8 (McAllister, 2014; Salonen et al., 2014). Since frequency and gambling problems are found to be higher among males (e.g., Shaffer, Hall, & Vander Bilt, 1999), measurement invariance was also tested across gender because this was not done in Wardle et al.'s (2011) original study. The second aim was to ascertain concurrent validity by testing the associations between gambling attitudes and frequency of gambling and gambling problems. In the present study, it was hypothesized that more positive attitudes towards gambling would be particularly associated with frequency of gambling and gambling-related problems (Canale et al., 2015; Lee et al., 2013; Orford et al., 2009).

2. Method

2.1 Participants

Data from the 2010 BGPS were used for the validation of the ATGS-8 (Orford et al., 2009). The analyzed data comprised 7,746 individuals (52% female). The mean age was 46.42 years (SD=18,82) and the majority of the respondents were White/White British (90%) and married

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104   (61%). To ensure British population representativeness, data were weighted based on age, gender,

105   and region (see Wardle et al., 2011 for additional methodological details).

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107   *2.2 Measures*

108   *2.2.1 Attitudes towards gambling*

109   The ATGS-8 by Orford et al. (2009) was used to assess attitudes. All eight items of the

110   ATGS concern attitudinal statements that some people have about gambling (e.g., "People should

111   have the right to gamble whenever they want"). Participants were asked to indicate how much they

112   agreed or disagreed with each attitudinal statement. ATGS-8 items were scored using a Likert scale:

113   1 = "strongly disagree" to 5 = "strongly agree". The sum of eight items forms a total ATGS-8 score

114   (range 8–40). In short, the higher the ATGS score, the more favorable attitudes the individual has

115   towards gambling.

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117   *2.2.2 Gambling-related problems in the previous year*

118   Gambling problems were assessed using an adapted version of the DSM-IV pathological

119   gambling criteria (American Psychiatric Association, 2000; Sproston, Erens, & Orford, 1999;

120   Wardle et al., 2011) recorded in the 2010 BGPS (Wardle et al., 2011). Ten gambling-related

121   problems (e.g., "In the last 12 month have you made unsuccessful attempts to control, cut back or

122   stop gambling?) were assessed (i.e., salience, increased tolerance, problems with spouse and/or

123   other people, work-related problems, and financial problems). Instead of scoring the presence or

124   absence of a symptom, the respondents rated each item on a 4-point scale of the frequency each

125   symptom occurred (0 being 'never' and 3 'very often'). There is a lack of consensus regarding

126   appropriate cutoff scores for determining the problem gambling status of gamblers (Orford, Wardle,

127   Griffiths, Sproston, Erens, 2007). Consequently, total DSM-IV score served as the primary

128   dependent variable as is common in such studies the gambling field. The internal consistency of the

129   total DSM-IV score was .81 (CI = .80/.82).

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131   *2.2.3 Gambling frequency*

132   The 2010 BGPS survey included 16 gambling activities. Participants were asked whether

133   they had participated in any of them during the past year (e.g., "In the last 12 months, how often

134   have you bought scratchcards?"). Participants were further asked to indicate frequency of

135   involvement in those activities (2 + days a week/once a week/once month, less than once a

136   week/less than once a month). The highest frequency of gambling reported in the last 12 months of

137   a gambler was used (Wardle et al., 2011).

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2.3 Analysis

　　　The R (R Core Team, 2013) Package lavaan (Rosseel, 2012) was used to validate the scale and to estimate parameters. A cross validation with a three-step analytic approach was carried out. The original sample was randomly split into three partitions. In the first step (Partition 1), the factorial properties of the ATGS-8 were evaluated. A Confirmatory Factor Analysis (CFA) using robust diagonally weighted least squares for ordinal items (e.g., Likert-type scales) was used to test the structure of the scale. To evaluate the overall model fit, the following indices were used: comparative fit index (CFI), root mean square error of approximation (RMSEA) [90% confidence interval (CI)], and non-normed fit index (NNFI; also known as the Tucker-Lewis index-TLI). In addition, to determine the equivalence of factor structure in different subgroups according to gender, a multi-group CFA was performed to examine measurement invariance of the ATGS-8 across males and females. A hierarchical approach was considered by successively constraining model parameters and comparing changes in model fit (Steenkamp & Baumgartner, 1998). Three models (i.e., configural, metric and scalar) were estimated and represented prerequisites for meaningful across-group comparisons based on factor scales. The use of ΔX^2 values has been criticized because of their sensitivity to sample size (Cheung & Rensvold, 2002). For this reason, testing for invariance was examined through the practical perspective (Byrne & Stewart, 2006), which recommends that invariance can be based on two criteria: (a) the multigroup factor model exhibits an adequate fit to the data and (b) the change in values for fit indices (e.g., ΔCFI, ΔRMSEA) is negligible. A ΔCFI larger than 0.01 and a change larger than .015 in ΔRMSEA is indicative of non-invariance (Canale, Santinello, & Griffiths, 2015; Chen, 2007; Gilson et al., 2013). Finally, to confirm the concurrent validity of the ATGS-8, separate regression models were performed. In all models, variables of attitudes towards gambling[2], as well as age and gender were the independent variables, whereas frequency of gambling and gambling problems were the dependent variables. Following Cudeck and Brown (1983), a cross validation strategy was used in which the observed-variables model was developed (second step) using a calibration data sample (Partition 2) and then confirmed (third step) using an independent validation sample (Partition 3). Two regression analyses with gambling frequency and gambling problems as outcome variables with both partitions (partition 2 and partition 3) were performed. Therefore, the sample was randomly split into three partitions, all containing one-third of the data (n=2582): Partition 1 (51% female; mean age= 46.47; SD=18.52); Partition 2 (52% female; mean age= 46.63; SD=18.99); and Partition 3 (51% female; mean age= 46.17; SD=18.92). The three groups did not differ as far as concern gender and age.

3. Results

3.1. Confirming the factor structure

The percentages of item endorsements and item loadings are shown in Table 1. Public opinion was generally negative towards gambling in Britain. In fact, 70% believed that there are too many opportunities for gambling. However, there was little support for banning gambling. Only 14% supported banning gambling, and 61% agreed that people should have the right to gamble whenever they want. However, it is worth noting that only 40% of respondents agreed or strongly agreed with the statement that gambling should be discouraged in Britain. The internal consistency of the ATGS was good [α = .78 (CI = .77–79)]. The results of the CFA revealed high and homogenous item loadings that were 0.50 or higher (see Table 1). The fit indices revealed a good model fit with CFI and NNFI values of 0.98 and 0.98, respectively. The RMSEA value was .07 (.06–.08) and therefore a reasonable approximate fit.

3.2. Measurement invariance across gender

Before measurement invariance testing, the one-factor ATGS-8 model was estimated separately in both male and females. Results demonstrated that the model fit was adequate for both men and women (see Table 2). A configural model was first established as a baseline model, and all parameters were freely estimated (unconstrained) across gender. Fit indices showed that this model had adequate fit for the data suggesting that the factor structure is similar across groups. A subsequent metric model that tested for invariance of all factor loadings was established. All item loadings were related to each factor, and were constrained to equality. Fit statistics showed that this model (compared to the configural model) did not result in a significant degradation of fit (ΔCFI=.000; ΔRMSEA=.005), suggesting that the scale assesses similar underlying factors across both males and females. Scalar invariance was tested by constraining the intercept of each item while maintaining constraints on the factor loadings. Fit statistics showed that this model (compared to the metric model) did not result in a significant degradation of fit (ΔCFI=.006; ΔRMSEA=.012).

3.3. Link with frequency of gambling and gambling problems

Separate regression analyses were performed to determine the concurrent validity of the scale (see Table 3). More positive gambling attitudes were associated with higher levels of gambling frequency and gambling problems. Retesting the model on the validation sample (Partition 3) showed that the standardized parameters, R^2 of each endogenous variable and the direct

206 effects of gambling attitude on gambling frequency and gambling problems (see Table 3) were
207 largely in accordance with the development sample (Partition 2).

208

209 **4. Discussion**

210   The present study extends the information and psychometric testing of the ATGS-8 by using
211 a cross-validation strategy and more robust statistical analyses to provided other measurement
212 properties not investigated in the original analysis by Wardle et al. (2011), such as model fit and
213 measurement invariance of the ATGS-8 across gender (males vs. females). The scale had
214 acceptable internal consistency with the expectancy dimension equal to the required α = 0.70
215 threshold (Nunnally & Bernstein, 1994). The hypothesized single-factor structure of the ATGS-8
216 (McAllister, 2014; Salonen et al., 2014) provided a good fit to the data. The overall public attitudes
217 towards gambling were negative in Great Britain. This result is also consistent with previous studies
218 using the same instrument that overall public opinion is generally negative towards gambling in
219 Finland (Salonen et al., 2014) and Australia (McAllister, 2014). However, there are notable
220 differences between the populations that necessitate future evaluations. For example, although more
221 than 70% of respondents believed that gambling should be discouraged in Australia (90% in
222 Finland), only 40% of British respondents agreed or strongly agreed with this statement. In general,
223 Australian and Finnish' opinions are more strongly expressed than those of their British
224 counterparts, perhaps because of the greater degree of public discussion concerning public policy
225 towards gambling in Australia and Finland, resulting in greater familiarity with the main arguments
226 (McAllister, 2014).

227   Furthermore, the invariance of the ATGS-8 across gender was established. This is an issue
228 that has not been addressed in previous evaluations of the scale (McAllister, 2014; Salonen et al.,
229 2014; Wardle et al., 2011) and is important as it shows that the ATGS-8 scale scores are not
230 confounded by gender and that they can be used to make meaningful comparisons between levels of
231 males' and females' attitude. Separate regression analyses in both partitions demonstrated that
232 people who had more positive attitudes towards gambling were more likely to participate in
233 gambling activities and to have gambling related problems. These results confirm that favorable
234 attitude towards gambling is associated with more gambling (Canale et al., 2015; Lee et al., 2013;
235 Orford et al., 2009), and for this reason, favorable attitudes may be considered as an important risk
236 factor to be reduced. In addition, the present findings highlight the good concurrent validity of the
237 scale.

238   The present study clearly has some limitations. Firstly, the data were self-report and subject
239 to standard limitations (e.g., memory recall biases, social desirability, etc.). Secondly, the sum of

gambling problems may not be an appropriate proxy for problem gambling severity. Thirdly, the effects found in the present study were modest, suggesting that additional factors are likely to be influential in the development of gambling problems. Other unconsidered factors associated with gambling (e.g., reasons for gambling [Canale, Santinello, & Griffiths, 2015]) or the community (different countries; Molinaro et al., 2014) may also be predictive of gambling-related variables.

5. Conclusions

The present study extends the previous psychometric evaluations of the scale (McAllister, 2014; Salonen et al., 2014) by providing detailed evidence for the utility and usefulness of the ATGS-8 in a community sample and across gender (males vs. females). The ATGS-8 is an instrument with good psychometric properties and useful for assessing gambling attitudes among the general population.

Notes

[1] The development of the ATGS-8 is described in greater detail in the report of the 2010 BGPS (Wardle et al., 2011).

[2] After the factor solution was confirmed, factor scores were calculated for gambling attitudes, and were used in the regression analyses.

References

Abbott M., Binde P., Hodgins D., Korn D., Pereira A., … & Williams, R. (2013). Conceptual framework of harmful gambling: An international collaboration. Guelph, ON: Ontario Problem Gambling Research Centre.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179-211.

Ajzen, I. (2011). The theory of planned behaviour: Reactions and reflections. *Psychology and Health*, *26*(9), 1113-1127.

American Psychiatric Association (2000). *Diagnostic and Statistical Manual of Mental Disorders, (4th edn, text revision)*.Washington, DC: American Psychiatric Association.

Canale, N., Santinello, M., & Griffiths, M. D. (2015). Validation of the reasons for gambling questionnaire (RGQ) in a British population survey. *Addictive Behaviors*, *45*, 276-280.

Canale, N., Vieno, A., Griffiths, M. D., Rubaltelli, E., & Santinello, M. (2015). How do impulsivity traits influence problem gambling through gambling motives? The role of perceived gambling risk/benefits. *Psychology of Addictive Behaviors*, *29*(3), 813-823.

274 Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance.
275   *Structural Equation Modeling*, *14*(3), 464-504.

276 Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness of-fit indexes for testing
277   measurement invariance. *Structural Equation Modeling: A Multidisciplinary Journal*, *9*,
278   233–255.

279 Connolly, D., Williams, R., & Morris, J. (2001). *Impact of statistical knowledge on gambling*
280   *attitudes and behaviour of university students.* Lethbridge, AB: Alberta Gaming Research
281   Institute.

282 Cudeck, R. & Brown, M.W. (1983). Cross-validation of covariance structures, *Multivariate*
283   *Behavioral Research*, 18, 147-57

284 Derevensky, J., Sklar, A., Gupta, R., & Messerlian, C. (2010). An empirical study examining the
285   impact of gambling advertisements on adolescent gambling attitudes and behaviors.
286   *International Journal of Mental Health and Addiction, 8*(1), 21–34.

287 Gilson, K. M., Bryant, C., Bei, B., Komiti, A., Jackson, H., & Judd, F. (2013). Validation of the
288   Drinking Motives Questionnaire (DMQ) in older adults. *Addictive Behaviors*, *38,* 2196–
289   2202.

290 Kassinove, J. I. (1998). Development of the gambling attitude scales: Preliminary findings. *Journal*
291   *of Clinical Psychology, 54*(6), 763–771.

292 Lee, C. K., Back, K. J., Hodgins, D. C., & Lee, T. K. (2013). Examining antecedents and
293   consequences of gambling passion: the case of gambling on horse races. *Psychiatry*
294   *Investigation*, *10*(4), 365-372.

295 Lorains F.K., Cowlishaw S., & Thomas S.A. (2011). Prevalence of comorbid disorders in problem
296   and   pathological gambling: systematic review and meta-analysis of population surveys.
297   *Addiction*, 106, 490–498.

298 McAllister, I. (2014). Public opinion towards gambling and gambling regulation in Australia.
299   *International Gambling Studies*, *14*(1), 146-160.

300 Molinaro, S., Canale, N., Vieno, A., Lenzi, M., Siciliano, V., Gori, M., & Santinello, M. (2014).
301   Country-and individual-level determinants of probable problematic gambling in
302   adolescence: a multi-level cross-national comparison. *Addiction*, *109*(12), 2089- 2097.

303 Nunnally, J. C., & Bernstein, I. H. (1994). The assessment of reliability. *Psychometric Theory*, *3*,
304   248-292.

305 Orford, J., Griffiths, M., Wardle, H., Sproston, K., & Erens, B. (2009). Negative public attitudes
306   towards gambling: findings from the 2007 British Gambling Prevalence Survey using a new
307   attitude scale. *International Gambling Studies*, *9*(1), 39-54.

308   R Core Team (2013). *R: A language and environment for statistical computing [Computer software*
309   *manual]*. Vienna, Austria. Retrieved from http://www.R-project.org/ (last accessed October
310   4, 2015).

311   Rosseel, Y. (2012). Lavaan: An R package for structural equation modeling. *Journal of Statistical*
312   *Software, 48*(2), 1–36.

313   Salonen, A. H., Castrén, S., Raisamo, S., Orford, J., Alho, H., & Lahti, T. (2014). Attitudes towards
314   gambling in Finland: a cross-sectional population study. *BMC Public Health*, *14*(1), 982.

315   Shaffer, H. J., Hall, M. N., & Vander Bilt, J. (1999). Estimating the prevalence of disordered
316   gambling behavior in the United States and Canada: a research synthesis. *American Journal*
317   *of Public Health*, *89*(9), 1369-1376.

318   Smith, G. J., Schopflocher, D. P., el-Guebaly, N., Casey, D. M., Hodgins, D. C., Williams, R. J., &
319   Wood, R. (2011). Community attitudes toward legalised gambling in Alberta. *International*
320   *Gambling Studies*, *11*, 57–79.

321   Sproston K., Erens B., & Orford J. (1999). *Gambling Behaviour in Britain: Results from the British*
322   *Gambling Prevalence Survey.* London: Gambling Commission.

323   Spurrier, M., & Blaszczynski, A. (2014). Risk perception in gambling: A systematic review.
324   *Journal of Gambling Studies*, *30*(2), 253-276.

325   Steenkamp, J. E. M., & Baumgartner, H. (1998). Assessing measurement invariance in cross-
326   national consumer research. *Journal of Consumer Research*, 25, 78–90.

327   Sutton, R. & Griffiths, M. D. (2008). The Casino Attitudes Scale: The development of a new brief
328   psychometric instrument. *International Journal of Mental Health and Addiction*, *6*, 244-248.

329   Volberg, R. A., Gupta, R., Griffiths, M. D., Ólason, D. T., & Delfabbro, P. (2010). An international
330   perspective on youth gambling prevalence studies. *International Journal of Adolescent*
331   *Medicine and Health*, *22*(1), 3-38.

332   Wardle H., Moody A., Spence S., Orford J., Volberg R., Jotangia D. … & Dobbie, F. (2011).
333   *British Gambling Prevalence Survey 2010.* London: Her Majesty's Stationery Office.

334   Wardle, H., Sproston, K., Orford, J., Erens, B., Griffiths, M.D., Constantine, R. & Pigott, S. (2007).
335   *The British Gambling Prevalence Survey 2007.* London: The Stationery Office