The initial measurement structure of the Home Drinking Assessment Scale (HDAS)

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Abstract

Aims: To evaluate the initial psychometric properties of a novel Home Drinking Assessment Scale (HDAS)

Design and Methods: Internet-based survey analysed using a two-stage factor analysis protocol and internal consistency (IC) assessment.

Findings: The items comprising the HDAS were found to offer the best fit to data in when comprising two-subscales, (1) *emotional reasons for home drinking* (5-items) and (2) *practical reasons for home drinking* (3-items). Subscale 1. was found also to have acceptable IC whereas subscale 2. exhibited sub-optimal IC characteristics.

Conclusions: This initial study indicates the HDAS has promise as a measure of the individuals' rationale for home drinking. Subscale 1. May usefully be used in future research whereas the IC characteristics of subscale 2. suggests further development is required, including the evaluation of additional items.

Keywords: Alcohol; Alcohol-related harm; Behavioural assessment; Cognition; Home drinking;

Introduction

Per capita consumption has been falling in the England and Wales steadily since 2004 (Alcohol Policy UK 2009). However the context in which alcohol is consumed has changed markedly over the past 30 years and arguably the major shift is greater consumption of alcohol at home. The Living Costs and Food Survey revealed that from1992 until 2012 there was a 33% increase in the amount of alcohol purchased for home consumption. This was accompanied by a fall in on trade sales of alcohol of 42% from 2002-2011 (Health and Social Care Information Centre 2014).

Foster and Fergusson (2012) conducted a review of the literature from 2000-2011 that consisted of six articles from an original pool of 48. The most comprehensive study was Holloway et al (2008), this was a telephone survey of adults followed up with 63 in-depth interviews. The headline finding was that the main venue of drinking was at home or friends/family houses and drinking at home was (in contrast to binge drinking) non-problematic and largely, risk free. Most of the other work to date has been conducted by the Foster et al research group which draws on the findings of four focus groups conducted in Blackpool, England. They found a more nuanced understanding of risk (Foster and Heyman 2013). The participants were aware that drinking at home involved a form of "calculated risk" but the risks they acknowledged were acute ones such as falling over, being sick or getting involved in fights. In contrast long term health risks were minimised, or dismissed. Foster et al (2010) described an explanatory model for home drinking that found the reasons for drinking at home revolved around cost, convenience, and relaxation.

There have been some studies since the aforementioned review. The majority have concerned pre loading which is drinking before going out to pubs bars and night clubs but this is outside the main scope of this paper. Foster et al (in press) have suggested there are two types of home drinking. Firstly, "In home", this is linked to going out and presents a challenge for policy makers because it creates visible problems that demand a response. Secondly "At home" drinking is largely seen as risk-free and creates tensions for policy makers because it involves regulating a private space. 2014).

However to date there has been little attempt to collect data systematically examine "At home" drinking, this may in part, being a consequence of a lack of suitable measure. This aim of the current investigation is to evaluate the psychometric properties of a new measure to assess reasons for home drinking, the Home Drinking Assessment Scale (HDAS).

Method

Design

This paper reports the results of an internet survey published on line using survey gizmo software. The original participants were University of Greenwich staff recruited alphabetically via the university address book (response rate 26%) and thereafter booster samples were obtained using when the web link was distributed via twitter and facebook. The emails were sent to the participants in batches of 100 over a three month period (March-June 2011). Table 1 show the components of the full survey tool, this paper focuses on Motivations for drinking at home only. A Pilot investigation where thirty individuals were asked to provide feedback as to the understandability and comprehensiveness of the measure and to nominate what was the main reasons for drinking at home from three options; a) cost, b) relaxation c) other. The primary reason given was to relax (71%) and a power calculation was made to establish that 371 participants were required to achieve the reliability of the HDAQ with a $\pm$ 5% assuming 95% certainty.

TABLE 1. ABOUT HERE.

Participants

Five-hundred and twenty-five participants completed the HDAS. The characteristics of participants in the study are summarised in Table 2. Fifty eight percent were female and 70% were aged between 20-49.

TABLE 2. ABOUT HERE

The nine items that constituted Component B are shown in Table 3. The nine items combined produced a Cronbach alpha of 0.83 this means the scale has prima facie internal consistency.

Subsequent Statistical analysis

The optimization of the HDAS measure was achieved by a two-stage process of exploratory factor analysis (EFA; Kline, 2000) followed by a confirmatory factor analysis (CFA; Byrne, 2012). Given that the dataset includes more than double the minimum N for any single analysis, a random split-half approach was taken comprising complete data, thus furnishing two independent datasets for EFA and CFA exceeding a minimum N>200. Statistical analysis was conducted using the statistical software packages PASW version 18 (SPSS, 2009a,b) and the Analysis of Moment Structures (AMOS) version 18 (Arbuckle, 1995-2009).

Exploratory factor analysis

Principal components extraction was used for initial component condensation (Kline, 2000) followed by an oblique factor rotation, the accepted approach when extracted components are likely to be correlated (Redshaw et al., 2009). Item-component loadings were considered meaningful if a loading coefficient of at least 0.40 was observed (Jomeen and Martin, 2004; Upton and Upton, 2006). Items that loaded on more than one component or had an item-component loading below 0.40 were rejected.

Confirmatory factor analysis

CFA evaluates how well data statistically ‘fits’ a factor structure and allows the model identified by EFA to be evaluated within a second dataset. A maximum-likelihoods (ML) estimation approach was chosen (Byrne, 2012; Kline, 2000). Multiple goodness of fit tests were used (Bentler and Bonett,1980; Hollins Martin and Martin, 2014) these being the comparative fit index (CFI; Bentler, 1990) and the root mean squared error of approximation (RMSEA; Byrne, 2012). CFI values in excess of 0.90 indicate an acceptable model fit to data (Hu and Bentler, 1995). A value of 0.95 or greater is indicative of a good fit to data (Hu and Bentler, 1999). RMSEA estimations of less than 0.08 are considered acceptable for model evaluation (Browne and Cudeck, 1993). RMSEA values of 0.06 or less indicate a good model fit (Schumaker and Lomax, 2010).

Internal consistency

The internal consistency of identified HDAS subscales and the total scale was evaluated using Cronbach's alpha (Cronbach, 1951). A Cronbach's alpha internal consistency of 0.70 indicates acceptable internal consistency (Kline, 2000).

Composite reliability

Cronbach's alpha may underestimate reliability due to correlated errors in a structural model. Raykov's rho (Raykov, 1998; 2001) calculates an index of reliability that takes into account correlated errors and thus may provide a more accurate index of reliability. Threshold levels of Raykov's rho are the same as those of Cronbach's alpha. The composite reliability of identified HDAS subscales and the total scale was thus also evaluated using Raykov's Rho.

Results

Exploratory factor analysis

Following factor extraction and oblimin rotation, three components were identified, all with eigenvalues greater than 1, explaining 61% of the total variance. Scrutiny of the scree-plot (Figure 1.) however, suggested that a two-component solution was more appropriate. The PCA was then rerun specifying a two-component solution explaining 48% of the common variance. The component loadings of the individual HDAS items are shown in Table 3. The components were clearly differentiated and no cross-loading items were identified.

FIGURE 1. ABOUT HERE

TABLE 3. ABOUT HERE

Confirmatory factor analysis

Measurement evaluation of the two-factor structure identified by EFA was conducted using the second random split-half dataset (N=219). Model fit was found to be relatively modest based on established acceptability criteria, $\chi^2_{(df = 26)} = 81.56$, $p < 0.001$, $\chi^2/df = 3.14$, CFI = 0.82 and RMSEA = 0.10. Examination of the individual item performance and contribution to the overall fit of the model suggested that item 6. 'I drink alcohol at home because I do not feel comfortable drinking out' was a problematic item within the scale. The CFA was then rerun excluding item 6. which resulted in an improved and acceptable model fit, $\chi^2_{(df = 19)} = 37.58$, $p < 0.007$, $\chi^2/df = 1.98$, CFI = 0.93 and RMSEA = 0.07[1]. This model was therefore representative of an acceptable fit to the data in relation to the CFI and RMSEA, however, scrutiny of modification indices suggested that the model could be improved further by correlating the error terms of HDAS question 1 '*I prefer to drink alcohol at home rather than a pub/restaurant etc*' and HDAS question 4 '*I drink alcohol at home because it is safer than going out*'. This resulted in an improved, acceptable and best-fit model, $\chi^2_{(df = 18)} = 30.97$, $p = 0.03$, $\chi^2/df = 1.72$, CFI = 0.95 and RMSEA = 0.06. The CFA model of this best-fit two-factor model is summarised statistically and diagrammatically in Figure 2.

FIGURE 2. ABOUT HERE

[1] It was noted that in the resulting two-factor CFA model that item-7 has a low loading onto Factor 2. Though a reanalysis excluding this item improved model fit very slightly, it is of note that such an approach would result in a factor comprising just two items. It was therefore felt appropriate *at this time* to keep this item (item 7).

HDAS subscales internal consistency

Calculated Cronbach's alpha of HDAS subscale 1. (Factor1.) and HDAS subscale 2. (Factor 2.) were 0.73 and 0.44 respectively. The total scale (8-items) Cronbach's alpha was 0.61.

HDAS subscales composite reliability

Calculated Raykov's rho of HDAS subscale 1. (Factor1.) and HDAS subscale 2. (Factor 2.) were 0.91 and 0.91 respectively. The total scale (8-items) Raykov's rho was 0.92.

Discussion

The HDAS shows promise as a measure of the motivations underpinning home drinking in adults. Factor 1 which we have termed "Emotional Reasons for drinking at home" (5 items) may usefully be applied in future research. Factor 2 has the provisional title "Practical Reasons for Drinking at Home" however the low alpha suggests that other items are required to supplement the scale e.g. to play computer games and continue to drink or to hold parties at home and further testing of these or similar items is required to supplement Factor 2. This study was not without limitations. One potential issue in terms of generalisability of the findings concerns the participant population which was drawn from the University sector. It is possible that this particular population may not be representative of the general population and this may therefore impact not only on HDAS sub-scale scores, but also potentially, the underlying factor structure of the instrument. It is therefore suggested that future studies seek to confirm the observations from the current study in other groups in order to determine both factorial stability and mean representative scores for different groups. Evaluation of the invariance characteristics of the tool would also be a valuable goal of further research endeavour in order to be confident of the veracity of comparisons between distinct groups. A further potential issue which should be addressed by further research enquiry concerns item-7 which had a relatively modest loading on Factor 2. Evaluation of the performance of this item within the context of future empirical research will help address whether revision, inclusion or exclusion of this item is appropriate. A further important consideration concerns the reliability estimations and in particular, the inconsistency between Cronbach's alpha and Raykov's rho. Cronbach's alpha was observed to be satisfactory only for factor 1. However, Raykov's rho revealed excellent composite reliability for both HDAS sub-scales and the total HDAS scale. Given that Raykov's rho accommodates correlated errors within the calculation process, it is possible that these errors may be impacting negatively on internal consistency estimations thus deflating Cronbach's alpha. In summary, the HDAS has potential as an internet based measure of the motivations for home drinking in adults and the emotional sub scale can be used with some confidence further work is required to test and augment the Practical reasons for drinking.

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Table 1: Components of the Full Survey Tool:

- Frequency and level of alcohol consumption (including the 10-item AUDIT (Saunders et al 1993) (Component A)
- Motivations for drinking at home (Component B)
- Activities associated with drinking at home (Component C)
- Alcohol purchasing behaviour (Component D)
- Attitudes towards alcohol. (Component E)

Table 2: Socio-Demographic Profile of the participants (n=525):

Variable	Number	Percentage
Gender		
Male	219	42
Female	302	58
Age		
< 20	1	< 1%
20-29	110	21
30-39	146	28
40-49	119	23
50-59	111	21
60 and Over	35	7
Living Situation:		
Alone	94	18
Partner Only	183	35
Partner and Children	133	25
Parents	25	5
Friends	47	9
Children only	19	4
Other	20	4
Source		
University Address Book	495	94
Twitter	19	4
Facebook	11	2

Missing Values: Gender 4 (< 1%), Age, 3 (< 1%), Living Situation 4 (< 1%).

Table 3: Component loadings of the HDAS subscale items following principal components analysis and oblimin rotation.

HDAS item	HDAS question	Factor 1	Factor 2
HDAS 1	I prefer to drink alcohol at home rather than a pub/restaurant etc	.77	
HDAS 2	I drink alcohol at home because it helps me relax	.52	
HDAS 3	I drink alcohol at home because it is convenient	.76	
HDAS 4	I drink alcohol at home because it is safer than going out	.69	
HDAS 5	I drink alcohol at home because I have children I cannot leave home if I go out		.77
HDAS 6	I drink alcohol at home because I do not feel comfortable drinking out.	.64	
HDAS 7	I drink alcohol at home because it is difficult to smoke in licensed premises		.49
HDAS 8	I drink alcohol at home because it is cheaper than drinking at pub/bar/restaurants etc	.70	
HDAS 9	I drink alcohol at home because I do not have to drink and drive		.58

Figure 1. Scree plot revealing the optimal selection of factors is a two-factor solution based on the components identified before the point of inflection.

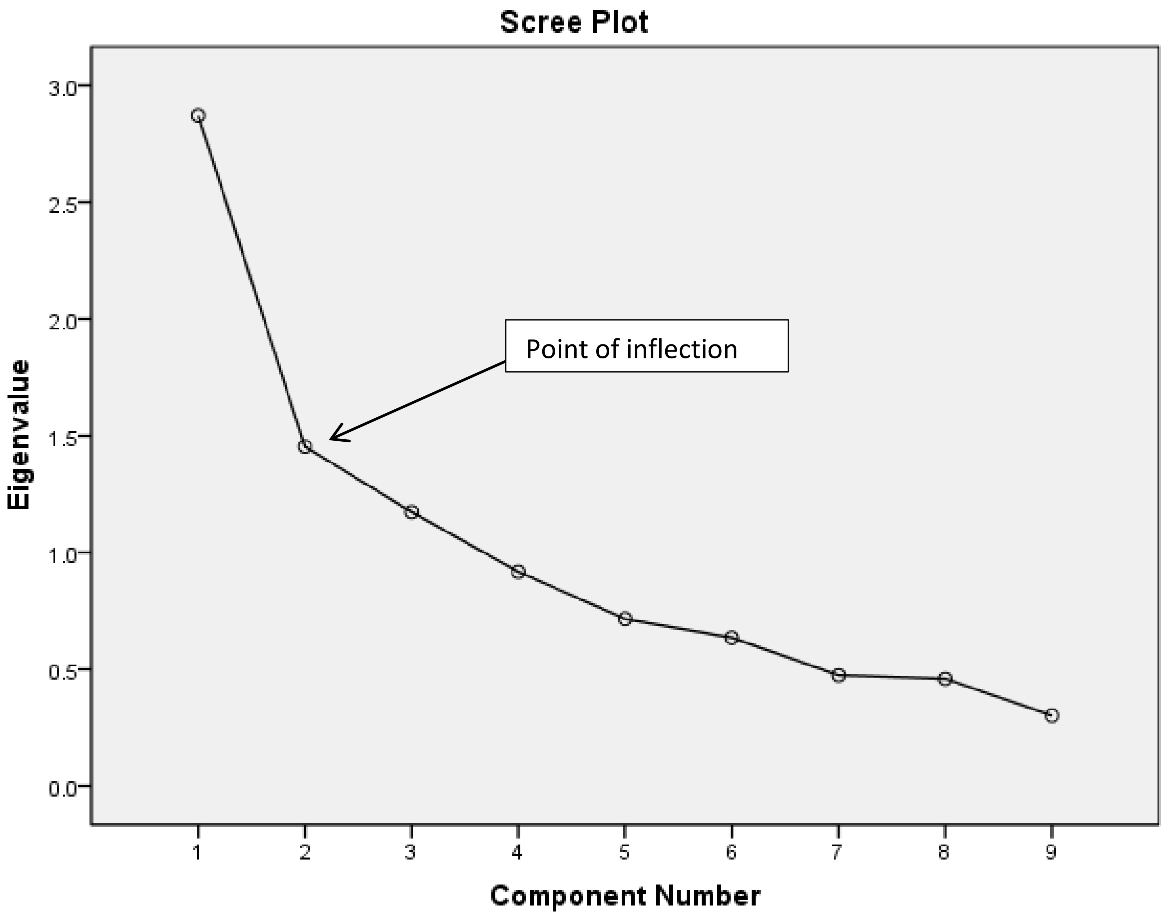
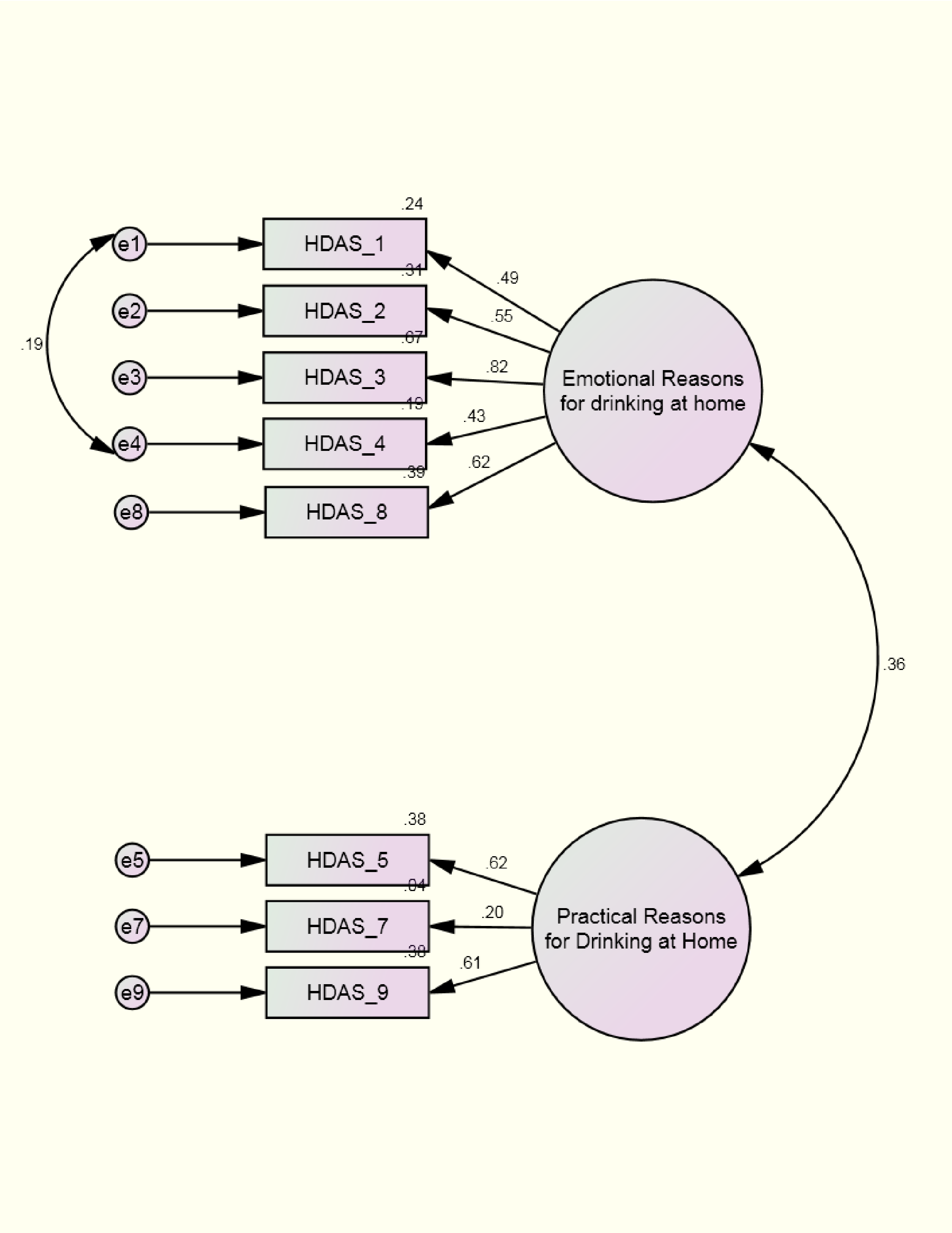


Figure 2. Final measurement model of the HDAS following model respecification and confirmatory factor analysis.



Item-factor loadings, squared multiple correlations and factor covariances are standardised.