Development and validation of the DISCUS scale: A reliable short measure for assessing experienced discrimination in people with mental health problems on a global level

Ioannis Bakolis [a, b, *], Graham Thornicroft [a, c], Silia Vitoratou [b], Nicolas Rüsch [d], Chiara Bonetto [e], Antonio Lasalvia [e, f], Sara Evans-Lacko [c, g]

[a] Centre for Implementation Science, Health Services and Population Research Department, Institute of Psychiatry, Psychology and Neuroscience, King's College London, London, United Kingdom
[b] Department of Biostatistics and Health Informatics, Institute of Psychiatry, Psychology and Neuroscience, King's College London, London, United Kingdom
[c] Centre for Global Mental Health, Health Services and Population Research Department, Institute of Psychiatry, Psychology and Neuroscience, King's College London, London, United Kingdom
[d] Department of Psychiatry II, University of Ulm and BKH Günzburg, Germany
[e] Section of Psychiatry, Department of Neurosciences, Biomedicine and Movement Sciences, University of Verona, Verona, Italy
[f] UOC Psichiatria, Azienda Ospedaliera Universitaria Integrata (AOUI) di Verona, Verona, Italy
[g] Personal Social Services Research Unit, London School of Economics and Political Science, London, United Kingdom

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ABSTRACT

Background: The Discrimination and Stigma Scale (DISC-12) was specifically developed to measure experienced and anticipated discrimination reported by people with mental health problems. However, the length of the DISC-12 may represent a disadvantage especially in country settings with limited human capacity and infrastructure. The purpose of the study was to develop a short version of DISC-12 (DISCUS) to address these limitations.
Methods: Data from 1087 participants with major depressive disorder and 732 patients with schizophrenia were collected as part of two research network studies across 35 countries - Anti Stigma Programme European Network (ASPEN) and International Study of Discrimination and Stigma (INDIGO). We used a Meta Exploratory Factor Analysis (meta-EFA) and a Multiple Causes Multiple Indicators (MIMIC) Model to reduce the number of items in the DISC-12 scale. The validity and reliability of the reduced scale (DISCUS) was tested in 202 people with the full spectrum of mental disorders recruited in a cross-sectional study conducted in South London. Psychometric validation for the reduced scale used confirmatory factor analysis and measures of Cronbach's alpha and Pearson's correlation coefficient.
Results: meta-EFA reduced twenty-one items to twelve items. An additional item was discarded with the use of the MIMIC model. The 11-item DISCUS demonstrated excellent reliability (Cronbach's alpha >0.85), good fit (Tucker Lewis Index and Comparative Fit Index value>0.9) and weak to moderate construct validity.
Conclusions: The DISCUS scale is a consistent and valid instrument to measure experienced and anticipated discrimination predominantly in personal and social relationships in global settings.

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1. Introduction

Stigma and discrimination have significant negative consequences for people with mental health problems in terms of social exclusion from relationships with friends and family or intimate relationships (Webber et al., 2014), barriers to participation in community activities and social life (Angermeyer et al., 2014; Lasalvia et al., 2013) and discouraging help-seeking (Clement et al., 2015). Moreover, there are significant measureable economic impacts in terms of employment, income, health service use and social participation (Evans-Lacko et al., 2015; Wright et al., 2015). Although evidence is growing in relation to effective interventions

to reduce stigma and discrimination (Corrigan et al., 2012; Thornicroft et al., 2016), mechanisms which explain the underlying processes and how these could be improved are insufficiently developed (Evans-Lacko et al., 2014).

Inclusion of valid and reliable measures for assessing discrimination experienced by people with mental health problems in large-scale studies could facilitate identification of key factors which promote a reduction in discrimination, and identify mediators and moderators which mitigate the negative consequences when it does occur. The complexity of mental health constructs are usually captured with composite measurement scales based on a large number of items (Garratt et al., 2002). However, the burden of long scales and the increasing need for multiple instruments in the same study have created a need to reduce the number of scale items while retaining psychometric properties. Given these issues which are prevalent across many large-scale studies, researchers should take advantage of the robust methods and processes to facilitate briefer and more feasible assessment instruments (Coste et al., 1997).

The Discrimination and Stigma Scale (DISC-12) is a psychometrically valid structured interview specifically designed to assess the scope and content of experienced and anticipated discrimination in people with mental health problems. In this context, discrimination is the behavioural element, where stigma is considered to comprise problems related to knowledge, attitudes and behaviour (Thornicroft et al., 2007). The DISC-12 has been tested across a number of social contexts such as the workplace, healthcare and family settings; and among different populations including people with different types of mental disorders, and across different geographical contexts (Lasalvia et al., 2013; Thornicroft et al., 2009; Corker et al., 2015; Oshodi et al., 2014; Milačić Vidojević et al., 2015; Brouwers et al., 2016). It was developed using focus groups of people with a diagnosis of schizophrenia in 27 countries (Thornicroft et al., 2009). Different versions of the scale have been developed over time, with the aim to increasingly improve both content validity and usability. The current version, the DISC-12, comprises 22 items and its length can be a disadvantage, especially if implemented in low- and middle-income country settings with few resources or when embedded in large-scale surveys.

To overcome this limitation, we conducted the present study aiming i) to develop and validate a short version of the DISC-12 (DISCUS) scale with comparable reliability and validity to the original scale and ii) to provide a methodology for item reduction of a mental health scale which could be used in a global setting. The new developed scale would be consisted of items, which apply across the different populations from which the data were derived (35 countries worldwide). To develop a short version of the DISC-12 scale we applied two approaches; (i) a novel meta-analytic approach to Exploratory Factor Analysis (meta-EFA) and (ii) a Multiple Indicators Multiple Causes (MIMIC) model. Validity and reliability of the short version of the DISC-12 scale were also assessed.

2. Methods

2.1. Data

We analysed secondary data collected as part of the Anti Stigma Programme European Network (ASPEN)/International Study of Discrimination and Stigma (INDIGO)-depression study and INDIGO-schizophrenia study, previously described elsewhere (Lasalvia et al., 2013; Thornicroft et al., 2009). Briefly, the EU-funded ASPEN study and the INDIGO-Depression research network recruited and interviewed 1807 people with Major Depressive Disorders (from Jan 1 to Dec 31, 2010) in 35 countries (39 sites) worldwide; the INDIGO schizophrenia recruited and interviewed 732 people with a clinical diagnosis of schizophrenia (from Jan 1 to Dec 31, 2005) in 27 countries (28 sites) worldwide. Study sites in both studies were identified through contact with members of the World Psychiatric Association (WPA) Global Programme against Stigma and Discrimination. In both studies, directors at each site were contacted and asked to identify participants who were, in their judgment, reasonably representative (as a group) of all people with a clinical diagnosis of major depressive disorder (ASPEN/INDIGO-depression) or schizophrenia (INDIGO-schizophrenia) in treatment with local psychiatric services, including those in inpatient, day-patient, outpatient, and community settings during the previous 12 months.

2.2. Discrimination and Stigma Scale (DISC-12)

We used here the most recent version of the DISC, the DISC-12, which contains 32 questions covering aspects of everyday life including work, marriage, parenting, housing, leisure and religious activities. Items 1–21 explore experienced discrimination (e.g. "Have you been treated unfairly in making or keeping friends?"), items 22–25 assess anticipated discrimination (e.g. "Have you stopped yourself from applying for work?"), items 28–32 explore coping strategies to overcome discrimination (e.g. "Have you been able to use your personal skills or abilities in coping with stigma and discrimination?"), items 26–27 explore positive treatment (e.g. "Have you been treated more positively by your family?"). Ratings are given on a 4-point Likert scale (0 = "no difference", 1 = "a little", 2 = "moderately", 3 = "a lot"). Individuals may also indicate that a given item is 'not applicable' to them, usually because they had not been in that situation (for example, experiencing discrimination in relation to having a child when the participant did not have any children). We excluded the item 'other' as it did not to contribute specific information needed for the construction of latent constructs. A more detailed description of the DISC-12 is provided elsewhere (Brohan et al., 2013). DISC-12 scale could be accessed upon request (please see details on how to access the scale on the online supplementary material).

2.3. Meta Exploratory Factor Analysis (meta-EFA)

For the specific purposes of this study, only the 21 items of the DIC-12 covering the experienced discrimination section were included in the analyses.

Because within country sample sizes were too small to analyse the data by individual countries, we grouped countries into seven regions according to the United Nations statistics division geo-scheme (http://unstats.un.org/unsd/methods/m49/m49regin.htm).

We employed a meta-analytic approach to Exploratory Factor Analysis (meta-EFA) proposed by Hedges and Olkin (Hedges, 1985) and being previously applied in the field of psychiatry (Norton et al., 2013; Grube et al., 1998; Smith et al., 1998) and asthma epidemiology (Hooper et al., 2010) to determine and confirm scale factor structures across different cultural contexts to the 1809 people with either major depressive disorders (n = 1087) and schizophrenia (n = 732) living in 42 countries across seven different regions. In each region, we evaluated the polychoric matrix of the 21 DISC-12 items and then we derived a pooled correlation matrix from each of the different regions using a meta-analytical approach. Exploratory factor analysis was applied to the matrix of pooled item correlation coefficients, giving us underlying dimensions of experienced discrimination, which could be used, across all regions.

Specifically, in each region k for each DISC item i and DISC item j, we evaluated the polychoric matrix using the polychoric correlation coefficient r_{kij}. Because the approximate distribution of r_{kij} depends strongly on the value of the population correlation ρ_{kij}, each correlation coefficient was transformed using a Fisher transformation.

$$z_{kij} = 0.5 \, log\left(\left(1 + r_{kij}\right)\Big/\left(1 - r_{kij}\right)\right), k = 1,.0.7 \; i = 1,.0.21 \; j = 1,.0.21$$

to give it an approximately normal distribution with asymptotic variance $1/(n_j\text{-}3)$, where n_k is the sample size for the country k. A weighted average of these values was then calculated

$$\sum_{k=1}^{7} w_k z_{kij} = w_1 z_{1ij} + \ldots + w_7 z_{7ij}, i = 1,..21 \; j = 1,..21$$

where the weights are $w_k = \frac{(n_k-3)}{\sum_{l=1}^{7}(n_l-3)}$.

An inverse Fisher transformation was then applied to give a pooled polychoric correlation coefficient matrix. Exploratory Factor analysis was applied to the matrix of pooled correlation co-efficients, giving us factor scores which could be used in all seven regions.

2.4. Multiple Indicator Multiple Cause (MIMIC) model

To explore the efficiency of item selection of the DISCUS, we also employed a MIMIC model to the international sample of 1809 people with either major depressive disorders (n = 1087) and schizophrenia (n = 732) living in 42 countries across seven different regions MIMIC models have been used previously to explore scalar invariance (Joreskog and Goldberger, 1975; Muthén, 1989). Similarly to factor analysis, factor loading estimates from the MIMIC model provide information on the strength of the association with the latent construct. Information about the relationship between the items and the validation metric is revealed through a regression parameter on the latent variable, which assesses the association between the validation metric and the latent variable. An extension of this model for categorical items assumes that ordinal items originate from underlying unobserved continuous, normally distributed items and relates the observed items with the underlying unobserved items through a series of threshold re-lationships (Muthén, 1984). The MIMIC model augments the orig-inal factor analysis model by introducing an external (exogenous) covariate. The covariate can affect the item(s) directly (direct ef-fects) and/or the latent trait (indirect effect). A significant direct effect indicates that for the same values of the latent trait (that is, fixed to average values) the probability of a certain response in the item varies (scalar invariance). In other words, two individuals with the same (average) latent trait levels, have different probabilities of responding, for instance, "a little" based on their values in the co-variate. This introduces measurement bias and therefore was considered as an item deletion criterion here. Significant indirect effects, on the contrary, simply reflect latent score differences, often anticipated in relation to the covariate.

2.5. Missing data techniques for non-applicable and missing data

We employed two different approaches for handling the non-applicable and missing responses. Firstly, we used a no discrimi-nation not applicable equal (NONE) approach where all responses were considered valid and where the categories "non-applicable" and "missing" were collapsed into the category "not at all" (i.e., no experienced discrimination). Secondly, we used an imputation technique whereby an estimated response for an individual is imputed into non applicable and missing items conditional on the median response of all answered items for that individual item median pro rating (IMAP). The score to be imputed in place of applicable responses is therefore conditional on the responses of the applicable items.

Table 1

Socio-demographic characteristics and item content, response frequencies and percentages of the DISC questionnaire (n = 1809). Data were collected from the Anti Stigma Programme European Network (ASPEN)/International Study of Discrimina-tion and Stigma (INDIGO)-depression study and INDIGO-schizophrenia study.

Age years N = 1809			Mean (SD) 42.5 (13.9)
Female N = 1809			n(%) 996 (54.7)
Employment status N = 1759			n(%)
Unemployed			513 (28.2)
I work full-time (>30 h per week)			547(30.0)
I work part-time (<30 h pr week)			93(5.1)
I work as a volunteer (not paid)			15(0.8)
Work in a sheltered/supported employment			7(0.3)
Work in the home (looking after child)			87(4.7)
I am looking for a job			120(6.6)
Would like to work but I am afraid of			7(0.3)
I am not able to work (disabled)			129(7.0)
Choose not to work			42(2.3)
Student			72(3.9)

DISCUS items N = 1809	n(%) Not at all	n(%) A little	n(%) Moderately	n(%) A lot	n(%) Not applicable
Have you been treated unfairly in making or keeping friends?	984 (56.5)	251 (14.4)	218(12.5)	229 (13.2)	59(3.4)
Have you been treated unfairly by the people in your neighbourhood?	1229 (71.7)	169 (9.9)	126(7.4)	105 (6.1)	85(5.0)
Have you been treated unfairly in dating or intimate relationships?	858 (51.0)	141 (8.4)	159(9.4)	201 (11.9)	324(19.3)
Have you been treated unfairly in housing?	969 (62.4)	75 (4.8)	64(4.1)	106 (6.8)	340(21.9)
Have you been treated unfairly in your education?	744 (51.5)	92 (6.4)	77(5.3)	101 (7.0)	432(29.9)
Have you been treated unfairly in marriage or divorce?	598 (46.8)	93 (7.3)	82(6.4)	174 (13.6)	331(25.9)
Have you been treated unfairly by your family?	863 (53.0)	273 (16.8)	222(13.6)	251 (15.4)	20(1.2)
Have you been treated unfairly in finding a job?	729 (47.4)	93 (6.0)	105(6.8)	156 (10.1)	456(29.6)
Have you been treated unfairly in keeping a job?	752 (48.5)	117 (7.6)	132(8.5)	196 (12.7)	352(22.7)
Have you been treated unfairly when using public transport?	1334 (79.0)	56 (3.3)	43(2.5)	38 (2.3)	217(12.9)
Have you been treated unfairly in getting welfare benefits or disability pensions?	744 (49.3)	69 (4.6)	45(3.0)	64 (4.2)	586(38.9)
Have you been treated unfairly in your religious practices?	1141 (73.0)	37 (2.4)	38(2.4)	53 (3.4)	293(18.8)
Have you been treated unfairly in your social life?	1250 (74.9)	145 (8.7)	87(5.2)	73 (4.4)	113(6.8)
Have you been treated unfairly by the police?	1015 (65.2)	54 (3.5)	62(4.0)	71 (4.6)	354(22.7)
Have you been treated unfairly when getting help for physical health problems?	1351 (79.5)	124 (7.3)	73(4.3)	98 (5.8)	53(3.1)
Have you been treated unfairly by mental health staff?	1192 (79.9)	115 (7.7)	68(4.6)	66 (4.4)	25(1.7)
Have you been treated unfairly in your levels of privacy?	1363 (77.6)	137 (7.8)	96(5.5)	120 (6.8)	40(2.3)
Have you been treated unfairly in your personal safety and security?	1248 (72.7)	144 (8.4)	118(6.9)	159 (9.3)	48(2.8)
Have you been treated unfairly in starting a family or having children?	652 (45.7)	77 (5.4)	70(4.9)	82 (5.7)	546(38.3)
Have you been treated unfairly in your role as a parent to your children?	631 (49.3)	75 (5.9)	58(4.5)	93 (7.3)	421(32.9)
Have you been avoided or shunned by people who know that you have a mental health problem?	950 (60.9)	221 (14.2)	172(11.0)	183 (11.7)	31(2.0)

2.6. Assessment of the reliability and validity of the DISCUS

We validated findings from the ASPEN/INDIGO-depression and INDIGO-schizophrenia data using data collected as part of the Mental Illness-Related Investigations on Discrimination (MIRIAD) study (Evans-Lacko et al., 2015; Farrelly et al., 2014). This was an ethnically diverse sample, which comprised 202 individuals using secondary mental health services in South London.

Cronbach's coefficient alpha was employed to evaluate the reliability (internal consistency) of the items of the DISCUS. It evaluates the extent to which items within a scale are inter-correlated with one another and thus seem to measure the same concept. Its value ranges from 0 to 1 and internal consistency reliability is suggested to be acceptable when Cronbach's alpha (Cronbach, 1951) is at least 0.70 (DeVellis, 2016). Construct validity was further examined by estimating the correlation between the DISCUS and the total scores of the Brief Psychiatric Rating Scale (BPRS) (Lukoff et al., 1986) and the Internalised Stigma of Mental Illness Scale (ISMI) (Ritsher et al., 2003). A comparison of the DISCUS with the Internalised Stigma of Mental Illness Scale (ISMI) as it can be considered a similar stigma-related construct. Previous cross-country research shows that exposure to higher levels of stigma and greater perceived discrimination is associated with higher internalised stigma (Evans-Lacko et al., 2012). We further examined the relationship between the DISCUS and the BPRS as severity is a consistently identified determinant of experienced stigma (Livingston and Boyd, 2010).

Spearman's correlation coefficients were calculated and were interpreted as follows: >0.80: very strong relationship, 0.60–0.79: strong, 0.40–0.59: moderate, 0.20–0.39: weak, and <0.19: very weak. Agreement was also established by calculating the total score of DISC-21 and DISCUS scale and subsequently estimating the Pearson correlation coefficient ($\rho = 0.95$) between the two total scores.

A confirmatory item factor analysis (CFA) model was fitted, with all DISCUS items loading onto a single factor which we named as "Experienced Discrimination" (Fig. 2). CFA was applied using the weighted least square estimator with a mean- and variance-adjusted chi-squared method to handle ordered categorical items (Muth6n et al., 1997). Missing and non-applicable data across the DISCUS were handled using full information maximum likelihood estimation. This method computes parameter estimates on the basis of all available data, including the incomplete cases. The procedure works under the assumption that the data are missing at random. To evaluate overall model fit, the comparative fit index (CFI) (Bentler, 1990), the Tucker Lewis index (TLI) (Tucker and Lewis, 1973) and the root mean square error of approximation (RMSEA) (Steiger, 1980) were calculated. A CFI and TFI value of >0.90 indicates adequate fit to the data (Hu and Bentler, 1999). A value of RMSEA <0.05 indicates close fit, values between 0.05 and 0.08 suggest adequate model fit, and values >0.10 suggest poor model fit (Hu and Bentler, 1999). Finally, due to the chi-square sensitivity to the sample size, we used the relative chi-square (rel χ2) (Kline, 2011). According to Ullman (2001) (Ullman, 2001) the value of the relative chi-square should be close to 2 for adequate fit. Weighted Root Mean Square Residual (WRMR) a "residual-based" fit index was also employed (Muthén, BO, 1998). The smaller the

Table 2
How correlation coefficients of DISC items with identified DISC latent factors vary between regions[a] (Items in bold characters represent the factors that retained from meta-EFA).

	Australasia/ Eastern/ South East Asia (n = 318)		Eastern Europe (n = 225)		North/ South America (n = 146)		Northern Europe (n = 230)		Northern and Western Africa (n = 188)		Southern Europe (n = 422)		Western Europe (n = 290)	
	I	II	I	II	I	II	I	II	I	II	I	II	I	II
Have you been treated unfairly in making or keeping friends?	0.76		0.73		0.70		0.70		0.71		0.70		0.65	
Have you been treated unfairly by the people in your neighbourhood?	0.69		0.53		0.65		0.62		0.59		0.67		0.55	
Have you been treated unfairly in dating or intimate relationships?	0.63		0.58		0.59		0.68		0.62		0.63		0.56	
Have you been treated unfairly in housing?	0.61		0.56		0.58		0.61		0.60		0.63		0.51	
Have you been treated unfairly in your education?	0.59		0.50		0.51		0.59				0.48			
Have you been treated unfairly in marriage or divorce?		0.54				0.55		0.52		0.50		0.59		0.51
Have you been treated unfairly by your family?		0.55				0.52		0.42						
Have you been treated unfairly in finding a job?	0.67		0.48		0.58		0.63		0.60		0.56			
Have you been treated unfairly in keeping a job?	0.51		0.43				0.54		0.52		0.50			
Have you been treated unfairly when using public transport?		0.65		0.50		0.47		0.48		0.56		0.55		0.45
Have you been treated unfairly in getting welfare benefits or disability pensions?		0.75		0.73		0.58		0.72		0.76		0.68		0.63
Have you been treated unfairly in your religious practices?		0.61		0.43				0.60		0.48		0.46		
Have you been treated unfairly in your social life?	0.60		0.46		0.47		0.50		0.44		0.47			
Have you been treated unfairly by the police?		0.55						0.56		0.60		0.48		0.47
Have you been treated unfairly when getting help for physical health problems?		0.63						0.63		0.56		0.51		0.50
Have you been treated unfairly by mental health staff?		0.57		0.40				0.55		0.48		0.57		0.46
Have you been treated unfairly in your levels of privacy?	0.49		0.45		0.50		0.41		0.44		0.53			
Have you been treated unfairly in your personal safety and security?	0.56		0.58		0.50		0.66		0.49		0.53		0.50	
Have you been treated unfairly in starting a family or having children?	0.59		0.60		0.42		0.63		0.49		0.55			
Have you been treated unfairly in your role as a parent to your children?		0.65		0.53		0.48		0.71		0.52		0.57		0.61
Have you been avoided or shunned by people who know that you have a mental health problem?	0.55		0.50				0.54	0.43	0.60		0.49			

For clarity only food items that were correlated >0.40 or <−0.1 with a latent factor for each region were included in the table ** I: Personal Experience *** II: Service use experience **** Item Median Pro-rating (IMP) method.

[a] Values are Spearman Correlation Coefficients between a DISC item and an identified latent factor.

residuals, the better the model functions to reproduce the re-lationships from the input covariance matrix; consequently, a re-sidual-based fit index is likely to report acceptable model−data fit in such situations. Statistical analyses were conducted using STATA 14.1 (Stata Corporation, College Station, Texas USA) and Mplus 7.4 (Muthén, LK, 1998).

3. Results

Our final sample included 1809 people with either major depressive disorders (n = 1087) and schizophrenia (n = 732) living in 42 countries across seven different regions worldwide. Further sociodemographic and DISC-12 item descriptive data are presented in Table 1 for the overall sample, Table S1 for the validation sample and Table S2 per each different region.

3.1. Item reduction with the use of meta-EFA and MIMIC model

Meta Exploratory Factor Analysis (meta-EFA) was conducted to account for between country heterogeneity with the use of IMAP for missing data. A varimax rotation was applied to improve the interpretability of the factors obtained. We used three objective criteria to aid the choice of number of patterns and provide empirical support for the selection: i) The scree plot ii) the criterion of eigenvalues above 1 and iii) the percentage of total variance being explained by the factors retained above 80%. The two-factor solution explained 96% of the variance (first factor explained 90% and second factor explained 6%) of the variance in the original 21 items, however eigenvalues of the second factor were not above 1, with scree plot confirming these findings (Fig. S1 - see online supplement). According to Table 2, in more than five regions, the first factor was characterized by items relating to experiences of discrimination mainly in personal relationships and the second factor was associated with experiences of discrimination mainly in health and social care settings and thus factors were labelled accordingly, however these labels were not defining completely the two factors. We choose to retain the first factor for our shorter version of DISC-21 as the factor was explaining the biggest per-centage of total variance, had eigenvalues>1 and gave a meaningful interpretation of experience discrimination in personal, educa-tional and work settings. Table 2 presents correlation coefficients between individual DISC items (those which correlated ≥0.4 or ≤0.1) with the DISC latent factors across the seven different regions. The meta-EFA reduced the original twenty-one items to twelve items (we retained the items whose correlation coefficients were 0.40 or higher for one factor and 0.10 or lower for the other factor; Table 2).

One more item was discarded by applying the MIMIC model which indicated that one-item non-invariance was present and thus further shortened the reduced twelve item scale derived by the meta-EFA to a 11-item scale (data available upon request). Factor loadings from the ordinal MIMIC model indicated modest and strong relationships among the candidate items and the latent measure of personal experience of stigma across the seven global regions. A graphical representation of the MIMIC model for the DISCUS is presented in Fig. 1. The within country Cronbach's coef-ficient alpha value for the first factor ranged between 0.70 and 0.86 across the seven regions.

3.2. Psychometric properties of the DISCUS

A graphical representation of the one factor CFA model is pre-sented in Fig. 2. The one factor solution for DISCUS had relatively good fit, as illustrated by the goodness-of-fit indices. The RMSEA
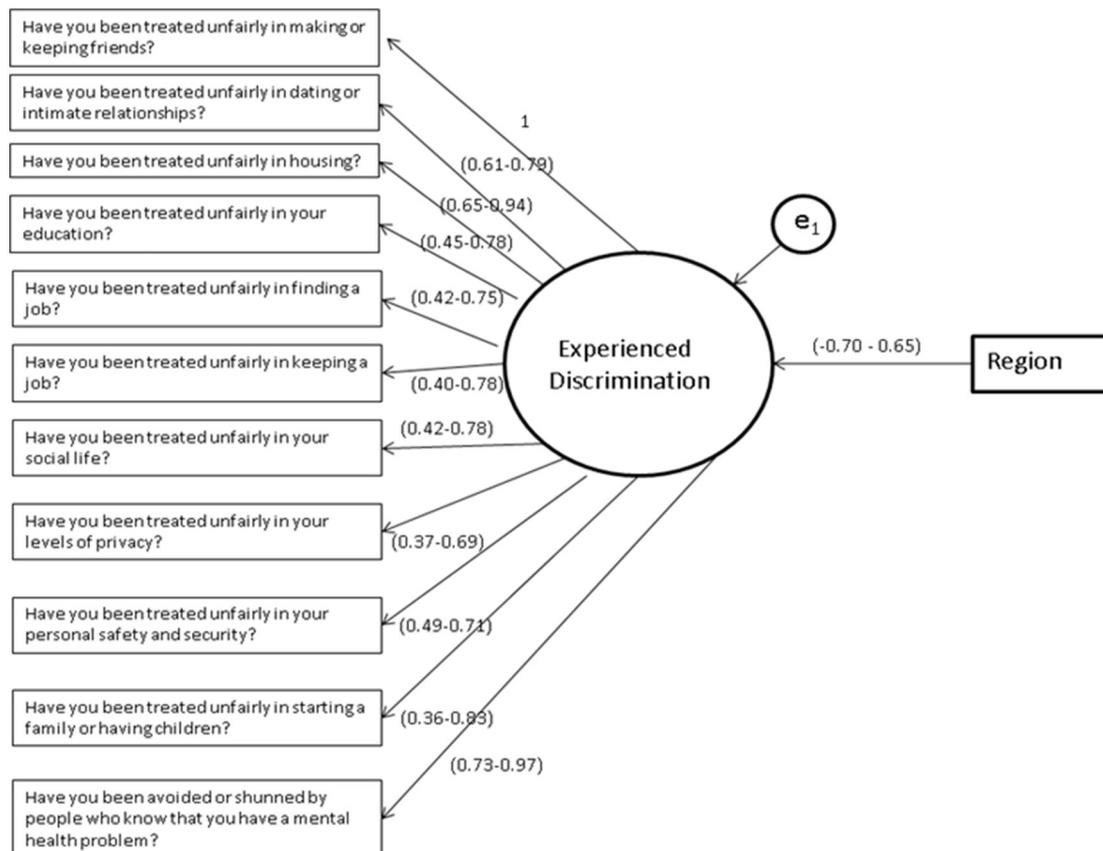

Fig. 1. Multiple Causes Multiple Indicators Model of DISCUS scale items relating to experienced discrimination across the different world regions. A range of different standardised loadings are presented in the graph according to the different combinations of regions (n = 1809).

value of 0.07, and CFI and TLI values >0.9 and WRMR <0.10 suggest adequate model fit. The reliability of DISCUS items and the DISCUS total score was satisfactorily established, including internal consistency and criterion-predictive validity. Cronbach's alpha coefficient for the eleven-item DISCUS was 0.87. Pearson correlation coefficients with the total scores of the BPRS (Lukoff et al., 1986) and the ISMI Scale (ISMI) (Ritsher et al., 2003) were 0.31 (p < 0.001) and 0.5 (p < 0.001) respectively. Excellent agreement was also observed between Pearson correlation coefficient of total scores of DISC-21 with the corresponding scores of DISCUS (ρ = 0.95). DISCUS could be accessed upon request (please see details on how to access the scale on the technical note of the online supplementary material).

4. Discussion

This paper describes the development of a short version of the DISC-12, the DISCUS scale, a reliable measure which can be used in large-scale international surveys, involving a wide range of respondent types. The DISCUS was designed to address the need for an international psychometrically validated brief measure which considers the scope and content of experienced discrimination. For this purpose, we utilise two statistical approaches, a novel meta-

EFA and a MIMIC model, which led to a recommendation for the 11-item subscale to be used as a stand-alone measure of experienced discrimination. This subscale was psychometrically robust, meeting content, discriminant and reliability criteria. It covers the key dimension of the experienced discrimination in terms of personal and social relationships.

Our analysis supported the existence of an experienced discrimination dimension. The analysis of convergent and discriminant validity reported here provides some preliminary information on how this dimension relate to other factors. Experienced discrimination was moderately associated with both the Brief Psychiatric Rating Scale and the Internalised Stigma of Mental Illness Scale, suggesting that this dimension may capture both psychiatric symptoms and stigma dimensions. The short version presented good agreement with the original scale. Further work is required to understand the complex ways in which all of these dimensions are related to other constructs and operate together and separately to influence outcomes.

4.1. Strengths, limitations and further research

Goetz et al., 2013 (Goetz et al., 2013) proposed necessary conditions for valid item reduction which were considered and met when
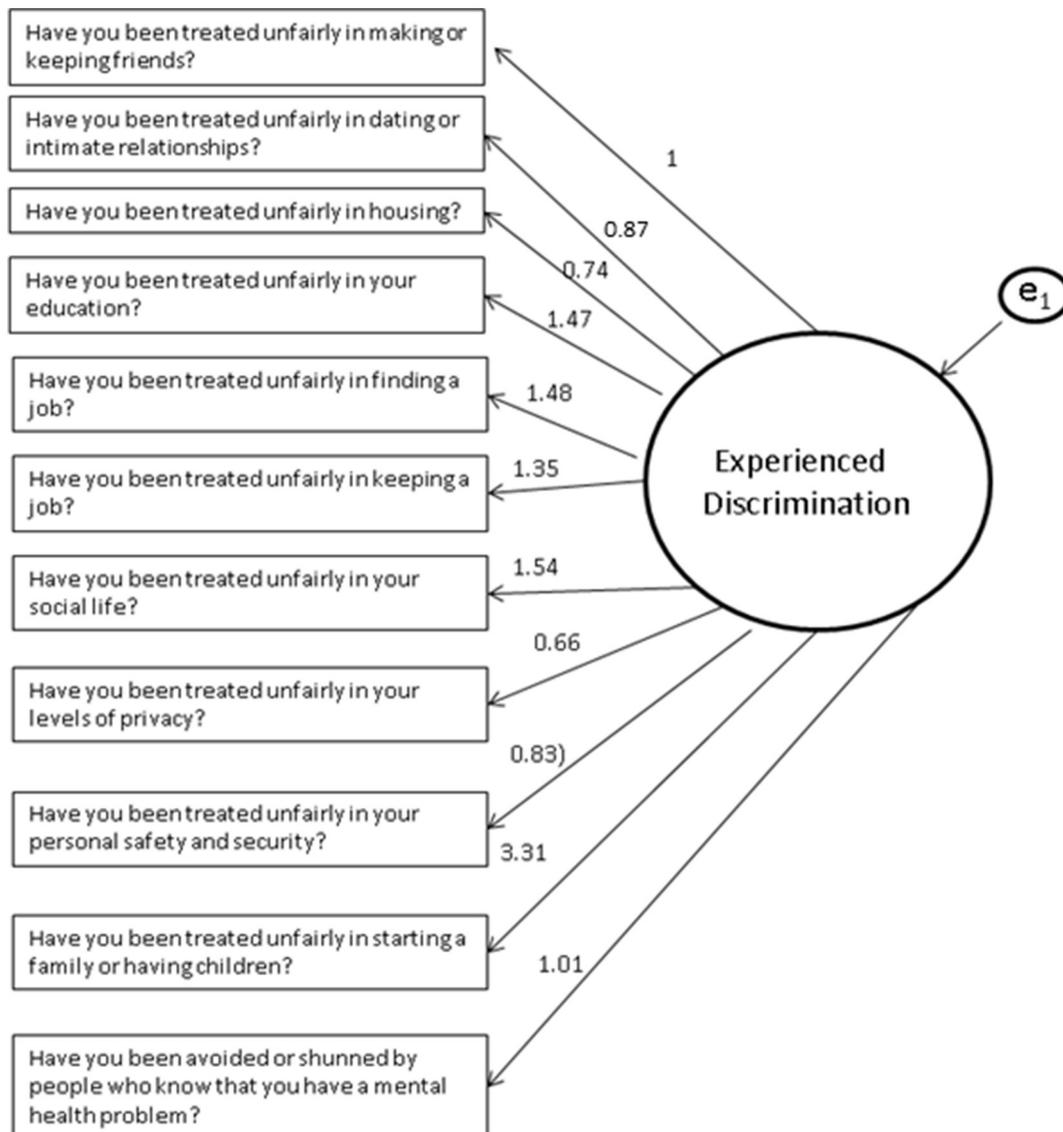

Fig. 2. Confirmatory Factor Analysis of items relating to personal experience of stigma with the use of the DISCUS scale. Standardised loading are presented in the graph (n = 202).

developing the DISCUS. Specifically, the validity of the original scale has well documented properties (Brohan et al., 2013) and DISCUS complies with the conceptual model postulated in the original DISC-12 scale and aims to capture the latent trait of experienced discrimination. Content validity is well documented in the original DISC-12 paper (Brohan et al., 2013) and a group of mental health experts (physicians, psychologists, service users and methodologists). To review the revised list of items in terms of conceptual content, we contacted individuals who were involved in measurement development and testing as part of the Indigo anti-stigma network and thus had some familiarity with the original DISC (http://www.indigo-group.org/the-network/_). The group included physicians (n = 5), psychologists (n = 4), service users (n = 3) and methodologists (n = 3) who reviewed and discussed the revised instrument in relation to the original version. The group confirmed that the eleven items of the DISCUS should be retained and had reasonable conceptual content. In addition, we used meta-EFA and MIMIC models as appropriate statistical techniques to derive the short scale. The DISCUS was also tested among an independent sample to document its construct validity, internal reliability and discriminant validity - Confirmatory factor analysis, Cronbach's alpha and Pearson correlation coefficients were employed to assess whether the initial model remained intact when items were removed in an independent sample.

The study is limited by the existing small sample sizes within the 42 countries and 46 sites. Aggregating the data into regions may be problematic in terms of the generalisability of the study as the people that were sampled may not be representative of the overall populations within and across the countries. Nevertheless, when we tested the DISCUS in an independent UK sample, the DISCUS scale has excellent psychometric properties. In addition, our final dataset was a combination of two different studies (ASPEN and INDIGO) where different sampling designs were used. We used two different imputation techniques (NONE and IMAP) to impute values in the non-applicable cells of the original DISC scale. These two different imputation techniques gave a slightly different factor structure after a meta-EFA was applied to the data. Specifically, when we applied the IMAP technique meta-EFA retained 12 items (Table 2) while when we applied the NONE technique meta-EFA retained 13 items (Table S3). However, 10 items were overlapping with either using IMAP or NONE, and the 11 item that were retained were retained by the additional application of the MIMIC model. As the data we used in our analyses were secondary data, we were limited by the instruments available for which we could assess construct validity. Validity was thus examined by estimating the correlation between the DISCUS and the total scores of the Brief Psychiatric Rating Scale (BPRS) (Lukoff et al., 1986) and the Internalised Stigma of Mental Illness Scale (ISMI). Construct validation involved comparison of the DISCUS with the Internalised Stigma of Mental Illness Scale (ISMI) as it can be considered a similar stigma-related construct. Previous cross-country research shows that exposure to higher levels of stigma and greater perceived discrimination is associated with higher internalised stigma (Evans-Lacko et al., 2012). We further examined the relationship between the DISCUS and the BPRS as severity is a consistently identified determinant of experienced stigma (Livingston and Boyd, 2010). Further work will also be necessary to evaluate the psychometric properties of the DISCUS in additional clinical populations or in cultural groups other than those included in this article and across different contexts and cultural settings.

5. Conclusions

In conclusion, the 11-item DISCUS had strong psychometric properties and is a reliable, valid, precise, acceptable, measure for use in assessing experienced discrimination predominantly in personal and social relationships. The DISCUS showed weak correlations with the BPRS and moderate correlation with the ISMI scale. The use of this scale is recommended as an evaluation tool in a global setting to assess the impact of discrimination predominantly in personal and social relationships upon people with experience of mental ill health and future studies.

Declaration of competing interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.schres.2019.07.018.

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