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CONFIRMING THE STRUCTURE OF A TEN-ITEM EXPAGG SCALE USING CONFIRMATORY FACTOR ANALYSIS

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ABSTRACT

The short Expagg scale is a psychometric measure of social representations of expressive and instrumental aggression developed by Campbell, Muncer, McManus and Woodhouse (1999). Confirmatory factor analysis (CFA) was used to compare the 16-item and 10-item versions of the scales on their goodness of fit to a proposed two-dimensional model. On a sample of 1,000 respondents, the 5-item version showed superior fit measures and exceeded three criteria of fit adequacy (CFI = .93, GFI = .97, RMSEA =.06). We conclude that the ten-item Expagg is not only more convenient to use than the longer version but that it provides a better fit to the underlying two-dimensional conceptual structure than the longer version.

INTRODUCTION

In an initial qualitative study, Campbell and Muncer (1987) found that men and women held different social representations of aggression. Men tended to describe their aggressive experiences in instrumental terms, viewing it as a socially functional means of exerting control over others' misbehaviour. Women spoke of their experiences in expressive terms, viewing it as a personal and regrettable loss of self-control. In order to examine sex differences in a larger sample, Campbell, Muncer and Coyle (1992) developed the Expagg scale. It consisted of twenty statements each followed by two possible endings (one instrumental and one expressive) from which the participant chose the one which best described their experience of aggression. (For example, following the introductory statement "I believe that my aggression comes from…", respondents chose between "losing my self control" and "being pushed too far by obnoxious people".) Endorsement of an expressive ending was scored as 1 and instrumental as 0, so that the individual's overall score (between 0 and 20) reflected their relative preference for an expressive representation of aggression. Effectively, an individual's social representation of aggression was conceptualised as being located on a one dimensional continuum from instrumental to expressive and a single factor was thought to underlie Expagg.

Archer and Haigh (1997a) suggested that instrumentality and expressivity might be two independent dimensions rather than opposite ends of a continuum (i.e. a two factor structure), and that it might be possible for an individual to endorse both representations. Based on this conceptualisation, Archer and Haigh developed the Revised Expagg scale, in which the original twenty items were expanded into forty items on five point Likert scales. If there is no substantial loss of psychometric quality, shorter inventories are preferable to longer ones in terms of administration time and demands on research participants. Hence their revised two-dimensional version of Expagg was reduced to a sixteen item scale (revised short Expagg, see below), consisting of eight instrumental items and eight expressive items (Campbell et al. 1999). These two dimensional versions allowed independent measurement of expressive and instrumental representations, although the original Expagg score can be obtained by subtracting the instrumental from the expressive score.

The original, revised and revised short Expagg have been widely used and have revealed sex differences in a number of cultures including the United States (e.g. Campbell, Muncer and Gorman 1993), England (e.g. Archer and Haigh,1997a; Archer and Latham 2003), Slovak republic (Baumgartner 1995), the Philippines (Puyat 2001), Spain (Gomez, Andreu, Rogers and Lasprilla 2003), France (Richardson and Huguet 2001) and Japan (Ramirez, Andreu and Fujihara 2001). The unbiased mean effect size across 1,674 participants is d = 0.84 (Campbell 1999). This sex difference has been found among children as well as adults (Archer and Parker 1994; Tapper and Boulton 2000). Instrumental and expressive representations are independent of the general positivity or negativity with which aggression is regarded (Archer 2004). Instrumental views of aggression are positively correlated with self-reported and psychometrically assessed aggression (Archer 2004; Archer and Haigh 1997a,b; Campbell, Muncer and Odber 1997; Campbell, Sapochnik and Muncer 1997).

Given its wide use in aggression research, measurement issues are clearly important. Exploratory analyses have used principal components analysis, factor analysis and Microfact (a program explicitly designed for dichotomous data) to examine the underlying structure of the questionnaire. The original Expagg was found to be unidimensional (Campbell, Muncer, McManus and Woodhouse 1999) and the Revised Expagg has two dimensions corresponding to instrumental and expressive representations (Archer and Haigh 1997a; Campbell et al. 1999). The revised short (16 item) Expagg was constructed on the basis of principal components analysis and showed good internal consistency and the expected sex differences (Campbell et al. 1999).

While exploratory factor analysis is useful in revealing the empirical structure of questionnaire items, confirmatory factor analysis (CFA) is a statistical technique which provides a means of assessing how well a proposed theoretical model explains or "fits" a set of data by examining patterns of covariance in the data. The proposed model specifies the way in which individual items load onto underlying factors, and the relationship between these factors. CFA is appropriate in situations where the researcher has some a priori theory about the latent factors that might underlie a set of data and the relationships between them.

CFA programs can provide up to thirty-one measures that indicate how well the data fit the proposed model. We briefly summarise the most widely accepted indices below. The GFI (goodness of fit) and CFI (comparative fit index) both indicate how much better the model fits the data than a null model which specifies there are no common factors, and that sampling error alone explains the item covariances. Their values can range between 0 and 1 with higher values indicating a better fit; Bentler and Bonett (1980) among others have suggested that values above .9 represents a reasonable fit. The RMSEA (root mean square error of approximation) is better conceived of as an index of badness of fit. Steiger (1989), who first proposed the RMSEA, argued that values below .1 were good, while others have been more stringent in suggesting that "a value of about .08 or less for the RMSEA would indicate a reasonable error of approximation" (Browne and Cudeck 1993). The chi square statistic tests whether there is a significant difference between the model and the data and hence, ideally, should be non-significant. However problems with this index have been noted before (Joreskog and Sorbom 1993; Rayko 1998). The main difficulty is that chi square is very sensitive to sample size; with large samples it is very sensitive to relatively trivial discrepancies between the data and the expected data and with small samples it can be non-significant even with fairly large discrepancies.

Forrest et al. (2002) used CFA to examine the structure of Expagg. Their model which specified a two factor solution to the short revised (16 item) Expagg produced a GFI of .89 (where anything above .9 is considered adequate) and an RMSEA of .082 (where anything between 0.05 and 0.08 is considered adequate). It seems likely that with a few of the assumptions (e.g. equal error variance or correlated error variance) that are typically made by CFA users, an even better fit could be achieved. Although over-reliance on the chi square statistic led them to reject the model, Muncer and Campbell (2004) showed that the results that Forrest et al. obtained for the 16-item Expagg scale were superior to those obtained for other widely used measures such as the Eysenck Personality Questionnaire (Eysenck and Eysenck 1991), the Belief in a Just World Scale (Lambert, Burroughs and Nguyen 1999) and the Right Wing Attitudes Scale (Altmeyer 1981).

Muncer and Campbell (2004) also found superior fit indices for a reduced 10-item version of Expagg (GFI=.94, CFI=.90, RMSEA=.08). The Cronbach's alphas were .75 (instrumental scale) and .73 (expressive scale) and both scales showed significant sex differences in the expected direction. Correlations between the 5-item and 8-item versions were high (instrumental scale r=.94, expressive scale r =.92) leading them to conclude that the 5- and 8-item scales would perform similarly when used in research, since they are highly correlated, have similar Cronbach's alphas and show similar sex differences.

In this study, we aim to confirm the superior psychometric status of this short 10-item, two-factor version of Expagg using CFA. We expect that the 10-item version will again show better fit as a two-factor model than the 16-item version. Previous studies have typically obtained sample sizes of less than 400 from undergraduate populations (Muncer and Campbell 2004; Forrest et al. 2002). The data used in this analysis were obtained through a web site hosted by a UK television company. Respondents were self-selected but more likely to be representative of the general population than respondents in previous studies.

METHOD

Sample

Data was collected with the assistance of Channel 4 Television (UK). The Expagg questionnaire was placed on their website (www.channel4.com) between October and December 2002, as part of another study on aggressive behaviour (Campbell and Muncer, in press). In the present study, we analyse Expagg data from the first 1000 respondents. This sample was composed of 569 males (56.9 per cent) and 431 females (43.1 per cent). As noted by Muncer and Campbell (2004), an approximate gender balance is important for CFA studies of scales on which a strong sex difference is anticipated. The age range was from under 17 to over 60.

Procedure

All participants completed the revised Expagg short scale, composed of eight items measuring instrumentality and eight items measuring expressivity (Campbell et al 1999), along with a number of other measures not relevant to this study. The study was introduced to participants as follows: "What goes on in the minds of men and women? Here is your chance to try out the experiment that aims to find out just that". Participants were informed that there were no right or wrong answers, that they should give honest answers, that their responses were anonymous, and that some of the questions were about aggressive behaviour. Participants responded to items by checking one of the boxes next to each item on the Expagg questionnaire which indicated their degree of agreement (between 1 and 5) with each statement.

RESULTS AND ANALYSIS

We tested both the sixteen item two factor model and the ten item two factor model using EQS 6. The models specified that, for the sixteen item version, the eight instrumental items load onto the 'instrumental' factor and the eight expressive items load onto the 'expressive' factor and these factors are assumed to be correlated. For the ten item version, the model specified that the five instrumental items suggested by Muncer and Campbell load onto the instrumental factor and the five expressive items onto the expressive factor, and the factors are assumed to be correlated.

16-Item Scale

The sixteen item model gave an chi square value of 790.68 ($p < .001$), an RMSEA of .082, a GFI of .899 and a CFI of .824 None of these values quite meet the definitions of good fit described in the introduction. Cronbach's alphas were .83 for the instrumental scale, and .70 for the expressive scale. Again these values are consistent with previous findings, with the reliability coefficient for the expressive scale usually being lower than that for the instrumental scale. The two scales were correlated at $r=0.38$ ($p<.001$).

With regard to sex differences, males scored significantly higher ($t=7.655$, $df = 998$, $p < .001$) than females on the instrumental scale (male mean = 23.53, SD = 6.52; female mean = 20.39, SD = 6.30) consistent with previous findings. The sex difference on the expressive scale did not reach significance (male mean = 26.56, SD = 5.16; female mean = 27.03, SD = 5.57). Although females consistently score higher on the expressive scale, it is not unusual for the difference to fall slightly short of significance on the 16 item scale.

10-Item Scale

The ten-item model gave a chi square value of 157.91 ($p < .001$). Again, this was significant, but all other indices suggest that the model provides a good fit to the data, with an RMSEA of .060, a GFI of .969, and a CFI of .933. The RMSEA has a 90 per cent confidence interval of 0.051 to 0.07. These values all suggest a better fit to the data than the sixteen item model, and meet the definitions of good fit values given above.

There are a number of available measures of goodness of fit which allow comparison between models. Those commonly used include the AIC (Akaike Information Criterion) and ECVI (Expected cross-validation index). In each case, the model with the lower value provides the better fit to the data. The ten-item model gives an AIC of 89.911, compared to 584.678 for the sixteen-item model. The ECVI value is .2 for the ten-item model, and .858 for the sixteen item model. These values again suggest that the model based on the ten item version provides a better fit to the data. It should be noted that both of these models were compared as stated and without any extra assumptions such as equal or correlated error variances.

The correlation between the between the 5-item and 8-item scales were r = .95 (p< .001) for the instrumental scales, and r = .89 (p < .001) for expressive scales. These values are comparable to those reported by Muncer and Campbell (2004) of .94 and .92 respectively. Analysis of the three items omitted from each scale provides further evidence of the superiority of the ten item scale. The remnants of the 8 item instrumental scale show a significant positive correlation with the 5 item instrumental scale (r = .65, p < .001) and with the 8-item instrumental scale (r = .85, p < .001). The remnants from the 8 item expressive scale show a significant positive correlation with the 5 item expressive scale (r = .40, p < .001) and with the 8 item expressive scale (r = .78, p < .001).

Cronbach's alphas were .78 for the instrumental scale and .63 for the expressive scale. Muncer and Campbell (2004) found a similar alpha for the five item instrumental scale (.75), but a considerably higher alpha of .73 for the five item expressive scale. Values are slightly lower than for the 16 item version, in line with the reduced number of items. There is also a significant but modest positive correlation between the five-item instrumental scale and expressive scales, r = 0.065 (p =.05), indicating only 0.4 per cent of common variance.

With regard to sex differences, males again scored significantly higher (t = 7.472, df = 998, p < .001) on the instrumental scale (male mean = 14.34, SD = 4.40; female mean = 12.23, SD = 4.46). The expressive scale again showed a higher value for women (male mean = 17.04, SD = 3.66; females mean = 17.39, SD = 3.68) but the effect was not significant.

DISCUSSION

We confirm the findings of Muncer and Campbell (2004) in showing that a two factor model with only 5 items on each scale provides a better fit to the data than the 8 item version. In this case, CFI, GFI and RMSEA values easily meet the criteria for good fit. The values are obtained from this sample all suggest a better fit than the values obtained by Muncer and Campbell from their sample of 379 participants (GFI of .939, CFI of .900 and RMSEA of .083). This is likely a consequence of the larger sample size used in the present analysis. We suggest, in line with Muncer and Campbell, that a two factor ten item version of Expagg is psychometrically sound. Given the high correlations between the five and eight item versions, both are useful for research purposes although the shorter version obviously offers advantages in terms of speed of administration and scoring.

The instrumental and expressive scales can be used independently. For example, partner violence seems to be best predicted by raised instrumental scores which are also associated with non-physical controlling behaviours such as economic and emotional coercion (Archer and Graham-Kevan 2003). A measure of relative preference, similar to that obtained from the original Expagg, can also be computed by subtracting the instrumental from the expressive score. This measure may be especially useful for some research purposes. For example, Archer and Haigh (1997b) reported that violent offenders scored lower than non-violent offenders on the expressive scale while Smith and Waterman (2004) found significantly higher scores on the instrumental scale among violent compared to non-violent offenders. Using the combined relative measure may help to clarify and simplify patterns of findings. This relative score accepts that aggression may have experiential elements of both loss of self-control and assertion of other-control, as we discuss below.

Our use of an Internet sample is not novel; they have been used in psychological research since the 1990s. Initial reservations concerned the possibility of multiple submissions by the same individual. While steps can be taken to address this, some may remove participant anonymity (asking for identifiers such as e-mail addresses) and others (eliminating participants responding from the same IP address) have the effect of excluding legitimate participants who use a common computer in a lab or library. Birnbaum (2004) detected only one repeat submission in a total of 1,000 data records and suggests that "Web researchers are of the consensus that this issue has not been a real problem" (Birnbaum 2004, p.816). The Internet provides considerably larger data sets, with consequently greater statistical power, than are found in most traditional samples and is particularly valuable for personality research (Birnbaum 2004). Internet samples are more diverse and more representative with respect to gender, socioeconomic status, geographical location and age compared to samples reported in the prestigious Journal of Personality and Social Psychology (Gosling, Vazire, Srivastava and Oliver 2004). Reliabilities and factor structures for personality inventories and constructs are similar to the paper-and-pencil versions (Buchanan and Smith 1999; John and Srivastava 1999) and gender differences found in traditionally administered tests are replicated on Internet samples (Srivastava, John, Gosling and Potter 2003).

In the present study, we find significant differences on the instrumental but not the expressive scale. Of 13 published studies that have examined sex differences on the instrumental and expressive scale separately, 12 have found significantly greater instrumentality among men and significantly lower expressivity among women. The present results may be due to the lower internal consistency of the expressive scale relative to the instrumental scale. Items tapping loss of control appear to be less cohesive and unitary than those which assess the use of aggression to control others. While greater scale reliability reduces random error and so increases the power to detect relationships with other variables, gender differences have been found even where the reliability values for E have been less than .75 (e.g. Archer and Latham 2004; Muncer and Campbell 2004).

Nonetheless the effect sizes found for the expressive scale are somewhat smaller than the instrumental scale. Over 13 studies where it was possible to compute effect sizes, the unweighted averages were $d = -.65$ and $d = .80$ respectively, corresponding to medium and strong effect sizes (Cohen 1977). The weaker sex differences suggest a second possibility: The expressive scale may be picking up a more general experience of 'upset' feelings that are associated with the high arousal and negative tone of interpersonal conflict, and these shows greater overlap between men and women. Scores for both sexes in this study, as in others, are higher for the expressive than for the instrumental scale. The sex difference for expressive as compared to instrumental scores also shows greater consistency across type of aggression and opponent (Archer and Haigh 1999). We have also found invariance over age for the expressive but not the instrumental scale (Campbell and Muncer, under review). An expressive experience may characterize conflictive encounters more generally, while instrumentality may be an interpretation that is superimposed on this aversive arousal by those who use aggression to control others. This reasoning would be consonant with the finding that the instrumental scale is more predictive than the expressive scale of physical and verbal aggression (Archer 2004; Archer and Graham-Kevan 2003; Archer and Haigh 1997) and violent offending (Smith and Waterman 2004).

A final word on conceptual issues regarding the Expagg scale. Archer and Haigh (1997, p. 84) employed the term 'belief' rather than 'representation' to describe the construct underlying the Expagg scale on the grounds that the latter implied a shared interpretation while the questionnaire responses are obtained from individual participants. Although Moscovici emphasizes the social nature of representations (in that they are developed and transmitted through social interaction, broadly defined) he equally attends to their impact on individual psychology; "…social representations become capable of influencing the behaviour of the individual participant in a collectivity. This is how they are created inwardly, for it is in this form that the collective process itself penetrates, as the determining factor, into individual thought" (Moscovici 1984, p.12). Much research in this tradition continues to collect data from individual representatives of different social groups (see the Papers on Social Representations at http://www.psr.jku.at/). Unlike Archer, we see no contradiction between data collection from individuals and the concept of a shared social representation.

Rather, in the development of Expagg, we were conscious of Moscovici's definition of representations as "cognitive matrices co-ordinating ideas, words, images and perceptions that are all interlinked. They are common-sense "theories" about key aspects of society" (Moscovici and Hewstone 1983). Our initial qualitative study suggested that the discourse of men and women corresponded to what academics would refer to as instrumental and expressive theories of aggression respectively. In developing the 20 item Expagg, our aim was to systematically capture differences between these two theoretical schools with respect to eight domains of aggression (Campbell, Muncer and Coyle 1992). Is the aim still fulfilled in the current version of the questionnaire containing only 5 items per representation?

The five expressive items are drawn from following three domains; proximate cause (I believe that my aggression comes from losing my self-control), cognition (In a heated argument I am most afraid of saying something terrible that I can never take back; During a physical fight I feel out of control) and emotion (When I get to the point of physical aggression the thing I am most aware of is how upset and shaky I feel; After a physical fight I feel drained and guilty). The instrumental items have a broader coverage of five domains; social value (I feel that physical aggression is necessary to get through to some people), form (In an argument I would feel more annoyed with myself if I cried than if I hit the other person), aim (The best thing about physical aggression is that it makes the other person get in line), reputation (If someone challenged me to a fight in public I'd feel cowardly if I backed away) and emotion (If I hit someone and hurt them, I feel as if they were asking for it). The only domain which remains untapped is situational factors (the likelihood of aggression occurring in private versus public) which does not reliably differentiate the two representations. It is noteworthy that the instrumental and expressive scales are distinctive in the differing domains on which they draw. (Indeed the one instrumental item drawn from the overlapping domain of emotion might be considered to be functioning as a social value item.) Broadly, expressive items pick up differences in intra-individual experiences of aggression (specifically feelings of inability to control one's own behaviour and attendant guilt) while instrumental items are more clearly oriented to inter-personal functions (specifically impression management and perception of unjustified provocation). A similar distinction has been noted by Archer and Haigh (1997,a).

Are we then dealing with social representations or beliefs? A belief is defined as "a cognition or piece of knowledge believed to be true or false regarding an attitude object" (Fraser and Burchill 2001, p. 418). We argue that Expagg captures much more than this. In addition to cognition, it taps personal experience in the wider sense of attributions of aim, value, cause, emotion and personal and interpersonal effects. Rather than assessing beliefs about the truth or falsity of a proposition, Expagg taps alternative, coherently organized models of aggression.

However, social transmission is a key component of Moscovici's conception and we initially presumed that gendered representations were passed "in the course of inter-individual communications" (Moscovici 1981, p. 181). Our recent work has challenged this assumption by investigating whether different representations of aggression might arise as a consequence of genuine differences in phenomenology. Two studies (Alexander, Allen, Brooks, Cole and Campbell 2004; Driscoll, Zinkivskay, Evans and Campbell, in press) now suggest greater inhibitory control by women so that they express overt behavioural aggression at higher levels of provocation and anger than do men, resulting in more strongly expressive experiences. If these findings are replicated, the adjective 'social' would need to be questioned. However we do not wish to be unduly pedantic about semantics; more important are empirical results that address the substance of proposals about gender and experiences of aggression.

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APPENDIX 1: REVISED SHORT EXPAGG ITEMS (BOLD DENOTES ITEMS CONSTITUTING THE FIVE-ITEM VERSION)

Expressive Items

1. **During a physical fight I feel out of control.**

2. I am most likely to get physically aggressive when I've been under a lot of stress and some little thing pushes me over the edge.

3. **After a physical fight I feel drained and guilty.**

4. After I lash out physically at another person, I would like them to acknowledge how upset they made me and how unhappy I was.

5. **I believe that my aggression comes from losing my self-control.**

6. I am more likely to lash out physically when I am alone with the person who is annoying me.

7. **When I get to the point of physical aggression the thing I am most aware of is how upset and shaky I feel.**

8. **In a heated argument I am most afraid of saying something terrible that I can never take back.**

Instrumental Items

1. **I feel that physical aggression is necessary to get through to some people.**

2. **If I hit someone and hurt them, I feel as if they were asking for it.**

3. **In an argument I would feel more annoyed with myself if I cried than if I hit the other person.**

4. **The best thing about physical aggression is that it makes the other person get in line.**

5. **If someone challenged me to a fight in public I'd feel cowardly if I backed away.**

6. After I lash out physically at another person I would like to make sure they never annoy me again.

7. I am more likely to lash out physically when another person shows me up in public.

8. I am most likely to get physically aggressive when I feel another person is trying to make me look like a jerk.

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