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What role does neuroticism play in the association between negative job characteristics and anxiety and depression?

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**Abstract**

Many studies have established an association between job characteristics and anxiety and depression and noted that personality characteristics such as neuroticism likely play a role in creating or modifying these associations. Few studies, however, have explicitly tested or compared these possible alternative roles. In this study, we tested several specific hypotheses about neuroticism and its effects on job characteristics, anxiety and depression and their association in a series of structural equation models. Participants (N=372) completed the Big Five Inventory, Job Contents Questionnaire and General Health Questionnaire. We tested a) whether neuroticism is likely to be an important confounder of the association between job characteristics and anxiety and depression and b) whether neuroticism moderates the association between job characteristics and anxiety and depression. Results indicated large attenuations by neuroticism of the association between job characteristics and anxiety and depression but there remained significant effects of Psychological Demands on Anxiety, and Social Support on Depression independent of neuroticism. Evidence was also found for interaction effects between neuroticism and Decision Latitude, with those lower in neuroticism being at higher risk for depression under conditions of low control.

**Keywords:** Anxiety; Depression; Job Characteristics; Neuroticism; Five Factor Model

**Highlights**

- Evidence for interactions between job characteristics and neuroticism.
- Neuroticism may confound job characteristics-anxiety associations.
- Neuroticism may confound job characteristics-depression associations.
- However, job characteristics still uniquely predict anxiety and depression.

## 1.0 Introduction

A large number of studies have established an association between aversive job characteristics and degraded mental wellbeing, including an increased risk of experiencing anxiety, psychological distress and depression (Stansfeld & Candy, 2006). Longitudinal studies have clarified the nature of this association as being primarily an effect of job characteristics on mental health, rather than the reverse (DeJonge et al.2001; Stansfeld, Clark, Caldwell, Rodgers & Power, 2008). Neuroticism (N) and related negative affectivity (NA) traits represent an important influence on the types of work circumstances that individuals find themselves in, their subjective experience of these circumstances and on their mental health (Spector & O'Connell, 1994; Spector, Zapf, Chen & Frese, 2000), therefore, in the present study we sought to clarify the role that neuroticism plays in creating and/or modifying this association between job characteristics and anxiety and depression.

The types of aversive job characteristics which have been the subject of empirical studies and which have been associated with decrements in psychological wellbeing include team climate, procedural and relational justice, job insecurity, effort-reward imbalance, and work-to-family conflict (Wang, Patten, Currie, Sareen & Schmitz, 2012; Ylipaavalniemi et al. 2005). The dominant theoretical model in this domain is the job strain model (Karasek, 1979) in which high demands and low decision latitude contribute to job strain and high job strain is expected to increase psychological strain and the attendant risk of experiencing decrements in psychological wellbeing. These predictions have, by and large, been borne out empirically (see Bonde, 2008 for a review).

A point of debate in studies of the job characteristics and psychological wellbeing outcomes has been the status of N and NA in the association between job characteristics and mental well-being. In particular, it is debated whether N/NA should be treated as a confounder of the association which should be statistically controlled for in order to obtain

the 'true' effect of job characteristics on psychological wellbeing (e.g. see Spector et al. 2000). Two variables can be said to be confounded when a third variable (the confounder) influences them both (Pearl, 1998). There are two senses in which N/NA may be considered to confound the association between job contents and anxiety and depression. First, individuals high in N/NA may have an increased tendency towards negative reporting of both work circumstances and wellbeing due to the pessimistically biased perceptual sets associated with high N/NA (Ylipaavalniemi et al., 2005). Second, being higher in N/NA may result in increased exposure to adverse work circumstances in addition to increasing risk of lowered psychological wellbeing. Individuals higher in N/NA have been shown to experience increased exposure to negative life events (van Os, Park & Jones, 2001) and, in addition, N/NA is a major vulnerability factor for both anxiety and depression (Krueger, 1999). In the work context, if an individual higher in N/NA is more prone to psychological distress they may receive less social support due to being perceived as less able to reciprocate, or be given less autonomy if they are perceived by supervisors as being less motivated (De Jonge et al. 2001). In addition, individuals who experience high levels of psychological distress may select into poorer working conditions due to, for example, a lack of self-esteem, or an impaired educational or work record as a result of experiencing psychological distress (Stansfeld et al. 2008). They may also be less effective in altering or controlling negative work circumstances when experienced (see Taris, Bok & Calje, 1998).

On the other hand, some authors have argued that controlling for N/NA may actually remove some of the variance in job strain and, thus, result in an under- rather than an over-estimation of the association between job characteristics and psychological wellbeing (Spector et al. 2000).

There is some evidence to suggest that N/NA may not in fact be an important confounder of the association between job characteristics and psychological wellbeing. For example, in studies in which job characteristics have been objectively assessed in order to control for reporting biases, work characteristics still predict psychological wellbeing (Waldenstrom et al. 2006). Further, in a longitudinal study, Stansfeld et al. (2008) found that although earlier psychological distress influenced later work characteristics, it did not completely explain the association between work characteristics and anxiety and depression later in life.

An alternative possibility is that the role that N plays in the association between job characteristics and psychological distress is primarily one of moderator rather than confounder. In this view N/NA may genuinely interact with aversive professional circumstances, in that individuals high in neuroticism may respond more negatively to these circumstances than individuals low on neuroticism. This is consistent with the evidence that individuals higher in N/NA, have stronger negative reactions to aversive circumstances and are more likely to become depressed as a result of exposure to such circumstances (Kendler, Kuhn & Prescott, 2004). If high N/NA individuals already have lowered thresholds for psychological distress, then they may require less exposure to adverse job characteristics to trigger, psychological disorders such as anxiety or depression. This would lead to a trait-by-environment interaction in which high N/NA individuals are at increased risk of anxiety or depression under exposure to aversive job characteristics than those lower on N/NA.

In the present study we, therefore, take a different approach to the question of the role of N in the association between job characteristics and anxiety and depression than that taken by previous studies. We test the plausibility of both the 'N as confounder' and 'N as moderator' hypotheses in latent variable models specifying these alternative but not necessarily mutually exclusive roles of N. We evaluate the feasibility of the 'N as

confounder' by comparing the association between job characteristics and anxiety and depression with and without modeling N as a confounder of this association. We evaluate the feasibility of the 'N as moderator' hypothesis by assessing whether the inclusion of latent interactions between N and job characteristics significantly improve the fit of structural equation model predicting anxiety or depression.

## **2.0 Methodology**

### **2.1 Sample**

The current sample (N=372) was approximately evenly split by gender (Female=222, 59.7%). Participants completed all measures through an on-line questionnaire. Participants provided their age in categories, with the majority of participants aged between 26 and 44 (18-25 n=23; 26-34 n=135; 35-44 n=106; 45-54 n=66; 55-64 n=39; 65+ n=3). All participants were currently in employment in a variety of organisations in the public and private sector.

### **2.2 Measures**

*Neuroticism* was measured using the eight item scale from 'Big Five Inventory' (BFI, John, Donahue & Kentle, 1991). Participants responded on a five point scale ranging from *Strongly Disagree* to *Strongly Agree*. John and Srivastava (1999) report the Cronbach's alpha of Neuroticism scores to be 0.85.

*Depression and Anxiety* were measured using the 28-item General Health Questionnaire (GHQ-28, Goldberg & Hillier, 1979). Only items from the 'Severe Depression' and 'Anxiety and Insomnia' scales were administered (Werneke, Goldberg, Yalcin & Uston, 2000). Participants responded on a four point scale (1=not at all, 2= no more than usual, 3=rather more than usual, 4=much more than usual), equivalent to that used in the full GHQ. The GHQ-28 has scale score reliabilities ranging from 0.71 to 0.85 (Vallejo, Jordán, Díaz, Comeche & Ortega, 2007).



*Job Characteristics* were assessed using ‘Job Contents Questionnaire’ (JCQ; Karasek, Brisson, Kawakami, Houtman, Bongers & Amick, 1998). The JCQ contains five scales, namely Skill Discretion, Decision Authority, Psychological job demands, Co-worker Support and Supervisor Support. The scales of Skill Discretion and Decision Authority can be combined into a measure of the broader construct of Decision Latitude, whereas Co-worker and Supervisor Support can be combined into a measure of Social Support. Here we use the three broad factors of Decision Latitude, Psychological Demands and Social Support. Participants responded on a four point scale ranging from *Strongly Disagree* to *Strongly Agree*. Karasek et al. (1998) report Cronbach’s alpha for scale scores for the ranging from 0.63 for Psychological Demands to 0.81 for Decision Latitude.

### **2.3 Analysis**

We applied structural equation modelling (SEM) to test alternative models for the role of neuroticism in the association between job characteristics and anxiety and depression. SEM has a number of advantages in this instance as it allows for the estimation of latent variables from only common variance in a set of indicators; thus excluding specific and error variance; and allows for the computation of model fit indices aiding model comparison. All models were estimated in Mplus 6.0 (Muthén & Muthén, 2010).

#### **2.3.1 Measurement Model**

In order to model latent interactions (see Structural Models), maximum likelihood (ML) estimation with numerical integration is applied and thus, continuous indicators are required. Given that the item formats for all variables are categorical with a limited number of response points, a parcelling strategy was used. Parcelling offers a closer, but not perfect, approximation to continuous measurement. The use of parcels allowed for the consistent application of ML estimation across our structural models.

However, there remains debate in the SEM literature as to whether the use of item parcels is appropriate and whether they lead to bias in the structural parameters (see Little, Rhemtulla, Gibson & Schoemann, in press). Here, we first establish the item level fit of the measurement model and the correlations between the latent constructs. Next, we create item parcels and re-estimate the model in order to compare model fit, and the magnitudes of the correlations between constructs. If both item and parcel level models displayed good fit, and the correlations did not differ markedly across solutions, then we considered item parcelling strategy to have introduced minimal additional bias to the model.

For the item level measurement model, we estimated latent factors for the three factors of the JCQ (Decision Latitude, Psychological Demands and Social Support), Neuroticism, Anxiety and Depression. All items were loaded onto their hypothesized latent factors with the variance of the latent constructs fixed to 1.0 for identification. No cross loadings were specified and all latent constructs were allowed to correlate. The model was estimated using weighted least squares means and variances (WLSMV) estimation because of the categorical item format.

Next we created item parcels. The aim was to build balanced parcels (Little et al., in press) based on the item factor loadings. Here we paired the highest and lowest loading items sequentially into parcels. Three parcels were created per latent factor as a minimum for identification. In the case of the Psychological Demands factor of the JCQ, which contains only 5 items, the highest loading item from the item level measurement model was retained as a single item, and the other four items were paired. The mean of the summed raw scores was used as the parcel value (see Figure 2).

### **2.3.2 Structural Models**

Four structural models (Figure 1) were estimated in order to test the different hypotheses as to the role of Neuroticism in the association between job characteristics,

anxiety and depression. Model 1 (Panel A) is a simple regression of Anxiety and Depression on the three factors of the JCQ. Model 2 (Panel B) extends this regression model to include Neuroticism. The difference in regression coefficients across models 1 and 2 provides a measure of the degree of attenuation due to N. Model 3 (Panel C), extends model 2 to include latent interactions between Neuroticism and the JCQ factors in order to test whether Neuroticism acts as a moderator. Lastly, in Model 4 (Panel D), we treat N as a confounder and partial out variance in both JCQ factors and Anxiety and Depression.

(Insert Figure 1 about here)

In all models, correlations between N and Decision Latitude, Psychological Demands and Social Support were fixed to zero, but the three JCQ factors were allowed to correlate. Parcel level structural models were estimated using robust maximum likelihood (MLR).

### ***2.3.3 Model Evaluation***

Model fit was assessed using multiple fit indices and common cut-off criteria for good fitting models (e.g. Hu & Bentler, 1999). Here we adopted a cut-off of  $>.90$  to  $.95$  for the CFI and TLI, of  $<.08$  for the RMSEA and of  $<.06$  for the SRMR. However, we treat cut-off values as approximate guides to model fit, and not as absolute values (Marsh, Hau & Wen, 2004). The SRMR is not available for categorical estimation using WLSMV, and so we also report the WRMR. Yu (2002) suggests values of  $<0.90$  are indicative of good fit according to the WRMR, however, there remains very little research on this index of fit.

Only limited model fit indices are available for the latent interaction model (Model 3), as this estimation method utilises numerical integration. Therefore, we also report AIC and BIC as these indices are available for all models. In comparing the four non-nested structural models, differences of approximately 10 in BIC taken as indicative of substantive improvements in model fit (Raftery, 1995). Models were also examined based on the magnitude and significance of the regression parameters of interest.

### 3.0 Results

In the current sample, 11.1% and 50.1% of participants scored above the threshold indicating the presence of depression and anxiety respectively, based on the suggested cut-off values for the GHQ.

#### 3.1 Measurement Model

Model fit for the item level measurement model was moderate to good ( $\chi^2=2145.61, df=887, p<.001; CFI=.94; TLI=.93; RMSEA=.062; WRMR=1.65$ ). All factor loadings were statistically significant ( $p<.001$ ). Factors loadings for Decision Latitude ranged from .32 to .87; for Psychological Demands from .48 to .85; for Social Support from .49 to .89; for Anxiety from .75 to .91; for Depression from .88 to .97; and for Neuroticism from .50 to .81. The parcelled measurement model (Figure 2) also showed good fit ( $\chi^2=263.38, df=120, p<.001; CFI=.97; TLI=.96; RMSEA=.057; SRMR=.045$ ), with the inter-factor correlations highly consistent across the item and parcel level models (Table 1).

(Insert Figure 2 about here)

(Insert Table 1 about here)

#### 3.2 Structural Models

The results for the structural models are shown in Tables 2 and 3. The difference in parameter estimates across models 1 and 2 and 4 provide an estimate of the attenuation of the association due to first, controlling N variance in anxiety and depression and, second, controlling the effects of N on both reported job characteristics and anxiety and depression. In model 1, Decision Latitude and Psychological Demands have significant effects on Anxiety, accounting for 27.3% of the variance. Decision Latitude and Social Support have significant effects on Depression, accounting for 13.3% of the variance.

N is a significant predictor of both Anxiety and Depression (Model 2). The inclusion of N as a predictor of Anxiety and Depression results in a large attenuation of the effects of

job characteristics. For example, the effect of Decision Latitude on Anxiety drops from  $-.38$  to  $-.13$ , whilst the effects of Psychological Demands drop from  $.45$  to  $.27$ .  $N$  incrementally adds 28.2% variance explained in Anxiety, and 8.4% in Depression. The inclusion of  $N$  also reduces the correlation between Anxiety and Depression from  $.44$  ( $p < .001$ ; Model 1) to  $.26$  ( $p < .001$ ; Model 2). Collectively these results suggest shared variance attributable to  $N$  in Anxiety, Depression and job characteristics.

(Insert Table 2 about here)

In model 3 we tested whether significant interactions were present between  $N$  and JCQ factors. No significant interactions were found in the prediction of Anxiety. In the case of Depression, a significant interaction was found between Decision Latitude and Neuroticism. This interaction is represented in Figure 3. The three lines indicate the linear variation of Depression with Decision Latitude for three different levels of Neuroticism. The interaction indicated that individuals of lower levels of  $N$  were of greater risk of experiencing depression under conditions of low decision latitude than those of higher levels of  $N$ .

(Insert Figure 3 about here)

In model 4, we also included the effects of  $N$  on JCQ factors.  $N$  had significant effects on Decision Latitude ( $\beta = -.36$ ,  $p < .001$ ; 12.0% variance explained), Psychological Demands ( $\beta = .18$ ,  $p < .01$ ; 3.5% variance explained) and Social Support ( $\beta = -.26$ ,  $p < .001$ ; 5.7% variance explained). When fully controlling for  $N$ , further attenuations were seen, with the effects of Decision Latitude now being non-significant for both Anxiety and Depression. However, the effect of Psychological Demands on Anxiety, and Social Support on Depression, both remained significant, suggesting this association is independent of  $N$ .

(Insert Table 3 about here)

Finally, considering the model fit of the four models (Table 3), it is clear that both the interaction (model 3) and confounding (model 4) models show the best, comparable levels of

fit. This is based on the observation that the difference in BIC is less than 10 (Raftery, 1995) and the difference in AIC is only 3. Thus, statistically, these models are largely indistinguishable in the current sample and it is, therefore, not possible to conclude that the possible confounding role of N is necessarily more or less important than the moderating role of N, merely that both seem to be reasonably consistent with the data.

#### **4.0 Discussion**

In the present study, we sought to clarify the role that neuroticism plays in the association between job characteristics and anxiety and depression. Consistent with previous studies, we found that adverse work characteristics tended to be associated with higher levels of anxiety and depression, however, we found different patterns of results for different job characteristics, suggesting that the effects of job characteristics on psychological wellbeing and the role that neuroticism plays in this is not uniform across different features of the work environment and different aspects of psychological wellbeing.

There was evidence that neuroticism may have confounded the associations between decision latitude and both anxiety and depression. After controlling for the effects of neuroticism on all three these constructs, the initially significant associations were attenuated to non-significance. As may be expected, the largest attenuation was seen after controlling for neuroticism variance in anxiety and depression.

Further, there was also evidence that neuroticism interacts with decision latitude in predicting depression. Specifically, individuals of lower levels of neuroticism were of greater risk of experiencing depression under situations of low decision latitude than were individuals of higher levels of neuroticism. Though high levels of control in one's job is typically thought of as being desirable, for individuals high in N who may lack confidence or worry about the consequences of their decisions, more direction from supervisors and *less* control and autonomy may be more conducive to maintenance of psychological wellbeing

(e.g. Sterns, Alexander, Barrett & Dambrot, 1983). However, this same interaction was not statistically significant for anxiety and so some caution in this interpretation is merited.

Nevertheless, the finding of a significant interaction between neuroticism and decision latitude implies an additional complexity to consider in the debate as to whether neuroticism should be treated as a confounder. Specifically, if interactions with neuroticism exist, then controlling for neuroticism alone will not remove the additional variance in outcome due to the interactions. To obtain associations that were entirely independent of neuroticism would require, in addition, statistical removal of this variance too. Whether or not this makes substantive sense in the context of a particular study is a theoretical rather than a statistical question, however, testing for the presence of interactions is informative with respect to the additional contribution to psychological wellbeing.

Two effects remained in model 4 which appear statistically independent of the main effect of neuroticism. Psychological demands were significantly related to anxiety, but not depression, whilst social support was significantly related to depression, but not anxiety. In both cases, controlling for variance due to neuroticism attenuated the strength of the associations, but did not remove them entirely.

Overall, the specificity of the associations between particular job characteristics and particular outcomes suggests that examining the effect of job characteristics on mental health using only higher-order job strain composites as is commonly done (e.g. Karasek & Theorell, 1990) could mask potential nuances in the associations with lower order factors.

#### **4.1 Strengths & Limitations**

Our study had some strengths and limitations which could affect the generalisability of results. The study utilised a good sized sample of participants all of whom were in full-time employment in a number of different organisations, thus ensuring some degree variability in work characteristics. We were able to utilise SEM in order to estimate our

models using latent (error free) variables, an advantage over observed score methods.

However, in order to more reliably estimate latent interactions, we required closer approximation to continuous measurement than is offered by limited response format items, and thus we employed item parcelling. In this instance, this represents a pragmatic modelling decision necessary to test our substantive hypotheses.

Further, we had only cross-sectional data meaning that we could not verify direction of causality in this particular study; though previous longitudinal analyses suggested that it was reasonable to assume that the causal direction primarily ran from job characteristics to psychological wellbeing outcomes (Stansfeld et al. 2008). In addition, although we addressed a potential source of response bias in neuroticism, we had only self-report data and so could not verify the accuracy of reported job characteristics.



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**Table 1:**

Latent factor correlations for the item and parcel level measurement models.

|                         | 1       | 2       | 3       | 4       | 5       | 6       |
|-------------------------|---------|---------|---------|---------|---------|---------|
| 1.Decision Latitude     | -       | .16*    | .40***  | -.30*** | -.31*** | -.35*** |
| 2.Psychological Demands | .17**   | -       | -.24*** | .36***  | .09     | .19**   |
| 3.Social Support        | .39***  | -.24*** | -       | -.33*** | -.28*** | -.24*** |
| 4.Anxiety               | -.31*** | .40***  | -.29*** | -       | .51***  | .73***  |
| 5.Depression            | -.39*** | .15*    | -.30*** | .65***  | -       | .46***  |
| 6.Neuroticism           | -.36*** | .21***  | -.22*** | .73***  | .66***  | -       |

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

Note: Correlations from the item level measurement model are shown below the diagonal, correlations from the parceled measurement model above the diagonal.

**Table 2:**

Standardized Structural Parameters for Models 1 to 4.

|   | Anxiety       |                 | Depression    |                 |
|---|---------------|-----------------|---------------|-----------------|
|   | $\beta$ (S.E) | <i>p</i> -value | $\beta$ (S.E) | <i>p</i> -value |
| <i>Model 1</i>                              |               |                 |               |                 |
| Decision Latitude                           | -.379(.076)   | <.001           | -.290(.071)   | <.001           |
| Psychological Demands                       | .454(.075)    | <.001           | .102(.065)    | .118(ns)        |
| Social Support                              | -.124(.073)   | .092(ns)        | -.156(.071)   | <.05            |
| <i>Model 2</i>                              |               |                 |               |                 |
| Decision Latitude                           | -.188(.082)   | <.05            | -.171(.073)   | <.05            |
| Psychological Demands                       | .409(.080)    | <.001           | .021(.067)    | .758(ns)        |
| Social Support                              | -.138(.079)   | .082(ns)        | -.154(.072)   | <.05            |
| Neuroticism                                 | 1.000(.098)   | <.001           | .449(.069)    | <.001           |
| <i>Model 3</i>                              |               |                 |               |                 |
| Decision Latitude                           | -.195(.105)   | .061(ns)        | -.203(.101)   | <.05            |
| Psychological Demands                       | .412(.074)    | <.001           | .022(.069)    | .749(ns)        |
| Social Support                              | -.137(.099)   | .167(ns)        | -.151(.085)   | .076(ns)        |
| Neuroticism                                 | 1.014(.111)   | <.001           | .551(.112)    | <.001           |
| Neuroticism x Decision Latitude Interaction | -.093(.066)   | .156(ns)        | -.497(.151)   | <.01            |
| <i>Model 4</i>                              |               |                 |               |                 |
| Decision Latitude                           | -.126(.080)   | .116(ns)        | -.138(.071)   | .053(ns)        |
| Psychological Demands                       | .369(.080)    | <.001           | .005(.067)    | .938(ns)        |
| Social Support                              | -.128(.078)   | .098(ns)        | -.148(.070)   | <.05            |
| Neuroticism                                 | 1.000(.102)   | <.001           | .450(.073)    | <.001           |

**Table 3:**

Model fit for the four structural models.

|         | $\chi^2$ | df  | <i>p</i> -value | CFI | TLI | RMSEA | RMSEA<br>90% CI | SRMR | AIC     | BIC      |
|---------|----------|-----|-----------------|-----|-----|-------|-----------------|------|---------|----------|
| Model 1 | 201.02   | 80  | <.001           | .97 | .96 | .064  | .053 to .075    | .046 | 7617.58 | 7833.12  |
| Model 2 | 316.13   | 123 | <.001           | .96 | .95 | .065  | .056 to .074    | .098 | 9974.44 | 10233.09 |
| Model 3 | -        | -   | -               | -   | -   | -     | -               | -    | 9924.69 | 10191.18 |
| Model 4 | 263.38   | 120 | <.001           | .97 | .96 | .057  | .047 to .066    | .045 | 9927.69 | 10198.09 |

### Figure Captions

#### Figure 1

Schematic diagram of the four structural models to be tested. JCQ represents the three JCQ factors; N=Neuroticism; GHQ represents both Anxiety and Depression. Single headed arrows depict the regression parameters estimated. Dashed lines in Panel C depict latent interaction estimates.

#### Figure 2

Full parcel level measurement model. DL=Decision Latitude; PD=Psychological Demands; SS=Social Support; ANX=Anxiety; DEP=Depression; N=Neuroticism. All estimates are standardized and significant at  $p < .001$ . Item numbers for the items included in each parcel are given in the rectangles and correspond to those in the following publications. JCQ: Karasek et al. (1985); GHQ: Goldberg & Hillier (1979); BFI; John & Srivastava (1999).

#### Figure 3

Latent interaction plot between Decision Latitude and Neuroticism. The three lines indicate how Depression varies linearly with Decision Latitude at the mean and +/- 1SD of Neuroticism.



Figure 1

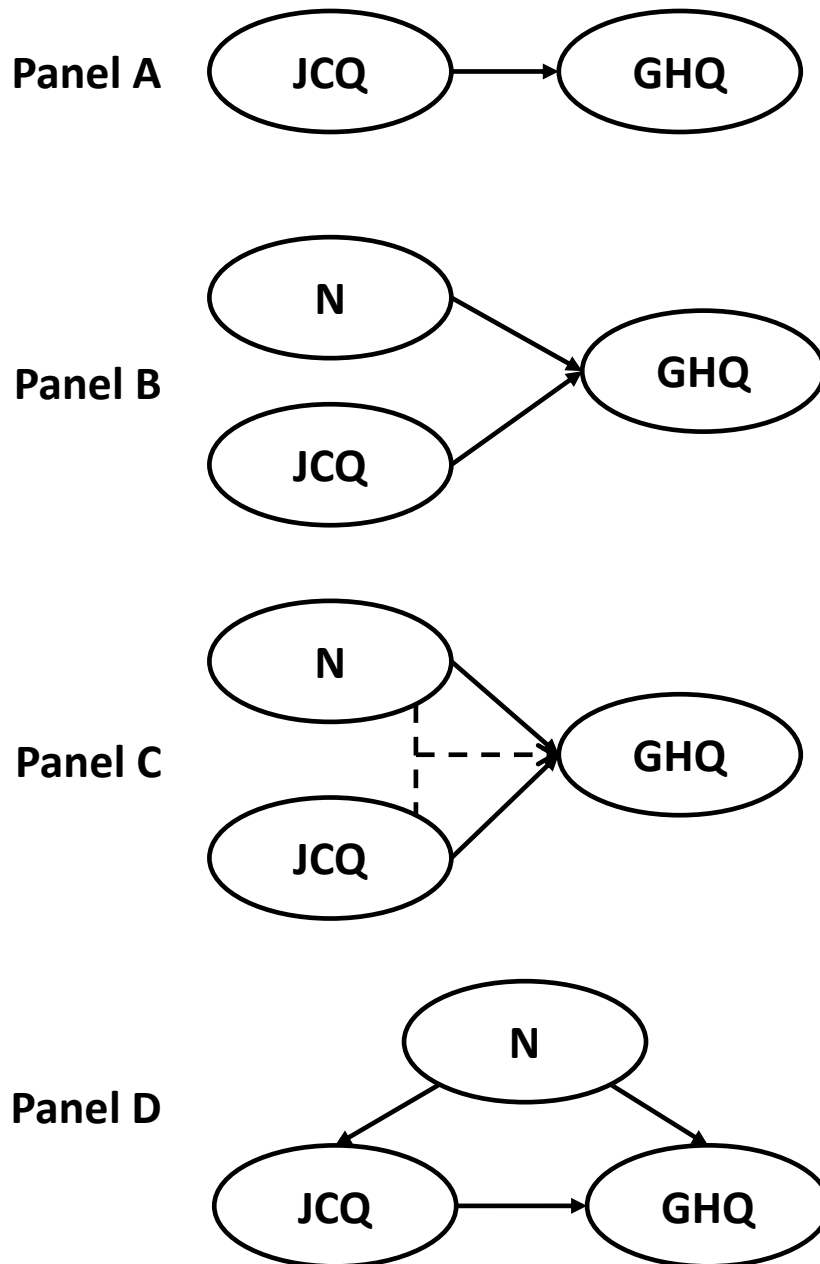
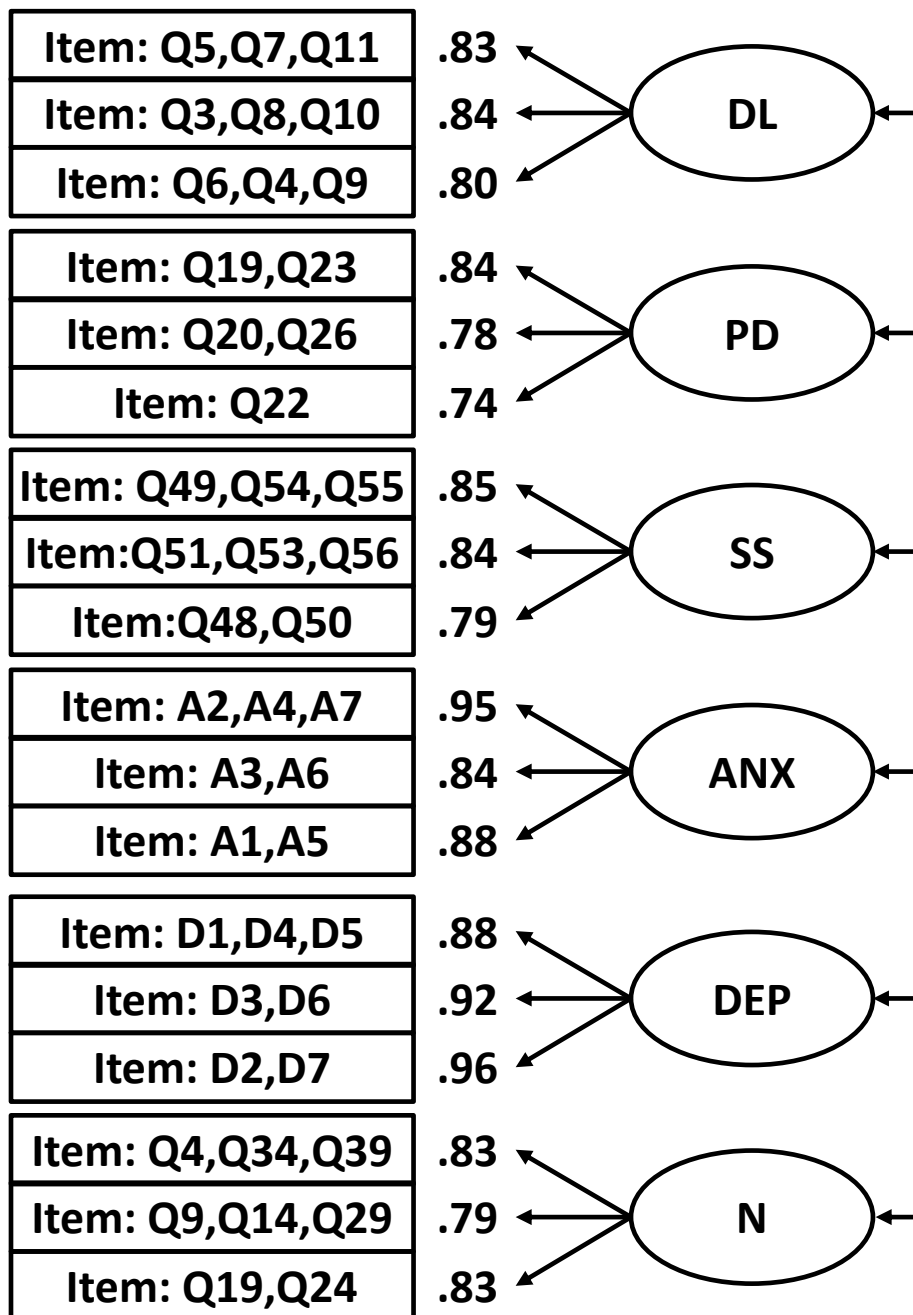


Figure 2



**Figure 3**

