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The Association of Extraversion and Openness to Experience with Psychopathology in Fresh Entrants to Professional College

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ABSTRACT

In order to investigate the association between the big five personality traits (Neuroticism, Extraversion, Openness to Experience, Agreeableness and Conscientiousness) and psychopathology in fresh entrants to professional course, 142 first year students were recruited from a professional college in South India. The Self-rating Anxiety Scale and Self-rating Depression scale devised by Zung was administered to elucidate the psychopathology; NEO-FFI of Costa & Mc Crae was administered to delineate the predominant personality traits. The correlation co-efficient between the personality traits and psychopathology was calculated. Regression analysis was performed to determine which personality trait was the best predictor of psychopathology. We infer that the stressful situation of entering the professional curriculum is marked by a combination of decreased Openness to Experience & increased Extraversion in the great majority of normal students, and those with pure anxiety. In contrast, the co-morbid group has a relatively high prevalence of homebodies (decreased Extraversion & Openness) who like to spend most of their time alone. We hypothesize that an optimal balance of Extraversion and Openness to Experience is essential for psychological resilience. Drastic decrease in Openness (alexithymia) along with increased Extraversion predisposes the subjects towards the development of anxiety symptoms, since by focusing more on the external world, they neglect attending to their internal capacity necessary for psychological resilience. The alexithymia could be a stress-induced and state-dependent secondary trait, which needs further exploration by QTL analytic techniques. We suggest that a more global view regarding the association between multiple personality traits and psychopathology might lead to the discovery of specific patterns of symptoms which are not at present included in DSM-IV criteria.

Key word: Psychopathology, Personality traits, Professional college students

INTRODUCTION

Many studies have investigated the relationship between the big five personality traits, (Neuroticism, Extraversion, Openness to Experience, Agreeableness, Conscientiousness) and psychopathology[1, 2], but the extent to which personality traits are associated with anxious and depressive psychopathology is still unresolved. There is general agreement that individuals scoring high on Neuroticism have diminished psychological resilience, and exhibit negative affectivity[1, 3]

There is evidence indicating that the phenotypic structure of traits closely resembles the underlying genetic architecture and to a lesser degree, environmental structure [4]. Eysenck and Rachman[5] hypothesized that subjects with symptoms of anxiety and/or depression have high scores on Neuroticism scales and low in Extraversion. Results have been contradictory concerning the association between Extraversion and depression or anxiety disorders[6], though it is well established that high Neuroticism is a risk factor for both anxiety and depression. In order to identify the link between personality traits and psychopathology, we selected a group of adolescents experiencing a stressful situation viz., new entrants to professional course. These students have to cope-up with the stress of entering University education from school, in addition to having to face the developmental problems associated with the transitional stage of adolescence, which is characterized by physical, emotional, cognitive and social metamorphosis[7]. Since professional education is very challenging, it necessitates successful adaptation, social competence and inherent strength to cope with adverse circumstances.

According to several authors, personality factors could indicate early and persistent risk for the development of psychopathology[8]. Though numerous studies have identified Neuroticism as the personality trait

related to major depression and anxiety disorders, and some of the studies found a relationship between low Extraversion and anxiety disorders [2, 9, 10], results were contradictory regarding the relationship between low Extraversion and depressive disorders [2, 9]. These studies also reveal that co-morbidity between anxiety and depression is associated with Neuroticism, and to a limited extent, with low Extraversion[9, 11].

Neuroticism or negative emotionality represents a tendency to experience feelings such as anxiety, anger, guilt and depressed mood[12]. Individuals who are high in Neuroticism may show more emotional reactions when confronted with stressful situations[13].

Extraversion is a trait characterized by a keen interest in other people and external events, and extraverts are talkative, energetic, gregarious and assertive[14]. Openness to Experience refers to willingness to make adjustments in notions and activities in accordance with new situations[15, 16].

Agreeableness measures how people are able to get along with others. Agreeable traits include empathy, consideration, friendliness, generosity etc.[17]. People with Conscientiousness are organized, thorough, plan ahead, reliable, motivated and hardworking[18].

Aim and objectives

To explore the role of the big five personality traits in contributing to psychopathology among fresh entrants to professional course.; To discover whether specific combinations of the various personality traits play a role in predisposition towards psychopathology among the above group of students (specifically with regards to the association between Extraversion and Openness to Experience).

MATERIAL AND METHODS

The voluntary participants of the study include one hundred and forty-two first year students (68 males, 74 females) from a private professional college in South India. Their mean age was 21.4 years (SD - 2.3 years; range - 17 to 23 years).

ANXIETY – The Self-rating Anxiety Scale (SAS) of Zung[19] is a brief, 20 item self-report questionnaire that measures the presence and magnitude of the anxiety-based symptoms that are listed in the DSM-IV-TR (APA 2000) criteria for anxiety. Each item is scored on a 4-point Likert scale and raw scores were converted into SAS indices, with participants having cut-off index scores above 45 being classified as "clinically anxious".

DEPRESSION – The Self-rating Depression Scale (SDS) devised by Zung[20] was used to identify the students with depressive symptoms. This scale is also a brief, 20-item self-support questionnaire which measures the presence and extent of depressive symptoms. The same 4-point scale as in the SAS was used. Raw scores (Range = 20-80) were converted into SDS indices, and a cut-off index score of 50 was used to identify the participants experiencing significant depressive symptoms.

After computing their SAS and SDS indices, the personality traits were elucidated using the NEO-FFI (NEO Five Factor Inventory) [21], which was administered to the participants. The NEO-FFI comprises 60 items developed to provide a concise measure of the five basic personality factors and uses a five-point Likert response format. The participants responded by marking on each of 60 items whether they *strongly agree, agree, neutral, disagree or strongly disagree* with a given proposition about themselves. The scores of 12 items were summed to provide an overall measure of every factor. Raw scores were converted to T-scores using the formula $T = 50 + 10(X - Y) / Z$, where, X = Raw score of the student; Y = Average Score of the whole cohort; Z = Standard Deviation. Pearson correlation co-efficient was used to calculate the relationship between the personality traits and between the personality traits and SAS & SDS indices. Multiple Logistic Regression was performed to determine the predictors of psychopathology among the four personality traits (E, O, A& C; N already has been universally established as a predictor of psychopathology). ANOVA was performed between the four groups viz., normal, group with anxiety, group with depression, and the group with co-morbidity (anxiety co-existing with depression) ,for all the five personality traits, viz., Neuroticism(N), Extraversion(E), Openness to experience(O), Agreeableness(A) and Conscientiousness(C). The results were tabulated and graphically represented.

RESULTS

The correlations between the various personality traits and psychopathology are illustrated in Tables 1A, 1B, 1C & 1D and Figure 1.

Table 1A: Correlation matrix of the personality traits and SAS & SDS indices in normal students

	N	E	O	A	C	SAS	SDS
N							
E	-0.360**	-					
O	-0.566**	0.336*	-				
A	-0.407**	-0.16	-0.266	-			
C	-0.03	-0.720**	-0.282*	0.024	-		
SAS	0.294*	-0.274	-0.454**	0.187	0.145	-	
SDS	0.251	-0.327*	-0.26	0.028	0.222	0.514**	-

**Correlation is significant at the 0.01 level (2-tailed)

*Correlation is significant at the 0.05 level (2-talied)

Negative correlation between N & E ($p<0.01$); negative correlation between N & O ($p<0.01$); negative correlation between N & A ($p<.0.01$); positive correlation between E & O ($p<0.05$); negative correlation between E & C

(p<.01); negative correlation between E & depression (SDS) (p<0.05); negative correlation between O & C (p<0.05); negative correlation between O & anxiety(SAS) (p<0.01); positive correlation between anxiety(SAS) & depression(SDS) scores (p<0.01)

Table 1B: Correlation matrix of the personality traits and SAS & SDS indices in students with depression

	N	E	O	A	C	SAS	SDS
N	-						
E	-0.31	-					
O	-0.13	-0.286	-				
A	-0.22	-0.237	-0.650**	-			
C	-0.643**	-0.385	0.295	-0.284	-		
SAS	-0.05	0.301	-0.126	0.007	-0.1	-	
SDS	0.301	0.072	-0.264	0.298	-0.442*	0.131	-

**Correlation is significant at the 0.01 level (2-tailed)

*Correlation is significant at the 0.05 level (2-talied)

Negative correlation between N & C (p<0.01); negative correlation between O & A (p<0.01); negative correlation between C & depression (SDS) (p<0.05);

Table 1C: Correlation matrix of the personality traits and SAS & SDS indices in students with anxiety

	N	E	O	A	C	SAS	SDS
N	-						
E	-0.254	-					
O	-0.441*	-0.431*	-				
A	-0.475*	-0.138	-0.036	-			
C	-0.157	-0.659**	0.357	-0.042	-		
SAS	0.345	0.086	-0.362	-0.174	-0.105	-	
SDS	0.097	0.425*	-0.36	-0.165	-0.294	-0.224	-

**Correlation is significant at the 0.01 level (2-tailed)

*Correlation is significant at the 0.05 level (2-talied)

Negative correlation between N & O (p<0.05); negative correlation between N & A (p<0.05); negative correlation between E & O (p<0.05); negative correlation between E &CO (p<0.001); positive correlation between E & depression (SDS) (p<0.05)

Table 1D: Correlation matrix of the personality traits and SAS & SDS indices in students with both anxiety and depression

	N	E	O	A	C	SAS	SDS
N	-						
E	-0.435**	-					
O	-0.092	-0.147	-				
A	-0.247	-0.134	-0.525**	-			
C	-0.545**	-0.150**	0.161	-0.264	-		
SAS	0.081	-0.339*	0.212	-0.02	0.1	-	
SDS	0.226	-0.079	0.028	0.126	-0.361**	0.154	-

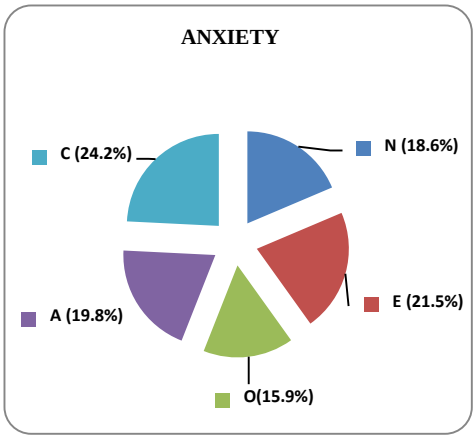
**Correlation is significant at the 0.01 level (2-tailed)

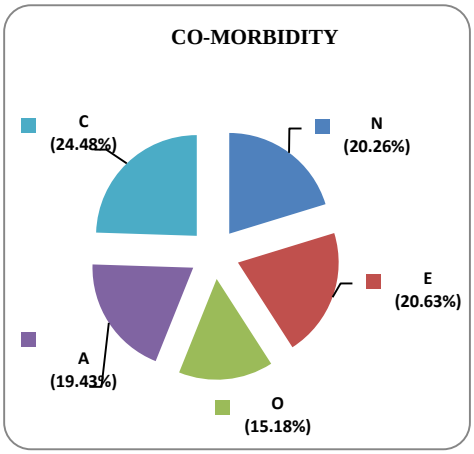
*Correlation is significant at the 0.05 level (2-talied)

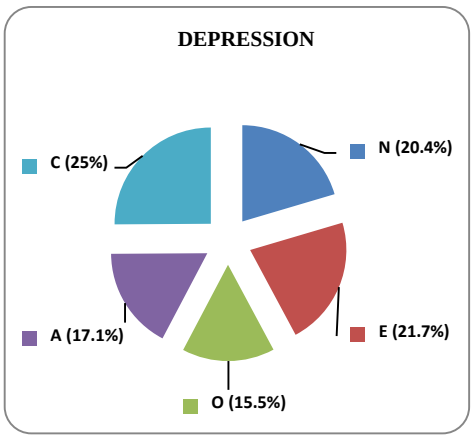
Negative correlation between N & E (p<0.01); negative correlation between N & C (p<0.01); negative correlation between E & anxiety (SAS) (p<0.05); negative correlation between O & A (p<0.01); negative correlation between C & depression (SDS) (p<0.05)

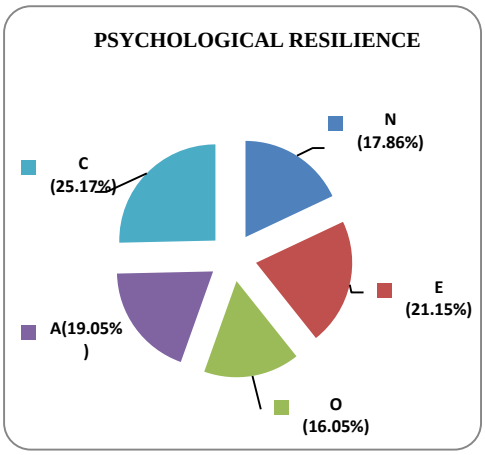
Fig:1 Contribution of the personality traits to psychopathology

Fig: 1 shows that Neuroticism is relatively high and Extraversion low in subjects with depression and co-morbid condition; a combination low Neuroticism and high Extraversion is present in psychologically resilient individuals.









Multiple Logistic Regression revealing which personality trait is the best predictor of psychopathology is depicted in Table 2 and Figure 2.

Table 2: Multiple Logistic Regression predicting psychopathology

	GROUP	B	Std. Error	Wald	p	Exp(B)
DEPRESSION	Intercept	8.144	9.505	0.734	0.392	
	E	-0.015	0.067	0.052	0.819	0.985
	O	-0.064	0.071	0.79	0.374	0.938
	A	-0.038	0.063	0.352	0.553	0.963
	C	-0.06	0.072	0.697	0.404	0.942
ANXIETY	Intercept	25.395	9.525	7.109	0.008	
	E	-0.093	0.067	1.916	0.166	0.912
	O	-0.219	0.089	6.009	0.014*	0.804
	A	-0.079	0.068	1.337	0.248	0.924
	C	-0.145	0.069	4.445	0.035*	0.865
CO-MORBIDITY	Intercept	32.038	8.028	15.925	0	
	E	-0.143	0.055	6.807	0.009***	0.867
	O	-0.216	0.07	9.596	0.002***	0.806
	A	-0.135	0.056	5.853	0.016**	0.874
	C	-0.155	0.06	6.716	0.010**	0.856

B: regression coefficient
Exp (B): Expected B – Odd's ratio
*O & C are predictors of anxiety.
**A & C are significant predictors for the co-morbid group
*** E & O are highly significant predictors for the co-morbid group

ANOVA between the normal students and the three groups of psycho-morbidity for all the five personality traits is illustrated in Table 3A & 3B.

ANOVA between Neuroticism (N) and the four groups of psychopathology is significant at $p<0.01$ (highly significant)

Fig: 2 Mean T- scores in normal students and students with psychopathology

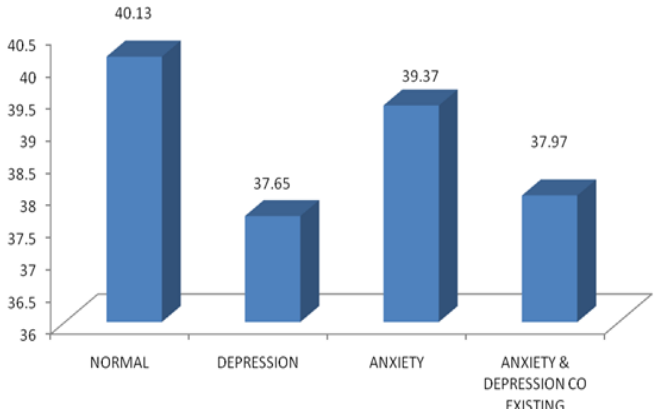


Table 3A: ANOVA (Neuroticism)

	Sum of squares	df	Mean square	F	Significance
Between groups	1002.868	3	334.289	9.049	0
Within groups	5098.083	138	36.943		
Total	6100.952	141			

Table 3B: ANOVA (Openness to experience)

	Sum of squares	df	Mean square	F	Significance
Between groups	156.132	3	52.044	4.008	0.009
Within groups	1791.836	138	12.984		
Total	1947.968	141			

ANOVA between Openness to experience (O) and the four groups of psychopathology is significant at $p<0.01$ (highly significant)

ANOVA between the four groups of psychopathology is highly significant for Neuroticism and Openness to experience ($p<0.01$); there is no significance for Extraversion, Agreeableness and Conscientiousness.

DISCUSSION

Our analysis clearly shows that Neuroticism contributes a large extent to both depression and co-morbidity (vide fig.1). Low Extraversion is related to elevated anxiety scores in the group with co-morbidity, whereas, in the group with pure anxiety, the SDS scores increase in proportion along with the increase in Extraversion scores, and there is a negative association between Extraversion and Openness scores. This trend can be depicted as follows -

Group with co-morbidity → ↓ Extraversion associated with ↑in SAS scores (negative correlation)

Group with pure anxiety → ↑ Extraversion along with ↑ SDS scores (positive correlation) → heading towards co-morbidity.

Post Hoc test
Tukey HSD – Multiple comparisons

		Mean difference	Std. Error	Significance	95% Confidence Interval	
					Lower bound	Upper bound
Normal	Depression	-4.79824	1.57592	0.015*	-8.8966	-0.6999
	Anxiety	-1.52186	1.52662	0.751	-5.492	2.4483
	Co-morbidity	-6.01107	1.22897	0.000**	-9.2072	-2.815
Depression	Normal	4.79824	1.57592	0.015*	0.6999	8.8966
	Anxiety	3.27638	1.8345	0.284	-1.4944	8.0472
	Co-morbidity	-1.21284	1.59536	0.872	-5.3618	2.9361
Anxiety	Normal	1.52186	1.52662	0.751	-2.4483	5.492
	Depression	-3.27638	1.8345	0.284	-8.0472	1.4944
	Co-morbidity	-4.48921	1.54668	0.022	-8.5115	-0.4669
Co-morbidity	Normal	6.01107	1.22897	0.000**	2.815	9.2072
	Depression	1.21284	1.59536	0.872	-2.9361	5.3618
	Anxiety	4.48921	1.54668	0.022	0.4669	8.5115

ANOVA performed for Neuroticism (N)was highly significant between the four groups viz., normal, anxiety, depression and co-morbid group ($p<0.01$)**;N scores between the normal and depressed subjects is found to be significant ($p<0.05$)*; N scores between normal and co-morbid group is highly significant ($p<0.01$)**; N scores between normal and the group with anxiety, the groups with depression & anxiety, and depression & co-morbidity was not found to be significant; * N scores between the groups with anxiety and co-morbidity was found to be significant ($p<0.05$)

Post Hoc test
Tukey HSD – Multiple comparisons

		Mean difference	Std. Error	Significance	95% Confidence Interval	
					Lower bound	Upper bound
Normal	Depression	2.48667	0.93429	0.043*	0.0569	4.9164
	Anxiety	0.76855	0.90506	0.831	-1.5852	3.1223
	Co-morbidity	2.16376	0.7286	0.018*	0.269	4.0586
Depression	Normal	-2.48667	0.93429	0.043*	-4.9164	-0.0569
	Anxiety	-1.71812	1.08758	0.394	-4.5465	1.1103
	Co-morbidity	-0.32291	0.94581	0.986	-2.7826	2.1368
Anxiety	Normal	-0.76855	0.90506	0.831	-3.1223	1.5852
	Depression	1.71812	1.08758	0.394	-1.1103	4.5465
	Co-morbidity	1.39521	0.91695	0.427	-0.9894	3.7798
Co-morbidity	Normal	-2.16376	0.7286	0.018*	-4.0586	-0.269
	Depression	0.32291	0.94581	0.986	-2.1368	2.7826
	Anxiety	-1.39521	0.91695	0.427	-3.7798	0.9894

ANOVA performed for Openness to experience (O) was highly significant between the four groups viz., normal, anxiety, depression and co-morbid group ($p<0.01$)**; O scores between the normal and depressed subjects is found to be significantly low ($p<0.05$)*; O scores between normal and the group with co-morbidity is found to be significantly low ($p<0.05$)*

Our results also demonstrate a drastic decrease in Openness to Experience in the group with co-morbidity (vide fig. 2). Nettle[22] has suggested that both poles of normal personality dimensions involve costs and benefits, signifying the consequences of the drastic decrease in the personality trait, which resulted in psychopathology. The anxiety group has increased Extraversion scores when compared to normal subjects. These results are somewhat similar to those of Trull and Sher[11] who measured normal personality with the NEO-FFI and showed that low Extraversion predicted depression and anxiety.

Piedmont et al[23] argue that personality disorders could be conceptualized as extreme values on one or more of the five primary traits, and that negligible openness might correspond to an inability to adapt to change, intolerance to different perspectives, alexithymia and limited interests. Extreme values on Openness, either excessive or negligible, can undermine connections with social collectives or relationships.

Among the student groups, the great majority have the combination of increased Extraversion plus decreased Openness to Experience (i.e.) the group labelled as mainstream consumers. This combination of Extraversion and Openness (main stream consumers) is present mainly in the normal students and those with pure anxiety alone; the least proportion of main stream consumers is present in the group with co-morbidity. In contrast, the prevalence of homebodies (i.e.) decreased Extraversion plus decreased Openness is comparatively high in the co-morbid group. Around 36.17% among the group with co-morbidity are interested in pursuing activities alone, for example, spending most of the time watching television. Such a combination of low Extraversion and Openness is least prevalent in those with pure anxiety alone, indicating that the development of anxiety symptoms makes them concentrate more on external activities like enjoying themselves outside with others. In contrast, the co-morbid group is not motivated to enjoy life and they spend most of the time alone.

We hypothesize that a harmonious combination of Extraversion and Openness in optimal proportions is essential for psychological resilience. Regarding the etiology of depression and anxiety, the linear relation between Neuroticism and low Extraversion on one hand, and high Extraversion and low Openness on the other, links well to the hypothesis that anxiety and depression are polygenic disorders with a partly shared common genetic background [24, 25].

Bienvenu et al[2] have already suggested that subjects scoring high on Neuroticism and low on Extraversion have an increased chance to develop anxiety or depression, and as a result have a predilection for both disorders as well. We can therefore infer that dimensions like Extraversion and Openness to Experience exert a protective effect in the development of both depression and anxiety.

The correlation between the different personality traits and between the personality traits and anxiety and/or depression may occur due to the pleiotropic effect of certain genes, where a single gene contributes to multiple phenotypic traits. As a result, a given polymorphism in one of the genes may influence several traits. According to Scott et al[26], Openness to Experience is related to the 5-HTTLPR polymorphism, and this functional polymorphism was considered as a plausible candidate gene for anxiety-related personality traits.

Lesch et al [27] reported that individuals carrying the 5-HTTLPR-S allele have increased total scores on NEO-PI-R Neuroticism. These findings throw a light on the genetic contributions to the various personality traits/phenotypes which may also be linked with anxious or depressive psychopathology [28, 29].

Henning [30] has stated that dopamine is the neurochemical basis of Extraversion and that the COMT-VAL 158 MET polymorphism is related to Extraversion because of its great influence on the catabolism of dopamine, and that these findings have implications for the understanding of neurochemical correlates of normal and psychological behaviors.

Therefore, we can postulate that Neuroticism, Openness, and anxiety trait on one axis having the common gene exhibiting 5-HTTLPR polymorphism, and Extraversion linked with genes associated with meso-limbic dopaminergic system on the other axis, must be present in optimal balance for psychological resilience.

Dimensions of individual differences in personality are complex traits, multiple genes, genetic systems and multiple environmental factors influencing each trait [31]. The group with pure anxiety has a tendency towards alexithymia i.e. difficulty identifying feelings and distinguishing between feelings, and the bodily sensations of emotional arousal due to a stimulus-bound, externally oriented cognitive style, which is further aggravated by increased Extraversion, making them focus on the external world around them, and less concerned with the internal and inherent capability necessary for psychological resilience.

Moreover, this outgoing and restless nature of Extraverts, typical of the adolescent stage, makes them vulnerable for psychopathology. This psychological trait may be a “Secondary Alexithymia” rather than a primary one, which is state-dependent, arising as a result of the stressful situation of entering a professional curriculum and may disappear after the evoking stressful situation has changed. QTL (Quantitative Trait Locus) analysis in which two or three variables share the same loci may throw light on the role of the above combination of traits in predisposing the individuals to psychopathology i.e. whether the impaired psychological resilience is due to primary or secondary trait afflictions.

A combination of decreased Openness plus increased Extraversion predisposes these adolescents for symptoms of anxiety; their SDS scores increase in

proportion with increased Extraversion scores, leading them towards co-morbidity.

Conclusion

According to Kruger[8], personality and psychopathology are linked at an etiological level. Behavior genetic research reveals a genetic basis for such links, proving that these connections are not mere phenotypic associations.

Since recent research challenges some assumptions made in the DSM that all forms of psychopathology are discrete categories (many people diagnosed as having depression are found to meet criteria for anxiety disorders as well) [32], we need an empirically based model of psychopathology that could overcome these limitations. Research studies should encompass the association between a combination of the various personality traits and psychopathology (i.e.) we need to arrive at a more global view regarding the link between personality traits and psychopathology rather than investigating the contribution of a single personality trait to psychopathology. Kruger and Markon[32] have classified the psychopathology spectrum into an Internalizing one consisting of negative emotionality or Neuroticism (associated with phenomena such as Depression, Anxiety and Phobias) and an externalizing spectrum characterized by the broad domain of disinhibition – a domain that intersects unconscientiousness and disagreeableness, including phenomenon such as anti-social behavior and substance-use disorder. While negative emotionality confers risk for disorders in the internalizing spectrum, a combination of negative emotionality and disinhibition confers risk for disorders in the externalizing spectrum.

We can therefore come to the conclusion that an empirically based model of psychopathology which can guide us into its origin can be arrived at only by blending together behavior-genetic, personality and quantitative-psychological research perspectives, which would constitute an evolution of the DSM.

Further, the primary trait afflictions have to be differentiated from the secondary ones, for which QTL (Quantitative Trait Locus) analyses are of utmost value. Studies focusing on a more global view of the association between personality traits and psychopathology might form a strong basis for such QTL (Quantitative Trait Locus) and genetic analyses, since they can throw light on specific patterns of symptoms, which are not classified as a disorder according to the DSM IV criteria.

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