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**Factor Analysis of behavioural symptoms in Huntington's  
disease.**

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## **Abstract.**

A principal components factor analysis was performed on behavioural data obtained from the European Huntington's Disease Network REGISTRY study. 1690 valid assessments using the United Huntington's Disease Rating Scale (UHDRS) Behavioural Rating Scale were included in the analysis. This large data set confirmed previous reports of distinct behavioural patterns within HD comprising of a depressive factor, a dysexecutive factor, an irritability factor and a psychosis factor.

## **Introduction**

Huntington's disease (HD) is a progressive neuropsychiatric disorder consisting of motor, cognitive, behavioural, affective and perceptual changes. Psychiatric problems in HD are common and lead to significant impairment in the Quality of Life of people with HD<sup>1,2</sup>. The Behaviour section of the Unified Huntington's Disease Rating Scale (UHDRS) was designed to record a range of psychiatric phenomena in people with HD<sup>3</sup>. There are few studies analysing the relationship between different psychiatric phenomena in HD. Marder et al<sup>4</sup> performed a factor analysis on 960 UHDRS assessments as part of the Huntington's Study Group (HSG) project. They isolated 15 factors, including "depression/anxiety", "suicidal thoughts", "aggressivity" and "obsessive/compulsive". There were a number of smaller factors including hallucinations in different modalities, something not routinely enquired about in current UHDRS assessment. Craufurd et al<sup>5</sup> used factor analysis to examine data on 78 patients with HD who had undergone the Problem Behaviours Assessment in HD (PBA-HD). Principal components factor analysis revealed 3 clusters of symptoms, reflecting apathy, depression and irritability. The apathy factor was closely related to the duration of illness, being a stronger feature later in the illness. A further paper by Kingma et al<sup>6</sup> using the PBA on 152 HD mutation carriers also showed a 3 factor solution; apathy, depression and irritability.

The European Huntington's Disease Network (EHDN) REGISTRY study ([www.euro-hd.net/html/registry](http://www.euro-hd.net/html/registry)) has provided a unique opportunity to re-examine psychiatric symptoms in the setting of HD. This study has recruited around 4000 people with HD and participants are followed up at yearly intervals.

The aim of our study was to perform a factor analysis on all the completed UHDRS behavioural assessments performed across Europe since the inception of the REGISTRY study. The total number of fully completed assessments at the time of writing was 1690. Elucidation of specific behavioural or psychiatric factors may lead to the identification of specific phenotypes within HD, which in turn could lead to greater insight into aetiology and aid with treatment.

## **Method.**

Data were made available from the EHDN REGISTRY database following approval from the Scientific and Bioethical Advisory committee and the Executive committee of the EHDN. UHDRS behaviour scores were obtained for 1803 assessments on individual participants. The UHDRS behaviour section is made up of 11 individual **items**, each scored on the dimensions of frequency and severity. The frequency (score 0-4 points) and severity (score 0-4 points) of each item were multiplied to give a single score for each item. The item scores are then added together to give the total behaviour score.

Principal components analysis was employed, with the "frequency multiplied by severity" score for each item used as a factor. Data on all the factors were analysed using SPSS v.16. A Varimax rotation was utilised with Kaiser Normalisation. Due to missing data, 113 cases were excluded to give a final N of 1690. Full ethical approval was obtained for this study.

Results.

	1	2	3	4
Depressed mood	<b>.811</b>	.140	.122	
Low self-esteem	<b>.792</b>		.117	
Suicidal	<b>.662</b>		.124	.187
Anxiety	<b>.649</b>	.276	.113	
Compulsions		<b>.848</b>		
Perseveration	.178	<b>.763</b>	.203	.124
Apathy	.288	<b>.418</b>	.179	
Aggression	.141		<b>.887</b>	
Irritability	.229	.241	<b>.807</b>	
Hallucinations				<b>.852</b>
Delusions		.257	.106	<b>.760</b>

Table 1. Factor analysis of behavioural symptoms in Huntington's Disease. N=1690

Extraction method: Principal Components Analysis

Rotation method: Varimax with Kaiser normalisation

Data included in bold if factor > 0.4

As seen in Table 1, four factors achieved a loading of over 0.4. These factors accounted with 63.8% of variance in the total score. The four factors were;

1. Depression (depressed mood, low self-esteem, suicidal ideation, anxiety)

2. Drive/executive function (perseveration, compulsion, apathy)
3. Irritability/aggression
4. Psychosis (delusions and hallucinations).

There was a good delineation between factors with each item clearly loading to one of the four factors. All factors achieving the threshold of 0.4 were at least 0.6. Eigenvalues, after rotation, were as follows; depression (2.340), drive/executive function (1.714), aggression/irritability (1.580), psychosis (1.385).

#### **Discussion.**

This factor analysis builds on the findings of Craufurd et al<sup>5</sup> and Kingma et al<sup>6</sup> who both used the PBA and Marder et al<sup>4</sup> who used an old version of the UHDRS Behaviour assessment. All the studies have shown distinct factors for depression, executive functions and irritability. Both studies using the UHDRS behaviour section had separate factors for psychosis.

These data further support the existence of specific clusters of psychiatric symptoms in HD, which may be related discretely to affect, executive function, aggression/irritability and perception. More research is needed to assess the validity of these categories, as well as their stability over time, including in the pre-manifest period. Further work is needed to develop valid rating scales that measure change in these factors as a result of treatment.

#### **Conclusion.**

Distinct clusters of behavioural symptoms are emerging in HD. These relate in general to depression, executive function, irritability and psychosis. Further studies should aim to tie in these factors with specific endophenotypes in order to establish clear clinico-pathological correlation.

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**Competing Interests**

This study received no sponsorship and was led by the investigators.

Dr Rickards has sat on an advisory board for MEDA pharmaceuticals. He has been paid honoraria for work for Cambridge Laboratories.

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**Appendix 1.** Names of all clinicians contributing UHDRS behaviour ratings to the EHDN-REGISTRY database.