

# Screening for personality disorders: A new questionnaire and its validation using Latent Class Analysis

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## Abstract

*Background:* We evaluated a new screening instrument for personality disorders. The Personality Disorder Screening (PDS) is a self-administered screening questionnaire that includes 12 items from the Personality Self Portrait (Oldham & Morris, 1990). *Sampling and methods:* The data of  $n = 966$  participants recruited from the non-clinical population and from different clinical settings were analyzed using latent class analysis. *Results:* A 4-class model fitted the data best. It confirmed a classification model for personality disorders proposed by Gunderson (1984) and showed high reliability and validity. One class corresponded to “healthy” individuals (40.6 %), and one class to individuals with personality disorders (17.2 %). Two additional classes represented individuals with specific personality styles. Evidence for convergent validity was found in terms of strong associations of the classification with the Structured Clinical Interview (SCID-II) for diagnosing personality disorders. The latent classes also showed theoretically expected associations with membership in different subsamples. *Conclusions:* The PDS shows promise as a new instrument for identifying different classes of personality disorder severity already at the screening stage of the diagnostic process.

Key words: personality disorders; psychological assessment; screening test; SCID-II; Latent Class Analysis

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## Introduction

Personality disorders (PDs) are described as maladaptive, inflexible behavior patterns of long duration (American Psychiatric Association, 1994). The complex symptomatology of PDs burdens both, individuals and society (Walters, Moran, Choudhury, Lee, & Mann, 2004). The prevalence of patients with PDs in outpatient and inpatient psychiatric populations is high. The clinical prevalence rates range between 31 % among outpatients (Zimmermann, Rothschild, & Chelminski, 2005) and 40 % among inpatients (Newton-Howes et al., 2010). Furthermore, PDs are highly comorbid with axis I disorders (Lamont & Brunero, 2009).

Despite the fact that PDs are the most prevalent psychiatric disorder (Lamont & Brunero, 2009) and that individuals with this disorder have a high level of health service contact, personality pathology is often under-diagnosed (Lamont & Brunero, 2009; Newton-Howes et al., 2010). As a consequence, many patients do not receive adequate and targeted interventions for PDs (Lamont & Brunero, 2009). Moreover, diagnosing a co-occurring PD in patients with an axis I disorder is very important. Psychotherapy research has shown that PDs can reduce the effectiveness of axis I treatments under specific circumstances (e.g. Newton-Howes, Tyrer, & Johnsen, 2006; Reich, 2003). Even if therapy only addresses the axis I disorder it is essential to take a possible PD diagnosis into account in order to enhance the treatment outcome and to avoid complications or deteriorating effects.

Considering these facts the assessment of PDs should be an essential part of each psychiatric examination. Standardized clinical interviews give a detailed analysis of the personality status, but they are lengthy and require specially trained personnel. Hence, their application is very time consuming and expensive. In addition several self-report measures are available to identify patients with PDs. Those measures generally have poor specificity and require the ability to concentrate on a long set of items. Therefore, "... it would appear necessary within health care settings to consider systematic screening of all patients for personality disorder ..." (Lamont & Brunero, 2009, p. 633).

Taking into account that diagnoses of PDs are commonly unstandardized clinical judgments (van den Hout, Brouwers, & Oomen, 2006), it is recommended to proceed in a 2-stage diagnostic process. At stage I, a brief screening should be used to identify patients who are likely to have a PD, (e.g. Mann et al., 1999). At stage II, a structured interview or standardized self-report questionnaire should be used in order to provide detailed diagnostic information about which specific PDs are present.

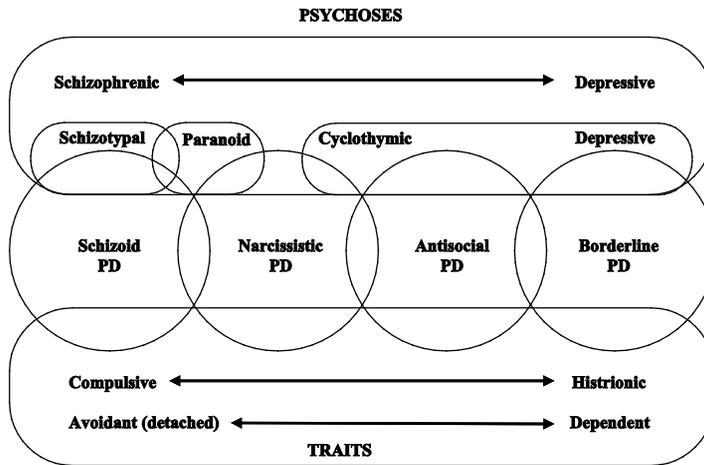
Several short interview administered screens for PDs are currently available: The Iowa Personality Disorder Screen (IPDS; Langbehn et al., 1999), the Rapid Personality Assessment Schedule (PAS-R; Van Horn, Manley, Leddy, Cicchetti, & Tyrer, 2000), and the Standardized Assessment of Personality-Abbreviated Scale (SAPAS; Moran et al. 2003). Moreover, short self-report measures or self-report versions of existing screening interviews have been developed to predict the presence or absence of a PD: The Self-report Standardized Assessment of Personality-abbreviated Scale (SAPAS-SR; Germans, Van Heck, Moran, & Hodiament, 2008), the self-administered version of the IPDS

(Germans, Van Heck, Langbehn, & Hodiament, 2010) scales for personality disorders developed from the Inventory of Interpersonal Problems (IIP-PD; Pilkonis, Kim, Proietti, & Barkham, 1996) and the Personality Disorder Screening – Short Version (PSS-K; Schöttke, Lange, Imholz, & Wiedl, 2011). The validity of these screening instruments has been analyzed in terms of sensitivity and specificity. Sensitivity ranges between .64 – .94 and specificity ranges between .40 – .88.

The application of the screening interviews requires individual scoring of particular items, which makes their use as screening instruments more complicated. Another limitation of existing screening instruments is the problem of validating diagnostic measures in the absence of a consistent ‘gold standard’ (Garrett, Eaton, & Zeger, 2002). In personality research, an adequate gold standard diagnostic test can rarely be found (Trull, 1993). Garrett et al. (2002) state that “in the absence of a gold standard, a population-based summary of covariation may temporarily serve as the standard of comparison” (p. 1290). Moreover they propose the “use of the population-based latent class model (LCM) as the standard of comparison for diagnoses in psychiatry for which there is no gold standard of diagnosis” (Garrett et al., 2002, p. 1290). A similar argument has recently been made by Thomas, Lanyon and Millsap (2009) who used latent class analysis (LCA) to validate several scales for measuring response bias.

Moreover, an important function of screening instruments is to detect diseases at an early stage (Stieglitz, 2007). It would be necessary to separate different groups of PD severity, ranging between healthy individuals and personality disordered patients. Traditionally, the receiver operating characteristic (ROC) analysis (Murphy et al., 1987) is used to identify an appropriate cut-off score in order to separate healthy individuals from personality disordered patients. Using the ROC approach it is not possible to detect different groups of PD severity. However, this goal can be achieved through LCA, which allows a classification of individuals into several distinct groups.

In the present study, we used this idea in reference to a theoretical approach for the conceptualization of PDs presented by Gunderson, Links and Reich (1991). They proposed a model, “... that organizes personality typology around a dimension of severity of impairment or dysfunction” (Gunderson et al., 1991, p. 60). Concerning the debate whether PDs are best described by using categories or dimensions, Gunderson et al. (1991) suggest synthesizing the strengths of the categorical and the dimensional approach by grouping PDs around the dimension of functional disability. Figure 1 illustrates the model according to Gunderson (1984). It proposes that “... more profound/severe types [of PDs] will be more apt to fit categorical models ...” (Gunderson et al., 1991, p. 65) and “the dimensional model [...] is most applicable to the less severe personality disorders that move imperceptibly into normally occurring traits” (Gunderson et al., 1991, p. 65). Hence this model allows separating different levels of PD severity ranging from extreme variants of normal traits to more severe forms of psychopathology.



**Figure 1:**  
Grouping of personality types from Gunderson (1984), p. 20.

## Current study

The purpose of the present study was to develop a new, short questionnaire to screen for PDs, the Personality Disorder Screening (PDS), and to assess its reliability and validity as a screening instrument for PDs in a diverse sample. Previous attempts to screen for personality disorders have only addressed the question of absence versus presence of a PD. A slightly modified approach was pursued here. In this study, we followed Garrett et al. (2002) in applying LCA to the contents of the structural model of Gunderson et al. (1991). With this more person-centered statistical approach, we aimed at obtaining more detailed information with regard to the PD status already at the screening stage of the diagnostic process. In line with Gunderson et al. (1991), we expected to identify different classes or prototypes of personality pathology. In addition, we evaluated the reliability and validity of the PDS as a case detector at stage I as the first part of a 2-stage diagnostic procedure.

The PDS consists of a selection of 12 items originally derived from the Personality Self Portrait (PSP; Oldham & Morris, 1990). The PSP was originally developed by Oldham and Morris to identify and describe personality styles in the normal population. The primary concern of the PSP is “to delineate the normal, adaptive personality styles that the disorders take to an extreme” (Oldham & Morris, 2000, p. 22). PDs are considered from a more “resource-oriented” point of view by defining PDs as extremes along a continuum of normal, individual differences. Lopez, Edwards, Pedrotti, Prosser and LaRue (2006) state the PSP to be an attractive alternative for the conceptualization of PDs: “The Oldham and Morris (1995) conceptualization leaves room for individuals to be diagnosed according to the degree of dysfunction or maladaptation as well as to the degree of positive use of resources” (p. 263). To the best of our knowledge no data concerning reliability or validity of the PSP are available to date.

## Methods

### Participants

Data from  $n = 966$  individuals were obtained from several research projects at the University of Osnabrück. For validation of the PDS we chose (1) patient subsamples with high prevalences of PDs and (2) subsamples for which the detection of a PD is of specific interest (e.g., prisoners). The majority of the participants ( $n = 616$ ) came from a non-patient sample ( $M$  age = 39.21,  $SD = 14.50$ ; 74 % female). Participants were recruited in the personal environment of the project assistants using the snowball sampling technique. Snowball sampling is a method where existing study participants recruit future subjects from among their acquaintances. Persons were eligible to participate in the study if they had not received psychological treatment or pharmacotherapy during the last year (and were not receiving such treatment at the time of data collection). The clinical subsamples ( $n = 350$ ) were recruited with particular regard to the prevalence and the relevance of PDs in these populations. A subsample of  $n = 145$  participants were enrolled in a prison of which  $n = 136$  provided information on age ( $M = 35.31$ ,  $SD = 12.20$ ; 37.2 % female). PDs are discussed to be a risk factor for criminal behavior (Blackburn, 2000). Another subsample of  $n = 90$  persons were patients with substance abuse ( $M$  age = 37.42,  $SD = 9.97$ ; 100 % males). Of these participants, 44.4 % were polydrug users, 44.4 % met alcohol dependence criteria and showed a psychoactive substance dependence syndrome; see Hesse, Rasmussen and Pedersen (2008) for a discussion of the importance of PDs among substance abusers. A third subsample involved  $n = 52$  psychiatric inpatients ( $M$  age = 38.71,  $SD = 13.08$ ; 53.8 % female). The main axis I diagnoses were mood disorders (59.6 %), anxiety disorders (15.4 %), and eating disorders (5.8 %). Another subsample of  $n = 43$  participants were psychotherapeutic outpatients ( $M$  age = 36.35,  $SD = 10.15$ ; 69.8 % female). These patients met criteria for mood disorders (39.5 %), anxiety disorders (51.2 %), and eating disorders (7.0 %); for the importance of PDs in psychiatric or psychotherapeutic samples see Lamont and Brunero (2009). Finally  $n = 20$  participants were patients suffering from a traumatic brain injury ( $M$  age = 45.85,  $SD = 13.25$ ; 15 % female; for the importance of PDs among individuals with traumatic brain injury see Hibbard et al. (2000)). We chose diverse samples with varying prevalence of PDs to make sure that the PDS works as a screening instrument for PDs in several clinical settings and to use the group information as a validation criterion. For the analysis, patients with substance abuse were assigned to the subsample of psychiatric inpatients.

### Measures

*Development of the Personality Disorder Screening (PDS).* The PDS screening-questionnaire consists of 12 items derived from the PSP (Oldham & Morris, 1990). We used items from the German version of the PSP published by Oldham and Morris (1992). The items of the PSP originally represent the 13 PDs of the DSM-III-R and were developed according to the criteria of the PDs in the DSM-III-R (Oldham & Morris, 1990). Many of the items include multiple part statements in order to account also for the gen-

eral criteria of PDs. Schöttke (2006) developed the PDS at the University of Osnabrück using the PSP data of  $n = 769$  participants (64.5 % non-patient, 30 % outpatients, 5.5 % substance abusers). Selection of items for inclusion in the PDS was based on statistical criteria. For all subscales except the sadistic PD subscale, the item with the highest item-to-total correlation for that scale and the lowest correlation to all other scales was selected. All items included in the PDS are listed in Appendix A. Each of the 12 items is scored 0 (no), 1 (maybe), or 2 (yes). Consequently, the minimum possible PDS sum score is 0, and the maximum possible sum score is 24.

*Structured Clinical Interview for DSM-IV Axis II Disorders (SCID-II)*. The SCID-II (First, Gibbon, Spitzer, Williams, & Benjamin, 1996; German Version by Fydrich, Renneberg, Schmitz, & Wittchen, 1997) is a semi-structured interview for assessing the DSM-IV PDs, as well as the passive-aggressive and depressive PD, which are listed in the appendix of the DSM-IV. The SCID-II is a widely used instrument for the assessment of PDs and demonstrates acceptable internal consistency (.71 - .94) and interrater reliability ( $\kappa = .48 - .98$  for categorical diagnosis; Intraclass correlation coefficient = .90 - .98 for dimensional diagnosis; Maffei et al., 1997). In the present study, all SCID-II interviews were conducted by psychology master students of the University of Osnabrück who had participated in a training workshop to learn the use of the SCID-II questionnaire and the structured interview prior to the study. In this study we used the dimensional SCID-II score from the self-report personality questionnaire as well as the categorical information from the interview "PD according to SCID-II" (criteria for at least one PD are met) to study convergent validity between the PDS and SCID-II.

## Procedures

The participants of several research projects completed the PDS screening questionnaire. Shortly afterwards, SCID-II interviews were conducted by psychology master students. The SCID-II was not administered to all subjects of the subsamples (see Table 1), because it was not an essential part of every research project.

**Table 1:**  
Descriptive Statistics for the PDS and SCID-II Sum Scores

	PDS		SCID-II	
	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>
Group "Normal population"	616	5.68 (4.08)	172	21.45 (11.22)
Group "Psychiatric inpatients"	142	11.17 (5.29)	52	41.25 (17.94)
Group "Outpatients"	43	10.47 (4.92)	41	33.15 (15.33)
Group "Prisoners"	145	9.83 (5.43)	97	37.57 (18.05)
Group "Traumatic brain injury"	20	7.55 (5.62)	–	–
Total	966	7.36 (5.10)	362	29.94 (16.95)

*Note.* The SCID-II was not administered to traumatic brain injury patients.

## Statistical analysis

LCA (Goodman, 1974; Lazarsfeld & Henry, 1968) is an "... alternative to the traditional symptom count ..." (Bornovalova, Levy, Gratz, & Lejeuz, 2010, p. 234) and offers a model-based approach to classifying individuals into homogeneous subgroups based on observed item responses. An advantage of LCA over more traditional methods of scale analyses is that this method takes errors of measurement into account (Dayton, 1998) and that it does not require the user to define arbitrary cut-off values for diagnosing a disorder and classifying individuals. Instead, classification of individuals is model-based and probabilistic in LCA: LCA takes the entire item response pattern including specific configurations of item responses and measurement error into account (Collins & Lanza, 2010). Furthermore, the fit of an LCA model to the data can be empirically tested.

In the present study, we used LCA to analyze the items of the PDS to find out to which degree the PDS is able to clearly separate individuals with a PD from individuals not showing a PD. Another reason for using LCA was to identify possibly existing "mixed" groups with certain personality disorders and/or personality styles. We also studied the reliability and convergent validity of the classification based on the PDS by relating the latent classes to the SCID-II and other relevant covariates (e.g., group membership as described above).

The input for an LCA is the set of observed item response pattern frequencies, in our case the set of observed responses to the items of the PDS. LCA assumes that the population is composed of several homogeneous and mutually exclusive subgroups, the latent classes. In our study, the latent classes correspond to pathological versus healthy subgroups of individuals, and to subgroups of individuals with specific personality styles. The number of classes needed to appropriately account for the observed response patterns is often determined by using so-called *information criteria* (IC) e.g. (Lin & Dayton, 1997). IC allows the comparison of models with different numbers of classes. The model with the lowest IC value among a set of models is considered the best-fitting model. In line with the recommendations of Nylund, Asparouhov and Muthen (2007), we used the Bayes information criterion (BIC) in the present study to determine the number of classes<sup>4</sup>. Further, we tested the absolute fit of the final solution to the data using a parametric bootstrap Pearson  $X^2$  test (Langeheine, Pannekoek, & van de Pol, 1996; von Davier, 1997). In addition to the item statistics and reliability measures provided by the LCA scaling method, we report traditional item statistics in Table 2 and Table 3.

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<sup>4</sup> In fitting the latent class models, we used full information maximum likelihood estimation in Mplus 5 (Muthen & Muthen, 1998-2007) to take missing data into account (Enders, 2010; Schafer & Graham, 2002). For each LCA model, we used 500 sets of starting values to check for local maxima. In addition, we fit the final (4-class) model also in the software PANMARK 3 (van de Pol, Langeheine, & de Jong, 1996), which resulted in an exact replication of the best loglikelihood value found by Mplus.

**Table 2:**  
Correlations, Means, and Standard Deviations of the PDS Items in the Healthy Subsample

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Self-Defeating	–											
2. Passive-Aggressive	.12	–										
3. Narcissistic	.24	.13	–									
4. Dependent	.25	.14	.23	–								
5. Histrionic	.05	.10	.06	.16	–							
6. Borderline	.27	.21	.24	.33	.21	–						
7. Paranoid	.25	.17	.23	.36	.10	.22	–					
8. Schizoid	.10	.12	.21	.10	.04	.10	.27	–				
9. Schizotypal	.24	.18	.17	.28	.06	.21	.32	.21	–			
10. Obsessive-Compulsive	.20	.15	.11	.18	.05	.08	.24	.21	.29	–		
11. Antisocial	.07	.05	.17	.07	.12	.19	.08	.11	.09	-.04	–	
12. Avoidant	.20	.16	.15	.15	-.01	.14	.33	.34	.31	.39	.06	–
Corrected item-to-total correlation	.36	.27	.35	.42	.17	.41	.48	.33	.44	.34	.16	.40
<i>M</i>	0.34	0.65	0.25	0.47	1.00	0.40	0.45	0.28	0.32	0.72	0.32	0.45
<i>SD</i>	0.62	0.76	0.57	0.76	0.86	0.68	0.69	0.57	0.62	0.81	0.64	0.72

Note.  $n = 613$ . Cronbach's alpha of the scale = .70. Scale mean = 5.66 ( $SD = 4.05$ ).

**Table 3:**  
Correlations, Means, and Standard Deviations of the PDS Items in the Clinical Subsample

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Self-Defeating	–											
2. Passive-Aggressive	.23	–										
3. Narcissistic	.31	.26	–									
4. Dependent	.32	.19	.22	–								
5. Histrionic	.17	.18	.18	.17	–							
6. Borderline	.31	.12	.12	.21	.26	–						
7. Paranoid	.38	.19	.27	.35	.13	.18	–					
8. Schizoid	.21	.13	.22	.12	.18	.07	.25	–				
9. Schizotypal	.42	.27	.26	.31	.21	.22	.31	.29	–			
10. Obsessive-Compulsive	.25	.19	.18	.25	.09	.10	.21	.22	.33	–		
11. Antisocial	.18	.12	.16	.05	.22	.25	.07	.17	.06	-.03	–	
12. Avoidant	.34	.24	.30	.21	.14	.12	.22	.43	.35	.38	.20	–
Corrected item-to-total correlation	.55	.36	.42	.41	.32	.33	.44	.39	.53	.36	.24	.50
<i>M</i>	0.90	0.91	0.76	1.12	1.23	0.75	1.12	0.59	0.87	0.77	0.57	0.73
<i>SD</i>	0.86	0.87	0.83	0.91	0.88	0.85	0.87	0.79	0.85	0.86	0.79	0.83

Note. *n* = 346. Cronbach's alpha of the scale = .77. Scale mean = 10.32 (*SD* = 5.41).

## Results

### Descriptive statistics

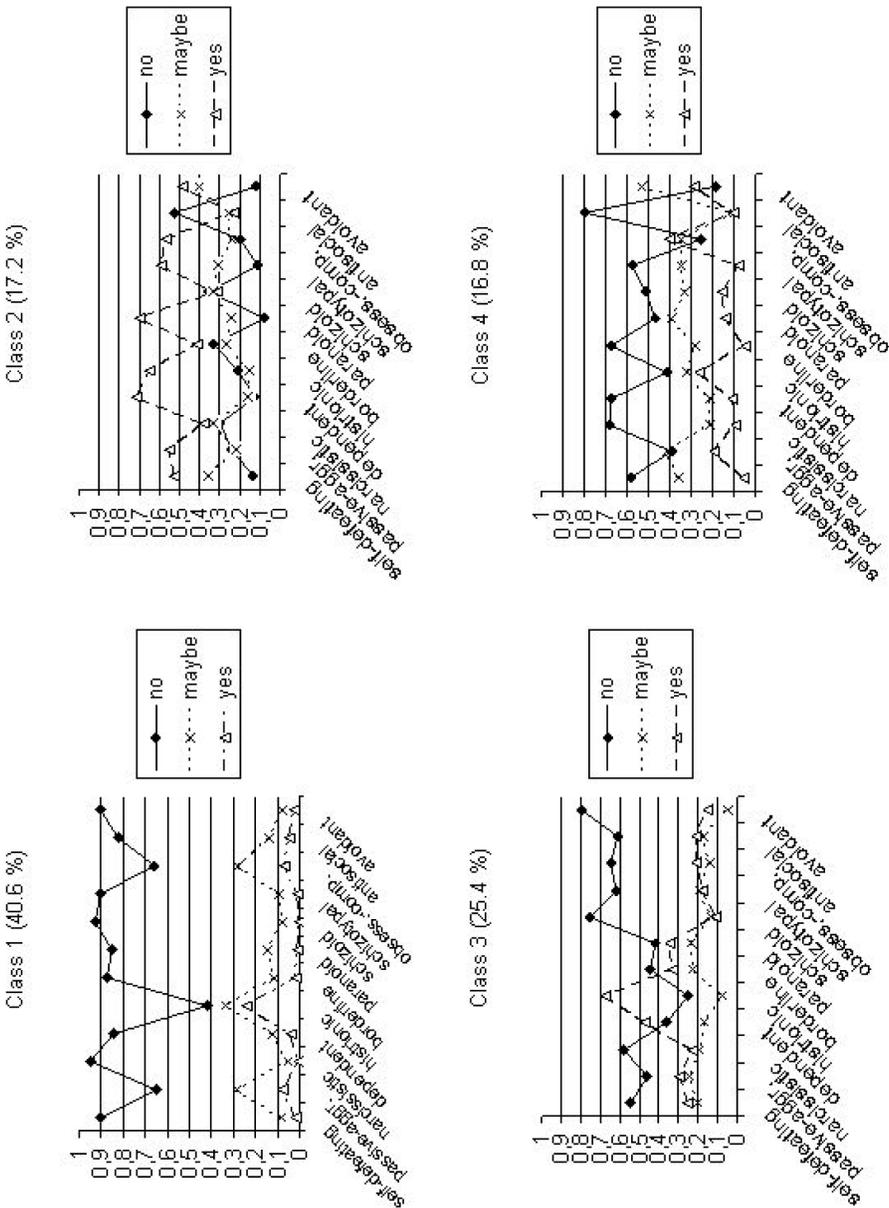
Table 1 shows descriptive statistics for the PDS and SCID-II sum scores for the total sample as well as by group. According to SCID-II, in the non-clinical group 2.9 % of participants had at least one PD and in the clinical subsamples the prevalence for any PD was 58.9 %. In the current study, Cronbach's alpha was .78 for the PDS sum score and .86 for the 12 SCID-II subscales combined in the total sample. Cronbach's alpha for the PDS was .70 in the non-clinical sample ( $n = 613$ ) and .77 in the clinical sample ( $n = 346$ ). Given that the screening measure was explicitly developed to cover multiple, potentially heterogeneous domains of PD, an interpretation of these measures as reliability coefficients may not be warranted. Inter-item correlations as well as corrected item-to-total correlations for the PDS are provided in Table 2 and Table 3. The correlation between the PDS and SCID-II sum scores in the total sample was  $r = .74$  ( $n = 362$ ,  $p < .001$ ).

### LCA

We estimated the 2-, 3-, 4-, and 5-class solutions and compared their fit in terms of the BIC coefficient. The 4-class solution yielded the lowest BIC value (2 classes: 20338; 3 classes: 20303; 4 classes: 20300; 5 classes: 20349). Given that the BIC values for three and four classes were very close, we inspected both the 3- and 4-class solutions carefully. The 3-class solution yielded two classes that remained almost exactly the same with regard to their pattern and size in the 4-class solution. The third class in the 3-class model split up into two additional classes in the 4-class solution. Both classes seemed to be important to us from a theoretical point of view, and they were also more clearly interpretable than the last class in the 3-class solution (see discussion below). We therefore decided to retain four rather than three classes. The 4-class model also fit the data well according to the parametric bootstrapped Pearson- $X^2$  test (Langeheine et al., 1996; von Davier, 1997), which showed a non-significant  $p$ -value ( $p = .22$ ). The estimated conditional response probabilities in each of the four classes are shown in Figure 2.

It can be seen that Class 1 (40.6 %) is characterized by a pattern of high probabilities of providing the response 'no' across all 12 items. The probabilities for both the 'maybe' and the 'yes' categories are low for practically all items in this class. This pattern of conditional item response probabilities clearly identifies Class 1 as a non-pathological class. This class was also found in the 3-class solution.

Members of Class 2 (17.2 %) showed a pattern in which the probabilities for a 'yes' response exceeded the probabilities for a 'no' or 'maybe' response for the majority of items. We therefore interpreted this class as a pathological class, with the members of this class showing a high likelihood of having some type of PD. Class 2 also occurred in the 3-class solution.



**Figure 2:** Latent class profiles for the four-class solution. The y-axis shows the conditional response probabilities.

Whereas Class 1 and Class 2 can be seen as ordered classes that clearly correspond to healthy versus pathological subgroups, the two remaining classes showed specific patterns of item response probabilities that led to a more differentiated interpretation. We suspect that these “mixed” groups depict specific pronounced personality styles. Class 3 members (25.4 %) had a high probability of choosing the ‘no’ category for most items. However, there were two exceptions. Members of Class 3 had relatively high probabilities of endorsing the category ‘yes’ for the item representing a histrionic PD as well as the item representing a dependent PD. We therefore interpreted this class a non-pathological group with a tendency towards a histrionic/dependent personality. A class with a similar, albeit somewhat less clear pattern was found in the 3-class solution.

Class 4 was the completely new class that emerged when moving from the 3- to the 4-class solution. Relative to the remaining classes, Class 4 (16.8 %) showed the highest probabilities for the ‘maybe’ category. In addition, members of this class had a relatively high probability of endorsing the item representing an obsessive-compulsive PD. We may thus speculate that the specific response behavior in this group (the tendency to endorse the ‘maybe’ category rather than ‘yes’ or ‘no’) in conjunction with the relatively high probability of endorsing the obsessive-compulsive item and the avoidant item indicates a tendency for an avoidant/obsessive-compulsive personality. Hence, we interpreted this class as a mostly non-pathological, albeit “insecure” class.

In order to evaluate the reliability of the classification into pathological versus healthy subgroups based on the 4-class solution, we inspected the average latent class assignment (or recruitment) probabilities (APs). These probabilities indicate the average assignment probability across all individuals assigned to a particular class and can thus be interpreted as a measure of the reliability of the classification. Ideally, the APs for the same class should be close to one. Values above .8 are commonly seen as satisfactory (Rost, 2006). In the present case, the APs indicated that the reliability of the classification was high for all classes (Class 1: .91; Class 2: .89; Class 3: .84; Class 4: .80), with the highest assignment probabilities found for the healthy Class 1 and the pathological Class 2.

In sum, the 4-class solution clearly separated four distinct groups with high classification reliability. In particular, this solution allowed discriminating a non-pathological group from one pathological group as well as two other groups with specific personality styles. In order to assess the validity of the classification according to the PDS and to find out whether the extracted classes truly corresponded to individuals with a PD versus non-pathological individuals, we related the classes to covariates in the next step of our analysis.

### **LCA with covariates**

Table 4 shows the relation of the latent classes to external variables that were used to assess the validity of the class solution.<sup>5</sup> Likelihood ratio difference ( $\Delta LR$ ) tests were

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<sup>5</sup> The resulting latent class solutions did not change in any substantial way after including the covariates into the model. The interpretation of the classes remained exactly the same and the average latent class assignment probabilities all remained high in all cases ( $\geq .8$ ).

used as omnibus tests to test for differences between classes. Post hoc pairwise comparisons after a significant  $\Delta LR$  statistic were tested at a Bonferroni adjusted alpha level of  $.05/18 = .003$ .

*SCID-II*. The classes differed significantly with regard to their average SCID-II scores,  $\Delta LR(3) = 253.11, p < .001$ . Post hoc analyses revealed that all classes differed significantly from each other ( $p < .001$ ), except Class 3 and 4 ( $p = .27$ ). In particular, individuals in Class 1 had the lowest, and individuals in Class 2 the highest average SCID-II scores.

We also related the latent classes to a classification into healthy versus PD individuals according to the SCID-II. The association between the PDS and SCID-II classification was highly significant,  $\Delta LR(3) = 99.92, p < .001$ . It turned out that 95.3 % of individuals classified as healthy according to our latent class solution (i.e., members of Class 1) were also classified as healthy according to the SCID-II. Only 4.7 % of Class 1 members were found to have a PD according to the SCID-II. In contrast, 73 % of members of Class 2

**Table 4:**  
Relation of Latent Classes to Covariates

	<b>Class 1 (Healthy, 40.6 %)</b>	<b>Class 2 (PD, 17.2 %)</b>	<b>Class 3 (Histrionic/ Dependent Personality, 25.4 %)</b>	<b>Class 4 (Avoidant/ Obsessive- compulsive Personality, 16.8 %)</b>
Gender (% Female)	49.3 %	50.2 %	40.6 %	40.3 %
Mean age ( <i>SD</i> )	39.34 (12.81)	39.43 (14.54)	32.21 (10.85)	46.04 (14.17)
PD according to SCID-II				
Yes	4.7 %	73 %	35.4 %	25.2 %
No	95.3 %	27 %	64.6 %	74.8 %
Mean SCID-II score ( <i>SD</i> )	14.39 (6.27)	49.04 (13.73)	31.13 (11.50)	28.19 (9.98)
Group "Normal population"	81.5 %	20.6 %	41 %	77.8 %
Group "Psychiatric inpatients"	3.7 %	34.3 %	23.4 %	12.2 %
Group "Outpatients"	1.7 %	14.4 %	5 %	1.5 %
Group "Prisoners"	6.1 %	28.9 %	28 %	6.6 %
Group "Traumatic brain injury"	2.0 %	1.9 %	2.5 %	1.8 %

(the PD class) were classified as pathological according to the SCID-II as well (27 % of Class 2 members were classified as non-pathological according to the SCID-II).

The majority (64.6 %) of Class 3 members were classified as non-pathological according to SCID-II, although approximately one third (35.4 %) were classified as having a PD according to SCID-II. Members of the insecure Class 4 were mostly non-pathological according to SCID-II (74.8 %), although 25.2 % of individuals in this class were classified as having a PD according to SCID-II.

*Age.* Significant mean age differences were found between classes,  $\Delta LR(3) = 50.91$ ,  $p < .001$ . Post hoc analyses revealed that all classes differed with regard to mean age ( $p < .001$ ), except Class 1 and 2 (i.e., the healthy and the pathological class did not differ,  $p = .96$ ). Individuals in Class 4 were oldest and individuals in Class 3 youngest.

*Gender.* No significant gender differences in class assignment were found,  $\Delta LR(3) = 4.91$ ,  $p = .18$ .

*Subsamples.* We also related class membership to membership in the following subsamples: normal population, psychiatric inpatients, outpatients, prisoners, and patients suffering from traumatic brain injury. The results indicated a significant association between latent class and subsample membership,  $\Delta LR(12) = 247.28$ ,  $p < .001$ . Post hoc analyses revealed that group proportions were different for all classes except Classes 1 and 4 ( $p = .07$ ) as well as Classes 2 and 3 ( $p = .005$ ). In particular, the healthy Class 1 consisted mainly of individuals from the normal population (> 80 %). In contrast, only about 20 % of Class 2 members (PD group) stemmed from the normal population. The highest proportion in this class were psychiatric inpatients (about 34 %) followed by about 29 % prisoners. Class 3 members (histrionic/dependent personality style) were mostly coming from the normal population (41 %). However, there was also a relatively high percentage of psychiatric inpatients in this group (ca. 23 %).

Class 4 members were mostly part of the normal population (ca. 78 %); however, about 12 % in this class were psychiatric inpatients. In sum, the results of the LCA as well as the LCA with covariates provided strong evidence for the reliability and validity of the classification of individuals according to the four-class latent class solution for the PDS.

## Discussion

The present study is an extension of previous attempts to provide a screening instrument for identifying personality disordered patients in the diagnostic process. The PDS is a short self-administered questionnaire, which makes its application very easy. Furthermore, it requires no specifically trained interviewer. Using LCA, we found support for the model of Gunderson et al. (1991), which proposes different classes of PD severity and impairment. Results of the current study indicated that a 4-class solution fitted the data best and allowed for a reliable and valid classification of individuals. Class 1 ("Healthy class") members had a high probability of being healthy according to SCID-II and stemmed mostly from the normal population. Class 2 ("Pathological class") had significantly higher SCID-II scores and were mostly members of the psychiatric inpa-

tients group. Individuals in this class have a high risk of being pathological according to SCID-II and should be assessed at stage II of the diagnostic process for specific types of PDs. The remaining Classes 3 and 4 describe mixed classes with specific personality styles. Individuals belonging to Class 3 are mostly non-pathological but seem to have a tendency towards histrionic and dependent personality styles. Members of Class 4 are mostly healthy but show a specific pattern of avoidant/obsessive-compulsive style. This is shown by a general tendency to endorse the 'maybe' response across nearly all items except the items representing the avoidant/obsessive-compulsive PD which are mostly responded with 'yes' in this class. The extracted classes closely correspond to the conceptualization of PDs proposed by Gunderson et al. (1991). The pathological class (Class 2) defines the more severe types of PDs "... whose 'faults' are deeper, more severe, and/or earlier in their origins" (Gunderson et al., 1991, p. 65). According to the conceptualization of Gunderson et al. (1991), the mixed Classes 3 and 4 represent less severe PDs which are on the border to normality and can change into normally occurring traits. On the other hand, the two latter classes may include people who have a higher risk of developing a full PD symptomatology in the future. In sum, our analyses with covariates suggest that members of these mixed classes should be particularly carefully examined in stage II of the diagnostic process before excluding a PD. These classes should also be investigated in following studies to learn more about the specific personality styles in these groups.

The PDS has attractive properties as a screening instrument. The PDS provides useful information about specific personality styles already at an early level of the diagnostic procedure. It is recommended to consider exaggerated personality styles for the treatment of axis I disorders (Lutz, Kosfelder, & Joormann, 2004). By incorporating the 12 items of the PDS into standard psychiatric examinations, this additional information potentially optimizes following diagnostic procedure. Furthermore, early information concerning exaggerated personality styles could optimize the application of specific intervention techniques and improve therapy outcomes.

A general advantage of the LCA approach used here to screen for PDs is that it allows for a reliable model-based classification of individuals into healthy versus pathological groups. These groups may differ in degree, in kind, or both. In contrast to more ad hoc procedures that specify (sometimes arbitrary) cut-off values based on overall sum scores, LCA provides clear reasons for assigning individuals to a particular group. The classification does not depend on the overall score, but rather on the specific configuration of item responses that provide evidence for the presence or absence of a PD or a specific personality style. This has the advantage that LCA allows for a more fine-grained analysis, as individuals with the same overall score may be identified as having different specific PDs.

The reliability of the class assignment can be quantified for each individual by means of assignment probabilities that are provided for each possible response pattern based on the estimated LCA model. This makes LCA very useful for diagnostic purposes, as individuals screened in future studies can be classified using the assignment probabilities estimated in the present study. We provide online supplemental material that includes the estimated class assignment probabilities for all possible response patterns and all classes.

Researchers and practitioners can not only use this table to classify individuals tested with the PDS as healthy or pathological according to their observed response patterns. They can also use these probabilities to assess the certainty with which each individual is classified.

Furthermore, LCA deals with latent variables which means that measurement error is taken into account when the classes are estimated. The present study showed that the influence of measurement error is small for the PDS, as the average assignment probabilities were high for all classes. This indicates that individuals tested with the PDS can in general be reliably classified based on this measure. Evidence for the validity of the obtained class solution was found in terms of the high association between a classification based on the PDS and the SCID-II. Given that the PDS consists of just 12 items, the agreement with the SCID-II classification can be seen as highly satisfactory.

Limitations of the current study are that the subsample from the normal population is not representative because participants were recruited in individual research projects and that the subsamples varied in size. Furthermore the SCID-II was not administered to all subjects of the study. Future research should also account for axis I disorders to get more specific information about Classes 3 and 4.

In summary, this study presented a new measure for assessing personality pathology that utilizes person-centered approach to screen for PDs as proposed by Garrett et al. (2002). Following this approach as well as the theoretical conceptualization of Gunderson et al. (1991), we developed an instrument that can be used to reliably classify people into different classes of PD severity. Moreover, the PDS turned out to be valid, brief and applicable in both clinical and non-clinical samples.

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## Appendix A

### The Personality Disorder Screening (PDS)

Please read through each question. Please choose the answer that best applies to you. Some questions include multiple-part statements. Choose the option “maybe” when you

agree with one part but disagree with the other part. Even if you do not think the question applies to you or to your life circumstances, answer how you think you would respond if it did apply to you.

		yes	maybe	no
1	Whenever I succeed at something, I find that either I don't really enjoy it much or something goes wrong somewhere else in my life. (Self-Defeating)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	When people give me suggestions on how to be more productive, I often resent it because they are putting their noses in where they don't belong, without really understanding my situation. (Passive-Aggressive)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	I believe that my problems are too complicated and unique for most people to really understand. (Narcissistic)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	I worry a lot that people I care about will leave me, even though there is usually no reason to. (Dependent)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	I can be impatient; usually I want what I want when I want it. (Histrionic)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	I typically get into very intense relationships, and I usually find my feelings about the person change from one extreme to another. Sometimes I almost worship, and other times I can't stand, the person I'm with. (Borderline)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	I am not a very trusting person, even though I would like to be. I just can't help worrying that other people might take advantage of me unless I'm careful. (Paranoid)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	I tend to be a loner, which is fine with me. I don't really enjoy being around other people that much, even my family. (Schizoid)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	I am very self-conscious. Often I can feel people looking at me and sizing me up, not always in a flattering way. (Schizotypal)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	I prefer to stick to my usual daily routines than to put myself in unfamiliar surroundings and situations. (Obsessive-Compulsive)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	I am intrigued by an underground kind of life where you can break the rules and get away with it. (Antisocial)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	I like people, but I find I'm much more comfortable if I steer clear of social activities and work situations that involve large groups of people. (Avoidant)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>