

# Psychobiology of dissociation and its clinical assessment

Radek PTACEK, Petr BOB, Ivo PACLT, Josef PAVLAT,  
Denisa JASOVA, Petr ZVOLSKY & Jiri RABOCH

Department of Psychiatry, 1<sup>st</sup> Faculty of Medicine, Charles University, Prague, Czech Republic

Correspondence to: Petr Bob, PhD.  
Department of Psychiatry, Charles University, 1st Faculty of Medicine,  
Ke Karlovu 11, 128 00 Prague, CZECH REPUBLIC  
PHONE: +420 224965314  
FAX: +420 224923077  
EMAIL: petrbob@netscape.net

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## Abstract

**OBJECTIVE:** Dissociation is often defined as partial or total disconnection between memories of the past, awareness of identity and of immediate sensations, and control of bodily movements, often resulting from traumatic experiences, intolerable problems, or disturbed relationships. This type of reaction to a psychological and/or physical trauma has often various neurobiological consequences and its clinical assessment has received enormous interest in recent psychological and neuroscience research.

**METHODS:** Psychometric parameters of the Czech version of the Dissociative Experiences Scale were tested from the viewpoints of internal consistency, validity and factor structure, using data from a sample of n=783 adults, divided into three groups (epilepsy n=243, depression n=357, norm n=183), average age 39 years, SD=13.5.

**RESULTS:** Findings of this study demonstrated that reliability, validity and factor structure of the Czech version of the Dissociative Experiences Scale correspond to those of the original English version.

**CONCLUSIONS:** The Czech version of the questionnaire may be considered a suitable tool for estimating subjectively experienced dissociative symptoms.

## INTRODUCTION

Scientific history of dissociation began in the 19<sup>th</sup> century French psychiatry, notably in the work of Pierre Janet [34]. Janet was a follower of many famous psychiatrists and neurologists such as Hughlings Jackson, Jean-Martin Charcot or Theodule Ribot who represented a great inspiration for his work. Janet comprehensively described many abnormal states of consciousness and studied these states as defects of the psychic wholeness [21], meaning that a traumatic or stressful event with

extremely negative charge [49] does not fit into the current cognitive scheme and is split off from consciousness [11,50,66,67]. Dissociation leads to an effort to eliminate these negative memories and it is linked to increase in intrusive thoughts because of contradictory tendencies, resulting to inner conflict when an unacceptable or traumatic memory is released into the consciousness. According to the modern definition, dissociation may be defined as partial or total disconnection between memories of

the past, awareness of identity and of immediate sensations, and control of bodily movements, often resulting from traumatic experiences, intolerable problems, or disturbed relationships [11,57,68,]. Diagnostic systems: DSM-III-R, DSM-IV and similarly ICD-10 define dissociation as “a disturbance or alteration in the normally integrative functions of identity, memory, or consciousness” [1,2,31]. ICD-10 also contains a definition of the organic dissociation, induced by a variety of conditions affecting cerebral function [27]. Dissociation on the psychic level emerges as memory losses, fragmentation of knowledge of the self and own experiences, splitting of the emotional and cognitive aspects of experiences, numbing of affect, psychological escape from unpleasant stimuli, trance-like states, increased suggestibility and greater hypnotizability [48,50]. Dissociative disorders are most often induced as a result of a traumatic event. This event may represent exposition of a trauma in childhood due to physical, emotional, or sexual abuse [17,18,20] with development of symptoms often following after many years. Dissociative symptoms also occur as a result of traumatic events such as accidents or natural disasters. Characteristic features of psychic dissociative symptoms include changes in the notion of external world such as derealization, hallucinations, changes of memory – predominantly in the form of psychogenic amnesic disorder or changes in the notion of identity such as depersonalisation, or in serious cases multiple personality disorder, characterized by different personalities existing in a single person side by side [6,46,48,56,58].

Dissociation as a reaction to a psychological and/or physical trauma has various neurobiological consequences. One of the first typical reactions is disturbance in self-regulatory systems such as in the hypothalamus-pituitary-adrenal axis (HPA), resulting in hyperarousal, tachycardia or other symptoms of autonomic nervous system instability and HPA is traditionally understood as the stress system of the body, closely related to the neuroendocrinological balance and hormonal control levels, energetic metabolism and neuroimmunomodulation during stress reaction [22,36,69]. According to neurodevelopmental research, the most serious disturbances of the HPA axis are caused by traumatic events (such as childhood abuse or neglect in the first years of life) and often have long-term impact on the emotional, behavioural, cognitive, social and physiological functions [28,32,64]. These neuroendocrinological and neurophysiological dysfunctions as a consequence of trauma and dissociation confirm both recent and historical findings that somatic components of dissociation also play a profound role in the long-term adaptation to traumatic experience and may lead to a lack of integration of somatoform components of experience, reactions, and functions (the so-called somatoform dissociation). Typical symptoms of somatoform dissociation are alterations in the sensation of pain (analgesia, kinaesthetic anaesthesia), painful symptoms, perception alterations, motor inhibition, or loss of motor control, gastrointestinal

symptoms and dissociative seizures [40,41,42]. The close relationship between the psychological and traumatic factors has already been recognized in the work of the famous British neurologist Hughlings Jackson and also by French neurologist Jean-Martin Charcot, who first proposed that dissociative symptoms in multiple personality disorder (MPD) are related to epileptic process [50]. Following these findings, both historical and recent literature described EEG abnormalities in patients with MPD. Several studies reported that prevalence of seizure disorders is much higher in MPD patients [3,38,50]. Reported findings that describe the relationship between the epileptic process and dissociation are based on clinical data which suggest a possible role of the temporal lobe abnormalities in pathological dissociation. Typical EEG abnormalities found in traumatized and dissociated patients in non-epileptic conditions involve frontotemporal spikes, sharp waves, or paroxysmal slow waves [50,63,64]. These findings are in accordance with evidence suggesting that in certain psychiatric patients, often without apparent EEG abnormalities, psycho-sensory symptoms related to epileptiform activity occur (so-called complex partial seizure-like symptoms) [29,54]. These symptoms are likely closely related to dissociative tendencies and experienced traumatic events [29,33,53,54]. Typical symptoms are memory gaps, confusion spells, staring spells, episodic irritability, episodic rhinitis, episodic aphasia, jamais-vu, olfactory hallucinations, gustatory hallucinations, visual illusions (e.g., scintillations), paresthesia, anaesthesia, auditory illusions (e.g., phone ringing). In addition, the patients suffer from headaches accompanied by nausea and/or photophobia, abrupt mood shifts, *deja-vu*, abdominal sensations, intrusive thoughts and parasomnias [29,54,55]. Many of these symptoms are characteristic for the so-called Epilepsy Spectrum Disorder (ESD). Although the phenomenology of ESD and the positive clinical response to anticonvulsants, seen in most ESD patients, would suggest the presence of subclinical electrophysiological dysfunction, the lack of clear non-behavioural evidence of CNS dysfunction (i.e., EEG) may obscure the underlying neurological nature of ESD [29,53].

This relationship between dissociation and epileptic activity has numerous practical implications, which might contribute to a decision for the use of anticonvulsant treatment in traumatized and dissociated patients. With respect to these findings we can expect a close relationship between the above and significant levels of dissociative symptoms, as well as complex partial seizure-like symptoms in accordance with criteria for Epilepsy Spectrum Disorders (ESD). Assessment of these symptoms is possible using psychometric measures for complex partial seizure-like symptoms [8]. We can also assume that many traumatized and dissociated patients, who meet the criteria for ESD, will show a more significant occurrence of EEG abnormalities compared to other patients. On the other hand, it is needed to emphasize specific psychotherapeutic approach, which must help

the patient to accepting his/her life and integrate of the experienced trauma. As an useful instrument for this process, we introduce comprehensive characteristics of the Czech version of Dissociative Experiences Scale [8] that represents a good measure suitable for screening of dissociation.

#### The Dissociative Experiences Scale

The understanding of the role of dissociative symptoms in connection with other psychiatric disorders significantly increased in recent years [4,37]. This emphasizes the need for objectification and standardization of tools to measure these symptoms. Psychological and psychiatric literature focused on this problem provides a number of questionnaires and self-assessment scales. The well-known is the Dissociative Experiences Scale [4] ("DES"). DES is a questionnaire designed for screening dissociative psychopathology and quantification of the dissociative experience.

At this time the DES is used in more than 13 language-versions [5] and was translated into the Czech language in 2000 [7]. The Czech version has already been used in several published studies [7,9,10,47].

The Dissociative Experiences Scale (DES) is a short self-reported questionnaire proposed for assessment of dissociative experience in everyday life in adults. The questionnaire is based on the DSM III [1] and criteria proposed by John Nemiah (1981) [39] which represent alteration of identity as a result of dissociative reaction and memory impairment during dissociative events. In this concept dissociation is understood in the context of the dissociation continuum theory, based on the work of Pierre Janet [34]. This theory identifies dissociation as a phenomenon ranging on the scale from normal dissociative processes from mild forms (e.g. absorption) to serious forms of dissociative psychopathology reported in psychiatric disorders.

The questionnaire contains 28 items, for which the subjects mark degree of their experience during the time on a 100 millimetres-long line (0%–100%). Average of the values obtained provides the DES score. Reliability and validity studies for the original English version of the DES were published independently in several works [4,24,45,52]. The results of studies examining the reliability of the DES [4,24,45] were summarized in [5] and are listed in Tables 1 and 2.

**Table 1.** Overview of studies of test – retest reliability of DES.

|                                 | n  | r    | p       | Test/retest interval |
|---------------------------------|----|------|---------|----------------------|
| Bernstein, Putnam (1986)        | 26 | 0.84 | <0.0001 | 4–8 weeks            |
| Frischholz <i>et al.</i> (1990) | 30 | 0.96 | <0.0001 | 4 weeks              |
| Pitblado, Sanders(1991)         | 46 | 0.79 | <0.0001 | 6–8 weeks            |

These tables indicate that all studies show significant reliability of the DES questionnaire. The reliability was also supported by Frischholz *et al.* [24], who found Cronbach Alpha 0.95 ( $p < 0.001$ ) for total 321 normal subjects. Structural validity of the DES was studied Frischholz *et al.* [25], who found significant correlations of the DES with other psychometric measures related to dissociation. Significant correlation was found also between DES and hypnotizability [26]. Also studies concerning discrimination validity were reported [3].

Regarding criteria validity of the DES a multi centre study (N=1 051) was performed, in which the DES score was used as diagnostic tool for identification of multiple personality disorder in psychiatric population and compared with DSM-III criteria. The study found an 80% correspondence between the results of DES and DSM-III criteria [16].

Prediction validity of the DES by Frischholz *et al.* [24] and Steinberg *et al.* [60] were reported and both studies also reported a statistically significant concurrent and criteria validity.

Factor studies of DES [14,57] independently found three basic factors (Absorption, Amnesia, Depersonalisation). Several other studies pointed out to the possibility of existence of four or seven factor structure [51]. Comprehensive reported study by Stockdale *et al.* [61] was focused on evaluation of several factor models, using confirmatory factor analysis of a non-clinical sample (n=971) and confirmed consistence of the three-factor model, and also that the DES is reliable for measurement of dissociation. Despite these findings, the questionnaire should be subjected to further studies, which could show the possibilities of the use of this probability factor structure. As far as both research and clinical practice is concerned, the DES is reliable in measuring just one factor of "dissociation" [16].

#### Psychometric using of the questionnaire

The DES questionnaire enables a quantitative evaluation of dissociation, which may be used as a screening tool for evaluation of dissociative psychopathology [49]. This using of the DES is based on the findings which indicate that it enables to measure dissociative psychopathology in various diagnostic groups such as in depression, schizophrenia or epilepsy [9,10,13,36,43,44]. Published findings suggest that almost 15% of all psy-

**Table 2.** Overview of studies of internal reliability of DES.

|                          | n  | r    | p       |
|--------------------------|----|------|---------|
| Bernstein, Putnam (1986) | 73 | 0.83 | <0.0001 |
| Pitblado, Sander (1991)  | 46 | 0.93 | <0.0001 |

**Table 3.** Basic sample characteristics.

|               | Number of subjects |       |     | Education<br>(no. of subjects) |       |       | Age |     |     |       |
|---------------|--------------------|-------|-----|--------------------------------|-------|-------|-----|-----|-----|-------|
|               | men                | women | tot | elem.                          | high. | Univ. | MIN | MAX | AVG | St.D. |
| <b>Norm</b>   | 82                 | 101   | 183 | 20                             | 87    | 76    | 18  | 69  | 40  | 13    |
| <b>Depres</b> | 159                | 198   | 357 | 107                            | 192   | 58    | 18  | 70  | 42  | 12    |
| <b>Epi</b>    | 96                 | 147   | 243 | 95                             | 129   | 19    | 18  | 67  | 32  | 12,5  |
| <b>Tot</b>    | 337                | 446   | 783 | 119                            | 238   | 98    |     |     |     |       |

**Table 4.** Basic description characteristics of DES score for individual groups.

|                    | Med | AVG  | MIN | MAX  | St.Dev |
|--------------------|-----|------|-----|------|--------|
| <b>Norm</b>        | 6   | 6.4  | 0   | 42   | 5.76   |
| <b>Depression</b>  | 10  | 14.4 | 0   | 59   | 12.20  |
| <b>Epilepsy</b>    | 12  | 15.2 | 0   | 62.5 | 13.30  |
| <b>Basic group</b> | 8   | 12.8 | 0   | 62.5 | 11.94  |

chiatric patients reach a DES score about 30 or higher which represents criterion for dissociative disorders [30,59]. Other studies reported prevalence of dissociative disorders in the psychiatric population approximately 8% [23] or other 15% [19,65] and European studies indicate lower prevalence (approximately 8%) with respect to studies from USA or Canada [23].

## METHOD

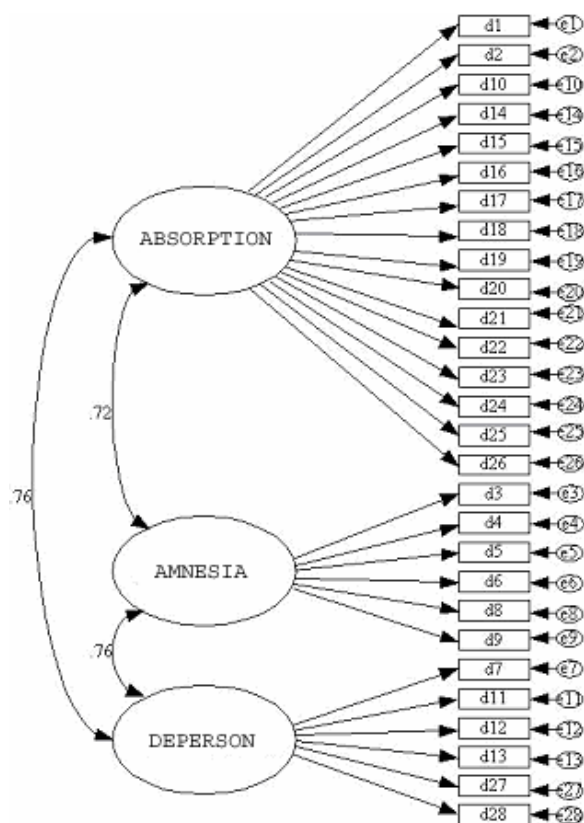
### The Czech version of DES – psychometric characteristics

The Czech version of the Dissociative Experience Scale was used in a sample of 783 adult subjects for the purpose to find preliminary standards of the questionnaire. The sample consisted of three groups. The first was healthy control group (n=183) of adults without psychiatric disorders. The second was patients with depression (n=357) who were inpatients and outpatients of the Psychiatric Clinic of the First Faculty of Medicine of Charles University Hospital in Prague with the ICD-10 [31] diagnosis: F 32.0, 32.1, 32.2, 33.0, 33.1, 33.2. The third group were outpatients with epilepsy (n=243) from Neurological outpatient centre departments with ICD-10 diagnosis [31]: G 40.1, 40.2, 40.3, 40.4, 41.0,41.1,41.2,41.9.

To evaluate concurrent validity, the subjects filled both the DES and the TSC-40 questionnaires. The TSC-40 (Trauma Symptom Checklist) [12], is a questionnaire evaluating traumatic symptoms which, among others, also contains the dissociation subscale. The Czech version of this questionnaire was previously used by Bob *et al.* [10]. In this study, 30 normal and 30 depressive subjects were retested within 6 to 8 weeks, which is the interval used in other studies as well [24, 45]. Results were processed by the STATISTICA software and confirmatory factor analysis using SEPATH STATISTICA was performed.

### Sample characteristics

The basic characteristics of the entire sample and individual subgroups, together with reliability and item analysis results, correspond to the studies of reliability of the original version (for example: Frischholz *et al.* [24]). The only difference is the normal adults score, quoted as 4.38 by Bernstein *et al.* [4]. Our score was higher.



**Figure 1.** Three factor structure of DES with inter-correlations of individual factors

Table 3 summarizes the basic sample characteristics. Table 4 shows an overview of average total score for the entire sample and individual subgroups, with a significant difference between dissociation scores of individual subgroups. The distribution of the overall score shows a strongly positive course. A similar trend may be observed for individual items. This corresponds to the results obtained using the original DES questionnaire [4,5].

#### Reliability

Table 5 shows an overview of reliability of the questionnaire for the entire sample and individual subgroups ( $p < 0.001$ ). The results show a relatively high internal consistency, which corresponds to the results of the item analysis.

As mentioned above, this fact suggests a possible redundancy of items, however, since the original questionnaire is not time-consuming and we wanted to keep the Czech version as close to the original as possible, we did not shorten the questionnaire. This decision was also supported by the fact that no other international studies used a shortened version. For this reason, this study will use a direct translation of the original version.

A retest with 30 normal and 30 depressive subjects after 6–8 weeks (norm  $r = 0.84$ , depression  $r = 0.84$ ,  $p < 0.001$ ) shows a relative stability of results within such shorter

time period. Over a long-term period, such stability may be expected for the normal group [5]. Other subgroups' results may change as a consequence of treatment, etc.

#### Factor analysis

A factor analysis of the DES was implemented for the non-clinical part of the sample ( $n = 186$ ). To find out the basic factor structure, we extracted the main components and normalized the varimax rotation used. Based on a criterion of an eigenvalue larger than 1 [35] and in keeping with previous studies [61], four basic factor models (factors 1–4) were defined. Despite the fact that based on the screen-plot criterion, the two factor model would be best suited, or that the high initial (pre-extraction) variance suggests the use of the one-factor model, we will evaluate all four factor models for the purposes of confirmatory factor analysis. Factor statistics for the one-, two, three and four-factor model are shown in Table 6. This table also lists inter factor correlations for individual solutions, which are relatively high. However, no factors show a critically high correlation ( $r > 0.80$ ), which would indicate two factors measuring the same construct.

A comparison between the one- and four-factor models was done using a confirmatory factor analysis (CFA). Because of the relatively high intercorrelation

Table 5: Reliability of the questionnaire for the entire group and individual subgroups.

|             | Split-half | Gutt. split-half | Correl. S-L item. | Cron. alfa | Std.Cr.Atfa |
|-------------|------------|------------------|-------------------|------------|-------------|
| Norm        | 0.8312     | 0.7336           | 0.7112            | 0.8596     | 0.8803      |
| Depression  | 0.8537     | 0.8483           | 0.7447            | 0.9141     | 0.9170      |
| Epilepsy    | 0.8771     | 0.8643           | 0.7812            | 0.9188     | 0.9181      |
| Basic group | 0.8707     | 0.8611           | 0.7711            | 0.9193     | 0.9213      |

Table 6. Exploratory factor analysis of DES: extraction of main components and normalised varimax rotation.

| Factor solution      | Number of items | Eigenvalue | % of variance | Correlation to F1 | Correlation to F2 | Correlation to F3 |
|----------------------|-----------------|------------|---------------|-------------------|-------------------|-------------------|
| <b>One factor</b>    |                 |            |               |                   |                   |                   |
| 1                    | 28              | 7.03       | 25.11         |                   |                   |                   |
| <b>Two factors</b>   |                 |            |               |                   |                   |                   |
| 1                    | 15              | 7.06       | 25.13         |                   |                   |                   |
| 2                    | 13              | 3.17       | 11.33         | 0.78              |                   |                   |
| <b>Three factors</b> |                 |            |               |                   |                   |                   |
| 1                    | 16              | 7.08       | 25.18         |                   |                   |                   |
| 2                    | 6               | 3.17       | 11.33         | 0.53              |                   |                   |
| 3                    | 6               | 2.29       | 8.18          | 0.21              | 0.46              |                   |
| <b>Four factors</b>  |                 |            |               |                   |                   |                   |
| 1                    | 12              | 7.08       | 25.18         |                   |                   |                   |
| 2                    | 7               | 3.17       | 11.33         | 0.53              |                   |                   |
| 3                    | 7               | 2.29       | 8.18          | 0.21              | 0.41              |                   |
| 4                    | 2               | 1.95       | 6.98          | 0.39              | 0.24              | 0.42              |



**Table 7.** DES: Confirmatory factor analysis.

| Model         | $\chi^2$ | df  | $\chi^2/df$ | RMSEA       |       |       |             |       |
|---------------|----------|-----|-------------|-------------|-------|-------|-------------|-------|
|               |          |     |             | (90%)       | GFI   | AGFI  | PGI(90%)    | BNFI  |
| One factor    | 2438     | 350 | 6.96        | 0.177–0.191 | 0.505 | 0.426 | 0.524–0.561 | 0.283 |
| Two factors   | 2336     | 349 | 6.69        | 0.157–0.151 | 0.553 | 0.482 | 0.579–0.599 | 0.313 |
| Three factors | 2184     | 347 | 6.29        | 0.147–0.160 | 0.582 | 0.511 | 0.611–0.653 | 0.357 |
| Four factors  | 2235     | 344 | 6.49        | 0.153–0.167 | 0.567 | 0.489 | 0.593–0.634 | 0.342 |
| Bifactor 3    | 2194     | 322 | 6.81        | 0.159–0.163 | 0.543 | 0.492 | 0.589–0.623 | 0.349 |

of the first order factors and a telling dominance of the first factor in all models, we also evaluated the relevancy of a hierarchical bi-factor model, which would take into consideration the hypothetic general factor of the DES. A comparison of statistic parameters of the bi-factor model (all 28 saturate a general dissociation factor in the second factor layer, while the three basic factors of first order saturate a layer of first order factors) with a parallel first order model may help to decide whether the common variance of individual items in the questionnaire is better described using a general hierarchic factor, or an inter-correlation between individual first order factors.

A CFA of four first order factor models has shown a) a reduction in the overall  $\chi^2$ , b) a reduction in  $\chi^2/df$ ,

c) a reduction in RMSEA, d) an increase of the value of correspondence indexes (for example: GFI, AGFI, BNFI) with the increase of number of factors from 1 to 3. An opposite trend can be observed during comparison of the 3 and 4 factor models.

The CFA results for individual factor models, listed in Table 7, show that the three-factor model has the highest correspondence to facts (Figure 1), even in comparison with the bi-factor model (Figure 2).

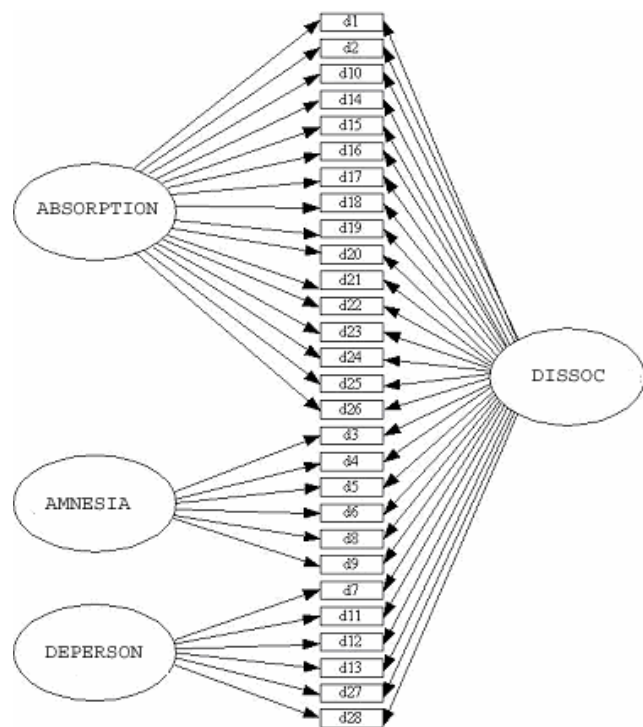
#### Validity

For the purpose of discrimination validity, we determined the relationship between the overall score in the questionnaire and theoretically independent variables (age, sex, education). The highest correlation  $-0.11$  ( $p < 0.05$ ) between the overall score and age for depressive patients (norm  $r = 0.02$ , epilepsy  $r = 0.08$ ,  $p < 0.05$ ), probably corresponds to the independency of the overall score on the theoretically independent variables, which is also confirmed by international literature [4,14,16].

Considering the fact that in the Czech Republic, we still lack a standardized tool for evaluating the level of dissociation or similar construct, we decided to use the Czech version of the TSC-40 questionnaire (the dissociation subscale) to determine convergent validity for the tested subjects. The results, depression  $r = 0.31$  ( $n = 150$ ), epilepsy  $r = 0.7$  ( $n = 67$ ), norm  $r = 0.82$  ( $n = 64$ ) ( $p < 0.05$ ), confirm a statistical dependency between the overall DES score and the dissociation subscale in the TSC-40 questionnaire.

As another criterion, we chose the theoretical presumption of existence of significant differences between the mean values of the overall DES score for the normal, depressive and epileptic subjects. Both the K-W and the K-S test showed a statistically significant difference ( $p < 0.001$ ), even between depression and epilepsy groups.

The results of discrimination analysis do not confirm sufficient sensibility of the questionnaire to individual diagnostic categories (see Table 8), but this corresponds with the theoretical premises of the questionnaire – the dissociative continuum – and with the results of other studies [4,5].



**Figure 2.** Hierarchical bi factor model of the DES. Note: Residual variables for items d1 to d28 are hidden to make the model more clear.

**Table 8.** Results of discrimination analysis.

| Group      | Determined percentage | n<br>p=.33333 | d<br>p=.33333 | e<br>p=.33333 |
|------------|-----------------------|---------------|---------------|---------------|
| Norm       | 86.3388               | 158           | 12            | 13            |
| Depression | 12.88515              | 178           | 46            | 133           |
| Epilepsy   | 37.86008              | 114           | 37            | 92            |
| Total      | 37.80332              | 450           | 95            | 238           |

## DISCUSSION

The study indicates great basic psychometric characteristics of the Czech version of the self-reported DES questionnaire, in full agreement with a number of international studies [16,4]. The results also demonstrate characteristic distribution of average dissociation score, which confirm the theory of the dissociative continuum. The theory assumes occurrence of dissociative experiences and states in non-clinical population. Based on these results, we can talk about normal and pathological dissociation, during which the manifestations of normal dissociative processes increase and characteristic pathological dissociative states becomes apparent.

Based on the results of this study, we may conclude that the DES questionnaire is suitable for evaluation of dissociative symptoms. In accordance with the trends in the study of dissociation in international literature the present study confirmed the possibility to use the questionnaire as an excellent research tool which can help to elucidate psychopathological mechanisms. Because the pathological processes related to dissociative symptoms are often linked to treatment resistance on usual pharmacological therapy further studies focused on psychobiological mechanisms of dissociation are needed and may provide new useful methods for diagnostics and therapy of psychiatric disorders.

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