# **Supplement Material**

**Supplement Material A**

Findings and Characteristics of Previous Studies Analyzing Subtypes of BPD

**Supplement Material B**

Results of differences in two-cluster-solution

**Supplement Material A** Findings and Characteristics of Previous Studies Analyzing Subtypes of BPD

|  |  |  |  |
| --- | --- | --- | --- |
| Authors | Factors / clusters | Statistical analysis | Sample characteristics |
| Andión et al. (2011)Becker, McGlashan, & Grilo (2006)Benazzi (2006)Blais, Hilsenrot, & Castlebury (1997)Bornovalova, Levy, Gratz, & Lejuez (2010)Bradley, Zittel Conklin, & Westen (2005)Calvo et al. (2012)Chabrol, Montovany,Callahan, Chouicha,& Ducongé (2002)Clarkin, Hull, & Hurt (1993)Clifton & Pilkonis (2007)Critchfield, Clarkin, Levy, & Kernberg (2008)Digre, Reece, Johnson, & Thomas (2009)Eaton et al. (2011)Fossati et al. (1999)Gamache, Savard, Lemelin, Côté, & Villeneuve (2018)Hallquist & Pilkonis (2012)Hoermann, Clarkin, Hull, & Levy (2005)Hudson, Zanarini, Mitchell, Choi-Kain, & Gunderson (2014)Hurt et al. (1990)James & Taylor (2008)Leihener et al. (2003)Lenzenweger, Clarkin, Yeomans, Kernberg,& Levy (2008) Lewis, Caputi, & Grenyer (2012)Livesley & Schroeder(1991)Ramos, Canta, de Castro, & Leal (2014)Rosenberger & Miller (1989)Rusch, Guastello, & Mason (1992)Salzer et al. (2013)Sanislow, Grilo,& McGlashan (2000)Sanislow et al. (2002)Shevlin, Dorahy, Adamson, & Murphy (2007)Slavin-Stewart, Boylan, & Burke (2018)Sleuwaegen et al. (2017)Smits et al. (2017)Soloff & Chiappetta(2012)Taylor & Reeves (2007)Thatcher, Cornelius,& Clark (2005)Whewell, Ryman, Bonanno, & Heather (2000)Westen & Shedler (1999)Wright et al. (2013)Zittel & Westen (2002) | 1. Disturbed relatedness
2. Behavioral dysregulation
3. Affective dysregulation
4. Self-negation (suicidal behaviour, emptiness)
5. Irritability

(affective instability, anger, identity disturbance)1. Poorly modulated relationships

(unstable relationships, fear of abandonment)1. Impulsivity
2. Affective instability

(unstable relationships, unstable self-image, unstable mood, anger, emptiness)1. Impulsivity

(avoidance of abandonment, impulsivity, suicidal behaviour, paranoid ideation)1. Interpersonal instability

(abandonment, identity disturbance, emptiness) 1. Affective and cognitive instability

(anger, paranoia or dissociative symptoms)1. Impulsive self-damaging behaviours

(unstable relationships, impulsivity, suicidal behaviour, affective instability)1. Baseline: no notable BPD pathology
2. Low intermediate
3. Moderate (higher probability for affective instability, emptiness, anger, paranoid ideation/dissociation and stormy relationships)
4. High BPD
5. High functioning internalizing
6. Histrionic
7. Depressive internalizing
8. Angry externalizing
9. Disturbed Relatedness
10. Affective Instability
11. Behavioral Dyscontrol
12. Painful feelings and dissociative defense (internalizing)
13. Impulsivity
14. Aggressiveness (externalizing)
15. Uncertainties about identity and interpersonal relationships (identity disturbance, emptiness, avoiding abandonment, unstable relationships)
16. Affect (anger, labile affect, suicidal behavior)
17. Impulsivity
18. High likelihood of BPD symptoms
19. Low likelihood of BPD symptoms
20. Extraversion vs. introversion

(histrionic, narcissistic, avoidant, schizoid)1. Antagonism vs. constraint

(paranoid, schizotypal, antisocial, dependent, obsessive–compulsive)1. Cluster A: paranoid/schizotypal
2. Cluster B: histrionic/narcissistic
3. Cluster C: avoidant/obsessive–compulsive
4. Withdrawn internalizing
5. Severely disturbed-internalizing
6. Anxious-externalizing
7. Distress (internalizing subfactor)
8. Externalizing
9. All criteria
10. Zero criteria
11. Impulsivity and inappropriate anger
12. Higher-functioning
13. Narcissistic Features/Entitlement
14. Pseudo-Normality
15. Highly Dysfunctional
16. Symptomatic (inappropriate anger more prevalent)
17. Asymptomatic (abandonment and identity disturbance more prevalent)
18. Angry/mistrustful
19. Poor identity/low anger
20. Prototypical (low levels of most of the markers)
21. Angry/aggressive
22. High effortful control
23. Low effortful control
24. Midway between groups 1 and 2
25. Internalizing
26. Externalizing
27. Identity (emptiness, identity disturbance,

intolerance of being alone)1. Affective (inappropriate anger, instability of affect, and unstable interpersonal relationships)
2. Impulse (self-damaging & impulsive behavior)
3. Anxious-misery (internalizing subfactor)
4. Externalizing
5. Autonomous
6. Dependent
7. Low levels of antisocial, paranoid

and aggressive features1. Elevated paranoid features
2. Elevated antisocial and aggressive features
3. Affect Dysregulation

(impulsivity, affective instability and anger) 1. Rejection Sensitivity

(suicidality, abandonment and emptiness)1. Mentalization Failure (stress-related paranoia, identity disturbance and unstable relationships)
2. Core features of BPD

(diffuse self-concept, attachment problems, unstable mood and interpersonal relationships)1. Interpersonal exploitation
2. Self-harm
3. Internalizing (self-demeaning, introversive, doleful, inhibited, submissive)
4. Externalizing

(unruly, forceful, egotistic dramatizing)1. Interpersonal disturbance

(avoiding abandonment, emptiness, identity disturbance, unstable relationships)1. Instability (anger, suicidal behaviour, impulsivity, affective instability)
2. Highly unstable

Volatility (V: inappropriate anger, unstable relationships, impulsivity) and Self-Destructive Unpredictability (SDU: affective instability and self-mutilating acts)1. Identity type (I): Identity disturbance and SDU
2. Severely impaired type: V, I and SDU
3. Undifferentiated type: only SDU
4. Vindictive
5. Moderate Submissive
6. Nonassertive
7. Exploitable
8. Socially Avoidant
9. Disturbed relatedness

(unstable relationships, emptiness, identity disturbance)1. Behavioural dysregulation

(impulsivity, suicidal behavior)1. Affective dysregulation

(affective instability, anger, fear of abandonment)1. Disturbed relatedness (unstable relationships, identity disturbance, emptiness)
2. Behavioural dysregulation

(impulsivity, suicidal behavior)1. Affective dysregulation (affective instability,

anger, fear of abandonment)1. High Class (high probability of all criteria)
2. Moderate (higher probability for unstable/intense relationships, affective instability and emptiness than class 3)
3. Low
4. Baseline/Normative (almost zero BPD criteria)
5. Low BPD symptom
6. Anxious (second lowest severity, high in self-image issues, emptiness and anxiety disorders)
7. Trauma (symptoms associated with early trauma, e.g. abandonment, suicidality, dissociation)
8. BPD group
9. Low Anxiety
10. Inhibited
11. High Self-control
12. Emotional/Disinhibited
13. Core BPD
14. Extravert/externalizing

(narcissistic, antisocial, and histrionic)1. Schizotypal/paranoid
2. Low Lethality
3. High Lethality
4. Fear of abandonment, unstable relationships, identity disturbance, suicidality, emptiness
5. Affective instability in absence of impulsivity
6. Stress-related paranoia in the absence of anger
7. Severe Class

(high endorsement of all symptoms)1. Moderate Class

(symptoms at relatively lower rates)1. Impulsivity Class

(only high impulsivity and inappropriate anger)1. Combined factor 2 + 3
2. Calm-internalizing

(impulsivity, suicidal behavior, abandonment)1. Mood-externalizing (affective instability, anger)
2. Undifferentiated
3. Dysphoric: emotional dysregulated
4. Histrionic
5. Nonassertive
6. Avoidant
7. Extreme Exploitable
8. Moderate Exploitable
9. Intrusive
10. Vindictive
11. Internalizing-dysregulated
12. Externalizing-dysregulated
13. Histrionic-impulsive
 | Confirmatory factor analysis (DSM-IV BPD criteria and DIB-R subscales) Principal component factor analysis(BPD PDE criteria)Principal component factor analysis(items of BPT)Principal component factor analysis (BPD DSM-IV criteria)Latent class analysis (BPD SCID-II criteria)Q-factor analysis(SWAP-200 items)Confirmatory factor analysis (PDQ-4+ BPD criteria) Principal component factor analysis (DIB-R data)Principal component factor analysis(BPD SCID-II criteria)Latent class analysis(BPD criteria consensus ratings)Principal component factor analysis (correlation matrix from IPDE dimensions)Q-analysis(comorbid categories based on IPDE data) Two-step cluster analysis (various demographic, clinical and psychological variables)Confirmatory factor analysisLatent class analysis(BPD SCID-II criteria)Two-step cluster analysis (GAF score and five factors of TARS-PD)PMI FacMM (BPD SCID-II criteria) 🡪 better fit than latent class or factor analysisFinite mixture modeling (several variables1)K-means cluster analysis (3 subscales of effortful control)Confirmatory factor analysis (within-person association of BPD with internalizing and externalizing disorders)Single-linkage clustering algorithm(BPD DSM-III criteria)Confirmatory factor analysis (sums of endorsed items for each disorder)Cluster analysis (IIP data)Finite mixture analysis (IPO aggression and IPDE antisocial and paranoid features)Principal component factor analysis(BPD DSM-IV criteria)Factor analysis (BPD dimensions)Latent class analysis (MACI personality pattern scales)Principal component factor analysis(BPD DSM-III criteria)Maximum likelihood and frequency analysisCluster analysis and structural summary analysis (scales of IIP)Principal component factor analysis(BPD PDE criteria)Confirmatory factor analysis (BPD DSM-IV criteria) Latent class analysis (BPD SCID-II criteria)Latent class analysis(nine subscales of BPQ that correspond to diagnostic criteria)Two-step k-means cluster analysis (BIS/BAS and ECS scores)Cluster analysis (SCID-II personality disorders)Trajectory analysis (lifetime maximum Lethality Rating Scale scores)Principal component factor analysis (BPD DSM-IV criteria)Latent class analysis(DSM-IV BPD criteria)Principal component factor analysis (scores of STCPD borderline section)Q-analysis(SWAP-200 items)Latent class analysis and structural summary analysis of resultant classes (scales of IIP) | *N* = 338 outpatients (73.3% female), 65.1% with BPD, SCID-II and DIB-R,mean age 27.24 years (*SD* = 7.61)*N* = 123 adolescent inpatients(46% female), PDE (DSM-III-R), age: *M* = 15.9 (*SD* = 1.3), range from 13 to 18 years*N* = 209 outpatients (61.1 - 77.1% female), self-assessed items of SCID-II Questionnaire 🡪 borderline personality traits (BPT), mean age about 39 years*N* = 91 outpatients with personality disorder (48% female), 27,5% with BPD,retrospective reviews of patient records,mean age 28 years (*SD* = 8)*N* = 382 inpatient substance users (31.7% female), 19.1% with BPD, diagnosed by SCID-II, age: *M* = 41.57 (*SD* = 9.24), range from 18 to 68 years*N* = 55 female adolescents with BPD, clinical DSM-IV diagnoses and Axis II checklists for adults, SWAP-200-A, age range from 14 to 18 years*N* = 159 outpatients (76.7% female), 58.5% with BPD, PDQ-4+ self-report, SCID-II, mean age 29.14 years (*SD* = 7.8)*N* = 118 adolescents (non-patient), diagnoses by DIB-R*N* = 75 hospitalized women with BPD, SCID-II (1-6 scale), age: *M* = 28.0, range from 15 to 45 years *N* = 411 participants (inpatient, outpatient, nonclinical; 74% female), 25% with BPD, diagnoses by consensus ratings including structured interviews of Axis I and II disorders, mean age 37.1 years (*SD* = 10.5)*N* = 90 outpatients (92.2% female) with DSM-IV BPD according to IPDE, age: *M* = 30.9 (*SD* = 7.9), range from 18 to 51 years*N* = 77 clients with personality disorder (96% female and BPD), diagnosed per SCID-I and SCID-II, additionally WCCL, DES and PHI, age: *M* = 34 (*SD* = 8.73), range from 19 to 55 years*N* = 34653 individuals (population-based sample), diagnoses by AUDADIS-IV, 48% female, age range from 20 to 90 years*N* = 564 inpatients and outpatients (57.6% female), 17.7% with BPD, SCID-II, mean age 29.92 years (*SD* = 8.50)*N* = 56 outpatients with BPD who dropped out during first year of treatment (60.7% female), diagnosed by DIB-R, GAF scale, TARS-PD, mean age 35.79 years (SD = 11.80)*N* = 362 adults (clinical and nonclinical, 71% female), 26% with BPD, diagnosed by SCID-II, mean age 39.98 years (*SD* = 11.29)*N* = 100 individuals of symptomatic class (85% female), mean age 37.38 years (*SD* = 11.14)*N* = 47 patients with BPD (87.2% female), IPDE, effortful control by ATQ, mean age 28.89 years (*SD* = 6.92)*N* = 386 women, 35.9% with BPD according to criteria of DSM-IV and DIB-R,age range from 18 to 35 years*N* = 579 subjects with personality disorder (in- and outpatients from four studies), 63-81% female, 80.3% with BPD, diagnoses according to medical reports and (semi-)structured interviews, age range from 22 to 32 years, *N* = 1197 (population-based sample), 45% female, diagnoses with CIDI, symptoms of BPD with IPDE Questionnaire, age range from 19 to 22 years *N* = 95 women (inpatient and outpatient tracks) with DSM-IV BPD, SCID-II and DIB-R, age: *M* = 27.1 (*SD* = 7.3), range from 17 to 45 years*N* = 90 individuals with BPD (92.2% female), from clinic as well as community settings, IPDE, SCID and IPO, age: *M* = 31.06 (*SD* = 7.81),range from 18 to 50 years*N* = 95 (86% female), treated outpatients, BPD as primary diagnosis, SCID-II, age: *M* = 30 (*SD* = 8.80), range from 18 to 56 years*N* = 274 general population (54.4% female), mean age 29.7 years (*SD* = 11.2); *N* = 133 patients with personality disorder (63.2% female), mean age 33.6 years (*SD* = 7.7), dimensional descriptions of cluster B diagnoses from content analysis of literature 🡪 assessed by self-report scales*N* = 60 adolescent outpatients with BPD (73.3% female), diagnoses by CI-BPD,age: *M* = 15.90 (*SD* = 1.05), range from 15 to 18 years*N* = 106 psychology students (56% female) with elevated borderline scale scores according to several self-report measures, 30.8% with borderline spectrum diagnosis,structured diagnostic interview,no information about age distribution*N* = 89 inpatients (82% female), 40.4% with BPD, diagnoses by DSM-III symptom-checklist in regard of patients’ medical records, mean age 27.8 years*N* = 228 inpatients with BPD, 92.5% female, diagnostic interviews according to ICD-10, mean age 31.29 years (*SD* = 9.47)*N* = 141 inpatients (25% female), PDE,44% with BPD, age: *M* = 22.4 years (*SD* = 4.7), range from 18 to 39 years*N* = 668 in- and outpatients (64% female), 36% with BPD, Diagnostic Interview for DSM-IV Personality Disorders,age range from 18 to 45 years,2-year-follow-up: *N* = 498*N* = 8383 adults (National Survey of Psychiatric Morbidity in Great Britain), 0.71% with BPD, diagnosed by SCID-II, age range from 16 to 74 years (no further information about age distribution)*N* = 75 adolescent girls, 18.9% with BPD, diagnosed by DIB-R, BPQ (self-report)age: *M* =14.92 (*SD* = 1.50), range from 11 to 18 years*N* = 146 BPD inpatients (85.6% female), SCID-II, reactive temperament by BIS/BAS scales, regulative temperament by ECS,age: *M* = 29.28 (*SD* =8.36), range from 18 to 65 years*N* = 187 outpatients with BPD(88% female), SCID-II, age: *M* = 29.1 (*SD* = 8.7), range from 18 to 56 years*N* = 137 repeated suicide attempters with BPD (75% female), in-/out-/non-patient, diagnosed by IPDE and DIB, Columbia Suicide History and a Lethality Rating Scale, mean age 29.9 years (*SD* = 8.1)*N* = 82 (63% female), college students, diagnoses at threshold (all criteria met), probable (all but one criterion met) and possible (all but two criteria met), SIDP-IV, SCID-II, mean age 18.1 years (*SD* = 4.04)*N* = 167 subjects with at least one symptom of BPD according to SCID-II (94.6% with alcohol use disorder), about 40% female, age range from 20.9 to 22.3 years*N* = 288 outpatients with BPD (64% female) STCPD (self-report questionnaire), clinical diagnoses, age range from 18 to 65 years*N* = 496 patients with personality disorder (clinical diagnosis), descriptions by SWAP-200, no information about age distribution*N* = 225 with three or more DSM-III criteria for BPD (91% psychiatric patients, 8% community members, 1% diabetic patients), 75% female, structured diagnostic interview, IIP-C, no information about age distribution |

*Note*. *M* = mean value; *SD* = standard deviation; *N* = sample size. ATQ = Adult Temperament Questionnaire; AUDADIS-IV = Alcohol Use Disorder and Associated Disabilities Interview Schedule-IV; BIS/BAS = Behavioral Inhibition/Activation System Scales; BPQ = Borderline Personality Questionnaire; CI-BPD = Childhood Interview for DSM-IV; CIDI = Composite International Diagnostic Interview; DES = Dissociative Experience Scale; DIB-R = Revised Diagnostic Interview for Borderlines; ECS = Effortful Control Scale; GAF = Global Assessment of Functioning; IIP = Inventory of Interpersonal Problems; IPO = Inventory of Personality Organization; MACI = Millon Adolescent Clinical Inventory; PDE = Personality Disorder Examination; PDQ-4+ = Personality Diagnostic Questionnaire-4+; PHI: Parasuicide History Inventory; PMI FacMM: Partial measurement invariance factor mixture modeling; SCID-II = Structured Clinical Interview for DSM-IV Axis II Personality Disorders; SIDP-IV = Structured Interview for DSM-IV Personality Disorders; STCPD = Screening Test for Comorbid Personality Disorder; SWAP-200 = Shedler-Westen Assessment Procedure-200; TARS-PD = Treatment Attrition-Retention Scale for Personality Disorders; WCCL = Ways of Coping Checklist.

1BPD criteria inappropriate anger, avoidance of abandonment and identity disturbance; DSM–IV antisocial personality disorder and paranoid personality disorder; mistrustfulness and aggressiveness subscale from IIP.

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**Supplement Material B** Description of Two-Cluster-Solution – Supplement for Results and Discussion

The distribution of IPDE variables (patients meeting criterion level, %) among the two clusters is illustrated in *Figure S1*, corresponding comparisons are depicted in *Table S1*.

Figure S1. *Distribution of IPDE Criteria for Two Subtypes (Patients meeting Criterion Level, %).*

Cluster 1 (C1; n = 43) shows higher values in *emptiness* but lower values in *relationship instability,* *feelings of* *abandonment, anger, quarrelsomeness, maintaining action* and *unexpected action*. Its prominent ICD-11 domains seem to be mostly Negative Affectivity and Disinhibition (regarding self-harm) with moderate Severity (regarding disturbance of both self and interpersonal functioning). Therefore, C1 refers to an *internalizing* subtype.

Cluster 2 (C2; n = 66) shows lower values in *emptiness* but higher values in *relationship -instability, feelings of abandonment, anger, quarrelsomeness, unexpected action* and *maintaining action.* Its ICD-11 domains seem to be equally Dissociality, Disinhibition and Negative Affectivity with overall high Severity. C2 refers to a *mixed* subtype.

*Table S1.* Differences between Subtypes on IPDE-Criteria, *M* (*SD)*.

|  |  |  |  |
| --- | --- | --- | --- |
| Criterion, *M (SD)* | Internalizing subtype(*n*=43) | Mixed subtype(*n*=66) | p-value |
| Identity disturbance (S) Relationship instability (S)Emptiness (NA)Mood instability (NA)Feelings of abandonment (NA)Anger (A)Quarrelsomeness (A)Unexpected action (D)Self-harm (D)Maintaining action (D) | 1.23 (.72)1.14 (.94)1.84 (.43)1.72 (.59).74 (.88)1.00 (.82).37 (.62).81 (.91)1.65 (.69).65 (.87) | 1.15 (.81)1.58 (.70)1.53 (.71)1.80 (.56)1.39 (.82)1.86 (.39)1.77 (.55)1.42 (.75)1.52 (.73)1.50 (.81) | .666 **.015** **.013** .260**<.001****<.001****<.001****<.001** .244**<.001** |

*Note. N* = sample size; absolute (*n*).

Differences in demographic, clinical, and therapeutic are depicted in *Table S2*. Results revealed lower values in *Definite BPD* for the internalizing subtype, but no significant difference in *BSL baseline.* Furthermore, the *internalizing* showed higher rates in affective disorders (90.7%) than the *mixed* subtype and higher therapeutic change (*RCI-BSL*; *p*= .059) although tests did not reach significance. The *mixed* subtype showed higher rates of therapy discontinuation(*p*= .054).

*Table S2.* Demographic, Clinical and Therapeutic Differences.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Internalizing subtype(*n* = 43) | Externalizingsubtype(*n* = 66) | *p-*value |
| Demographic variablesAge, *M (SD*)Gender (female), *n* (%)Comorbidities, *n* (%)F10 - F19 (except tobacco use)F30 - F39F40 + F41F43F50Number of diagnoses, *M (SD*)Definite BPD, *n* (%)Questionnaires, *M (SD)*BSL baseline BSI global index baselineBDI baselineTherapeutic variables, *M (SD); %* RCI of BSL Responders (%) RCI of BSI Responders (%) RCI of BDI Responders (%) Pre-post BSL Pre-post BSI Pre-post BDI Treatment duration in days, *M (SD)* Discontinuation of therapy, *n* (%) | 29.60 (7.23)36 (83.7)13 (30.2)39 (90.7)21 (48.8)11 (25.6)9 (20.9)2.74 (1.20)13 (30.2)1.85 (.79)28.97 (11.59)26.19 (11.64).83 (1.04)65.51.24 (.77)81.01.19 (.93)65,0.53 (.95)12.53 (7.37)11.36 (7.25)77.58 (19.36)5 (11.6) | 28.75 (6.00)56 (84.8)18 (27.3)40 (60.6)23 (34.8)23 (34.8)15 (22.7)2.36 (.95)62 (93.9)1.71 (.82)27.83 (13.82)26.95 (12.05).38 (1.03)40.01.00 (.82)77.31.14 (.94)63.6.33 (.89)15.39 (11.67)15.61 (12.41)72.34 (23.51)18 (27.3) |  .768 .728 .738**<.001** .146 .307 .825 .101 **<.001**.409 .536.658.**059**.347.851.332.346.181.219.**054** |

*Note.* Comorbidities include principal and secondary diagnoses. *M =* mean value; *SD* = standard deviation; *N* = sample size, variation in *N* due to missing values; absolute (*n*) and relative (%) frequency for categorical data. BSL = Borderline Symptom List; BSI = Brief Symptom Inventory; BDI = Becks Depression Inventory.

Additionally,the clusters were analyzed regarding differences in the BSL-95 subscales and BSL-severity. Results showed no significant differences in subtypes (see F*igure S2*)*.*

Figure S2. *Distribution of IPDE-Clusters in BSL-Severity Rating.*

Considering the two-cluster-solution, the *mixed* subtypeshowed higher rates in *therapy-discontinuation* than the *internalizing*. Rüsch et al. (2008) and Simonsen et al. (2021) suggest that personality traits like anger and quarrelsomeness may influence therapy-discontinuation. For a successful treatment of patients with traits of Dissociality and Disinhibition as well as *identity-disturbance*, it may be essential to recognize and work through these aspects from the very beginning of psychotherapy (Löffler-Staska, Blueml & Boes, 2010). A sustainable therapeutic alliance may be essential for therapeutic change (Goldfried, 2012).

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