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Population-based cost–offset estimation for the treatment of borderline personality disorder:
Projected costs in a currently running, ideal health system

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Abstract

Borderline personality disorder (BPD) is considered one of the most expensive mental disorders in terms of direct and indirect costs. The aim of this study was to carry out a cost–offset estimation of disorder-specific psychotherapy for BPD at the population level. The study investigated whether the possible financial benefits of dialectical behavior therapy outweigh the therapy costs, assuming a currently running, ideal health system, and whether the estimated cost–benefit relationships change depending upon the number of patients willing to be treated. A formula was elaborated that allows the user to calculate cost–benefit relationships for various conservative or progressive scenarios, with different stages of individuals’ willingness to be treated (10%–90%). The possible costs and benefits of BPD-related treatment were evaluated using a 12-month, prevalence-based approach. The annual costs for untreated BPD were 8.69 billion EUR annually. The cost–benefit relationship for the treatment remained constant at 1.52 for all scenarios, implying that for each EUR invested, 1.52 EUR can be gained within one year, independent of the willingness to be treated. Additional intangible benefits were calculated with the aid of Quality-Adjusted Life Years. Findings suggest that BPD-related treatment might well be efficient at the population level.

Word count: 199

Keywords: cost–offset estimation; dialectical behavior therapy; borderline personality disorder
Borderline personality disorder (BPD) is a life-threatening mental disorder that is strongly characterized by lifetime rates of approximately 70% for acts of self-injury, 80% for suicide attempts, and 10% for suicide (Black, Blum, Pfohl & Hale, 2004; Linehan & Heard, 1999; Paris, 2002). The prevalence of BPD in the general population ranges from 0.5 to 1.4% (Samuels et al., 2002; Torgersen, Kringlen & Cramer, 2001; Coid, Yang, Tyre, Roberts & Ullrich, 2006; Lenzenweger, Lane, Loranger & Kessler, 2007). Yet the proportion of patients with a diagnosis of BPD in psychiatric care ranges between about 15% of outpatients and 30% of inpatients (Alnæs & Torgersen, 1988; Zimmerman & Mattia, 1999; Loranger et al., 1994). Individuals with BPD require more treatment services than patients with other disorders (Bender et al., 2001; Zanarini, Frankenburg, Khera & Bleichmar, 2001). Therefore, BPD is considered one of the most expensive mental disorders (Soeteman, Hakkaart-van Roijen, Verheul & Busschbach, 2008; van Asselt, Dirksen, Arntz & Severens, 2007), causing high direct and indirect costs. Direct costs include all treatment costs that are directly associated with BPD (e.g., hospital days or emergency department visits). Indirect costs cover all costs that occur secondary to the disorder (e.g., production losses and sickness benefit payments due to days absent; e.g., Brent, 2008; Margraf, 2009). Additional losses can be expected in terms of intangible values, which refer to the reduced quality of life and suffering caused by BPD as well as “years lost” due to mortality.

To the best of our knowledge, so far only three studies have been conducted that investigated the issues of costs and benefits of therapy for BPD. (1) Using a prevalence-based, bottom-up approach, societal costs of BPD in the Dutch population were calculated, resulting in an estimation of costs at around 17,000 EUR per patient each year (van Asselt et al., 2007). The overall annual costs covered healthcare, medication, informal care, productivity losses, and out-of-pocket expenses. In this study, one third of the people affected by BPD were fully disabled and those who were employed reported that they had been absent from their jobs for more than five weeks per year. (2) In another study on this sample, the cost-effectiveness of borderline-specific treatment was
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calculated (van Asselt et al., 2008). Comparing schema-focused therapy (SFT) vs. transference-focused psychotherapy (TFP) for outpatients with BPD, the investment for SFT was lower (37,826 EUR for SFT vs. 46,795 EUR for TFP) while the recovery rate was higher (52% for SFT vs. 29% for TFP), implying that SFT is more efficient than TFP. The analyses considered a wide range of direct and indirect costs and intangible losses, but since the analyses considered cost-effectiveness, they were not transferred into financial values. (3) Comparing dialectical behavior therapy (DBT) vs. treatment-as-usual (TAU) for outpatients who predominantly suffered from BPD revealed that DBT was more expensive in terms of treatment costs (Priebe et al., 2012). In the additional cost-effectiveness analysis, health care outcomes related to self-injury were calculated. This analysis was not particularly specific to BPD, although most of the patients were affected by BPD. The analyses of these three studies were based on small sample sizes, ranging from 20 to 88 participants.

The aim of the present study was to carry out a population-based cost–offset estimation of psychological therapy for BPD, using data from the German health care system. The perspective is a societal one, considering the possible impact of therapy on direct and indirect costs for the health care system (hospital days, emergency department visits, sickness benefit payments), on society (unemployment, early retirement), and the economy (production losses, loss of gross value), as well as on intangible costs in the form of Quality-Adjusted Life Years (QALYs), a construct frequently used by the World Health Organization (e.g., Prüss-Üstün, Mathers, Corvalán & Woodwair, 2003). The approach is prevalence-based and not incidence-based: Given a constant 12-month prevalence, the costs of BPD and the benefits of its treatment could be evaluated for this period. Thus, all individuals affected by BPD within one year were included in the estimation, irrespective of the duration of their illness. It was not assumed that the intervention reduced the prevalence at the population level; in other words, potentially deteriorating individuals or those newly diagnosed with BPD are already included in this prevalence. The study included the costs incurred by all patients
who might be willing to undergo treatment within one year, as well as the benefits created by the patients whose symptoms improved within that one year. The individuals who were treated within the considered year were not necessarily the same individuals whose symptoms improved and who were responsible for the financial benefit within that year; i.e., running costs and running benefits were considered, but time trade-off was not. This implies the assumption of an “ideal health services system;” in other words, for each patient who might be willing to be treated, treatment can be offered promptly. The initial costs for the dissemination of the intervention were not taken into account. In contrast to some of the previous studies, which were in medias res or ex post studies, this study represents an ex ante estimation based on data provided by institutions like health insurance providers or the German pension fund. Ex ante analyses are usually carried out before a particular project is started in order to help decide whether resources should be allocated to that project, in contrast to in medias res or ex post studies, which evaluate the costs and benefits during (in medias res) or at the end (ex post) of a project. Generally, ex ante studies are less accurate than in medias res or ex post studies because the possible benefits and costs have to be estimated in advance and cannot be directly evaluated, as is possible at the end of a project (Boardman, Greenberg, Vining & Weimer, 2011). The aim is to present a possible method of calculating costs and benefits of the treatment of BPD ex ante, which can be performed for any treatment approach if the relevant data are available.

Method

In order to carry out the cost–offset estimations, it was necessary to estimate (1) how many patients with BPD might be willing to be treated, (2) how many of these individuals would stay in therapy, and (3) to what extent their specific symptoms might be reduced.

The next step was to estimate (4) which direct costs might be saved through the reduction of symptoms, namely through the reduction of inpatient treatments in the form of emergency room visits and hospital stays; and (5) which indirect costs might be saved through the reduction of days
absent, associated production loss, loss of gross value, payment of sickness benefits, unemployment, early retirement, and associated payments of unemployment benefits and early retirement pensions that might be reduced. In the next step (6), the costs incurred by treating the patients who were willing to be treated were estimated. These costs were compared to the direct and indirect cost savings. Whether cost-offset occurs, i.e., whether the financial benefit might outweigh the costs, and by how much, was evaluated with the aid of cost–benefit relationships. The last step (7) was to calculate additional intangible benefits that might be obtained through improvement of quality of life for patients affected by BPD, and the associated gain in QALYs as well as the reduction of “lost” QALYs through mortality due to suicide.

Data collection

To estimate the number of individuals affected by BPD within one year, a 12-month prevalence of 0.7% in the German population was assumed (Lenzenweger, 2008). Several institutions were contacted to collect the data necessary for the estimations. One of the large statutory health insurance providers (BKK Bundesverband) provided us with an extensive dataset about days absent, sickness benefit days, and hospital days due to the diagnosis of BPD. The German statutory pension insurance plan (Deutsche Rentenversicherung, DRV) provided us with a dataset about early retirements in 2012 that were caused by BPD. The included cases were diagnosed in accordance with the ICD-10 diagnoses covering F60.3X (emotionally unstable personality disorders, impulsive and borderline type) and only data of individuals between 20 and 59 years of age was included. Thus, the analyses refer to the adult German population. In order to estimate the costs due to early retirement, an exemplary calculation of the amount of an average payment for early retirement was included. We searched the health reports of large statutory health insurance providers (Allgemeine Ortskrankenkasse, AOK; Betriebskrankenkassen, BKK; Deutschen Angestellten-Krankenkasse, DAK; and Techniker Krankenkasse, TK) for data about the costs of sickness benefits and hospitalization. We interviewed the resident experts at health
insurance providers and hospitals, and searched databases of the Federal Health Monitoring Authority (Gesundheitsberichterstattung des Bundes, GBE-Bund) and publications of the Federal Ministry of Health (Bundesministerium für Gesundheit, BMG) for data about the costs of emergency services. Statistics as to demographics, the working population, and income were available via the Regional Accounts (Volkswirtschaftliche Gesamtrechnungen der Länder, VGRdL). Statistics about the average unemployment benefit were provided by the Federal Employment Agency (Bundesagentur für Arbeit). The estimations of the treatment costs were based on the current Physicians’ Fee Schedule for Psychotherapy (Einheitlicher Bewertungsmaßstab 2013, EBM 2013), valid in Germany. Additional intangible benefits in the form of improved quality of life and life years gained were estimated with the aid of QALYs.

Treatment

At present, there are several relevant types of psychotherapy for BPD, such as cognitive-behavioral therapy, psychodynamic therapy, schema-focused therapy, mentalization-based therapy, and dialectical behavior therapy, to name a few. So far, there is no clear evidence to support the assertion that one specific type of therapy is more effective than another (Leichsenring, Leibing, Kruse, New & Leweke, 2011). It is recommended that the effectiveness of a program be evaluated prior to cost-offset evaluations (Drummond, Sculpher, Torrance, O’Brien & Stoddart, 2005). For the present calculations, we therefore chose to base our exemplary estimations on outpatient treatment with dialectical behavior therapy (DBT; Linehan, 1993a, 1993b), since it is a frequently investigated psychosocial intervention for BPD. Its effectiveness has been demonstrated in several randomized controlled trials and a meta-analysis (Kliem, Kröger & Kosfelder, 2010), resulting in a global effect size of ES = 0.44. Consequently, specific effects on symptoms that might be relevant to our calculations are well reported.

This comprehensive treatment program focuses on (a) promoting the motivation for change via detailed chain analyses, validation strategies, and management of reinforcement contingencies in
individual therapy sessions twice a week; (b) increasing target-oriented and appropriate behavior by teaching skills in a weekly group format training, to foster mindful attention and cognition, emotion regulation, acceptance of emotional distress, and interpersonal effectiveness; (c) ensuring the transfer of newly learned skills to everyday life by telephone coaching and case management; and (d) supporting therapists’ motivation and skills with a weekly consultation team meeting.

A treatment target hierarchy determines the problem focus of each session. Reduction of suicidal gestures and self-injurious behaviors is given the highest priority in DBT, considering that these behaviors predict completing suicide (Linehan, 1993a, 1993b). Subsequently, patients are trained in skills geared to help them stay in outpatient therapy, followed by a reduction of co-occurring mental disorders. Finally, quality-of-life issues or individual targets are addressed.

Formula

We elaborated a formula that allows the user to estimate cost–benefit relationships for various more-or-less conservative or progressive scenarios. Cost–offset calculations for psychotherapy are often based on annual remission rates; in other words, how many individuals are cured by the therapy and which costs might be saved as a result of remission within one year. Given that patients with BPD do not go into remission within one year, although they might be offered a disorder-related treatment, a formula based on remission rates is not appropriate for the current calculation. Therefore, we have developed a formula based on “reduction rates,” the amount of reduction due to psychotherapy that can be assumed for specific symptoms. The reduction rates are constant but specifically applied to each relevant symptom separately. The number of affected individuals who are willing to be treated, however, is varied between 10 and 90%, in 10% steps. This makes it possible to observe how much the costs and benefits grow with respect to the willingness to be treated or the number of individuals treated. Since DBT requires a certain number of both individual and group therapy (skills training) sessions as well as telephone contacts, including crisis interventions, we assumed a fixed annual number of 60 sessions of individual therapy (40 weeks of
treatment, every second session a double session), 20 sessions of group therapy (half a year of group therapy), and 4 sessions of crisis interventions (1 crisis intervention per quarter of the year) for each patient treated per year.

**Determination of reduction rates**

We calculated reduction rates for days absent, payment of sickness benefits, unemployment, days in hospital, emergency room visits, suicidal behavior, and reduced quality of life. The calculated reduction rates were derived from pre-post differences of a randomized trial of DBT vs. general psychiatric management for BPD (McMain et al., 2009). Pre- to post-treatment mean differences on outcomes for several symptoms, critical behaviors, and health-care utilization for both conditions were reported 12 months after beginning the intervention in the above-named study.

As an example, for the reduction of hospital days, a reduction rate of –0.645 (average hospital days pre = 10.52 vs. post = 3.73; McMain et al., 2009) was calculated, implying that about 65% of the costs due to hospital days might be saved. Thus, the rate entered as a multiplication factor into the formula is 0.645 for the estimated financial profit due to the reduction of hospital days. The analogously calculated reduction rates for all relevant symptoms are shown in Table 1.

No pre-post differences for days absent or payment of sickness benefits were reported. Given that work ability is highly related to the symptom severity, we used the mean difference on the Zanarini Rating Scale for Borderline Personality Disorder (Zanarini et al., 2003) in the McMain et al. (2009) study. Furthermore, we could not find any variables that appeared to be sufficiently related to the incidence of early retirement. Therefore, we have determined a moderate reduction rate of –0.1 for early retirement. The complete formula for the present estimations can be found in Appendix 1.

**Results**

All results are reported for the range between the most conservative (10%) and the most progressive (90%) willingness to be treated among patients with BPD.
Reduction of direct costs. Based on the data from the BKK Bundesverband, we calculated a ratio of annual hospital days per BPD patient that point back to the diagnosis of BPD. This ratio was 8.67 annual hospital days per BPD patient. Given the reduction rate of –0.645 for hospital days, we estimated that between 193.29 thousand and 1.74 million hospital days might be saved per year. Assuming average costs of 381 EUR per hospital day (Allgemeine Ortskrankenkassen [AOK], 2013), the associated costs that might be saved ranged between 73.64 million and 662.80 million EUR.

Given that each BPD patient visits the emergency room 1.99 times per year (McMain et al., 2009), we assumed an average of one minor and one serious self-injurious behavior per year in the form of cut wounds to the arm. Based on this assumption, one emergency department visit is estimated to cost 2,016.20 EUR, plus 550 EUR for an ambulance transport and an emergency doctor’s deployment (for detailed calculations, see Appendix 2). Given a reduction rate of –0.533 for emergency department visits (McMain et al., 2009), we estimated that between 36.54 thousand and 328.82 thousand emergency department visits might be saved per year. The associated costs that might be saved ranged between 93.76 million and 843.82 million EUR.

Reduction of indirect costs. Based on the data of the BKK Bundesverband, we calculated a ratio of annual days absent due to the diagnosis of BPD for each individual. Assuming that the days absent are only caused by 35% of people affected by BPD, since only 35% are in employment (e.g., McMain et al., 2009; van Asselt et al., 2008), this ratio was 13.43 annual days absent per affected individual. In Germany, the current costs per day of absence are estimated at 272 EUR (99 EUR due to loss of productivity and 173 EUR due to loss of gross value; Bundesanstalt für Arbeitsschutz und Arbeitsmedizin [BAuA], 2013). Based on the reduction rate of –0.512 for days absent and the assumption of the above-named costs of days absent, we estimated that between 82.90 thousand and 746.09 thousand days absent could be saved per year, yielding an annual gain of 22.55 million to 202.94 million EUR through the reduction of days absent.
Similar to the calculation of a ratio of annual days absent, we calculated a ratio of annual sickness benefit payment days caused by the 35% of employed individuals affected by BPD. This ratio was 8.90 annual sickness benefit payment days per individual diagnosed with BPD. We assumed average costs of 45.48 EUR per sickness benefit day (for detailed calculations, see Appendix 2) and a reduction rate of –0.512. Consequently, the estimated number of sickness benefit days that might be saved ranged between 54,944 thousand and 494,434 thousand days, and the associated costs that might be saved lay between 2,500 million and 22,490 million EUR. According to the German statutory pension insurance plan, 1,197 individuals retired early because of BPD in 2012, which represents 0.21% of the individuals affected within one year. Assuming a reduction rate of –0.1 and an annual early retirement payment of 23,260.08 EUR, we calculated that between 7 and 66 of the individuals in our study might be spared an early retirement. This represents an estimated annual gain ranging between 170,144 thousand and 1,531,190 EUR. To avoid double counting, the percentage of individuals who entered early retirement within one year (0.21%) has to be deducted from the percentage of unemployed patients (65%). Consequently, we assume that 64.79% of patients receive monthly unemployment benefit payments of 821.99 EUR (for detailed calculations, see Appendix 2). Based on a reduction rate of –0.512, we estimated that between 112,710 million and 1,010 billion EUR might be saved per year through ceasing payment of unemployment benefits.

**Annual overall benefit.** Assuming a very conservative willingness to be treated of only 10%, annual savings of around 305,330 million EUR could be expected. About 55% of these overall savings (167,400 million EUR) are based on the reduction of direct costs, and about 45% (137,930 million EUR) result from the reduction of indirect costs. Given a very progressive willingness to be treated (90%), the annual overall benefit is expected to be around 2,750 billion EUR. The proportion of direct and indirect benefits remains the same because of linear cost and benefit increases. We also calculated benefit rates for “moderate” rates of willingness to be treated under the assumption that
one third (33%) or one half (50%) of the affected individuals would seek treatment. For the treatment rate of 33%, an overall benefit of 1.00 billion EUR could be anticipated. A treatment rate of 50% would lead to an estimated benefit of 1.53 billion EUR.

Costs for the treatment. Depending on the treatment rate, the costs for the treatment grow linearly. For a treatment rate of 10%, annual costs of 201.53 million EUR were estimated. A treatment rate of 33% would lead to annual costs of 665.06 million EUR, while 50% willingness to be treated would lead to annual costs of 1.01 billion EUR, and 90% willingness to be treated would produce annual costs of 1.81 billion EUR in the current estimation.

Treatment costs and benefits per patient. Estimating the costs for a single individual who accesses the treatment, the reduction of costs would be 4.86 thousand EUR for direct costs and 3.99 thousand EUR for indirect costs. Thus, the overall benefit would be 8.86 thousand EUR, while the costs would be 5.85 thousand EUR, resulting in a gain of 3.01 thousand EUR.

Comparison of costs and benefits. The estimated annual financial benefit and the expected costs have to be weighted up to determine whether cost-offset occurs and to obtain cost–benefit relationships for the different stages of willingness to be treated. The increase of benefits, costs, and net profit is shown in Fig. 1. The net profit grows constantly in tandem with an increased willingness to be treated. Since the formula implies that both the denominator (costs) and the numerator (benefits) are linear functions and pass through the origin, the relation between benefits and costs remains stable over the different stages of willingness to be treated. It oscillates around 1.52, implying that for each Euro invested in the treatment of BPD, around 1.52 EUR could be gained within one year, independently of the rate of willingness to be treated. Since this number is greater than 1.0, cost-offset occurs in this estimation.

Costs for untreated BPD per patient and at the population level. If BPD was untreated, annual costs per BPD patient were estimated at 16.23 thousand EUR. These overall costs consisted of 8.42 thousand EUR (52%) of direct costs and 7.81 thousand EUR (48%) of indirect costs. At the
population level, the overall annual costs were estimated at 8.68 billion EUR, consisting of 4.75 billion EUR of direct costs and 3.93 billion EUR of indirect costs.

*Additional intangible benefits.* We estimated additional intangible benefits due to gains in quality of life, and gained “life time” due to reduced suicidality with the aid of QALYs. The loss in QALYs for a patient with an untreated mental disorder compared with full health is 0.2 QALYs for each year (Layard, Clark, Knapp & Mayraz, 2007; Revicki & Wood, 1998); the willingness-to-pay (WTP) for one QALY in the scenario described is suggested to be 8,000 EUR (Ahlert, Breyer & Schwettmann, 2013). Based on the reduction rate of –0.107 for lost QALYs, we estimated that between 737.14 and 6,634.23 QALYs could be gained due to BPD treatment. The associated benefits that might be obtained ranged between 5.90 million and 53.07 million EUR. Assuming an annual suicide risk of 0.49% per patient with BPD (van Asselt et al., 2007) and a suicide reduction rate of –0.594, the estimated number of suicides that might be prevented ranged between 100 and 902 per year. The estimated monetary gain through QALYs no longer lost to BPD-associated suicides lay between 802.06 thousand and 7.22 million EUR per year. The reduction of direct and indirect costs as well as additional intangible benefits for the rates of willingness to be treated of 33% and 50% is shown in Table 2.

**Discussion**

This cost–offset estimation aimed to calculate both possible costs and benefits of psychotherapy for BPD at the population level, taking into consideration different levels of willingness to be treated and to evaluate whether the estimated benefits outweigh the estimated costs. Our findings suggest that a BPD-related treatment might be efficient independently of how many individuals would be willing to undergo therapy. The estimated cost–benefit relationship lies at 1.52, implying that for each Euro invested, 1.52 EUR can be gained within one year. The linear cost and benefit increase follows from the fact that costs for the dissemination of the intervention were not taken into account, but a “currently running, ideal system” was assumed, i.e., “running
"costs" and “running benefits” were compared. Expressed in financial terms, if 33% of the patients affected are treated, 552.42 million EUR of direct costs and 455.16 million EUR of indirect costs could be saved and a net profit of 342.52 million EUR could be obtained per year. An additional sum of 22.11 million EUR of intangible benefits could be gained.

The estimated annual direct costs (i.e., hospital days and emergency department visits) per untreated patient amounted to 8.42 thousand EUR; hence, our result turned out higher than direct costs for mental disorders in general, which were calculated in a cross-national analysis for Europe (Gustavsson et al., 2011), ranging between 1.08 thousand EUR for anxiety disorders to 5.81 thousand EUR for psychotic disorders. In a previous study (Soeteman et al., 2008), the mean annual costs due to personality disorders were lower than the costs for BPD that were estimated in the present study (11.13 thousand EUR for personality disorders vs. 16.23 thousand EUR for BPD, per patient). Compared to the BPD-specific study by van Asselt et al. (2007), the estimated annual overall costs per untreated BPD patient in the present study (16.23 thousand EUR) were equal to that of the Dutch study (16.85 thousand EUR). However, the proportion of direct costs was higher in the present estimation (52% vs. 22%). Differences in our findings for the direct costs might result from including not only hospital stays in our estimations, but also emergency room visits, ambulance transport, and emergency doctors’ deployments. Compared to the mean 4-years’ therapy costs for SFT (37.83 thousand EUR) and TFP (46.80 thousand EUR) in the van Asselt et al. (2008) study, the estimated annual costs for DBT per patient in the present study were lower (5.85 thousand EUR). Extrapolating these estimated annual costs to four years, as was done in the van Asselt et al. (2008) study, the costs for DBT were roughly only 60% of the costs for SFT and 50% of the costs for TFP. The previous analyses were based on individual therapy sessions twice a week for SFT (about 63 sessions per year; Giesen-Bloo et al., 2006) and TFP (about 77 sessions per year), respectively. In contrast, our estimations were based on the assumption of 60 individual DBT
sessions (81.87 EUR), 20 sessions of skills training in a group format (40.67 EUR), and 4 (quarterly) crisis interventions (31.30 EUR) during one year.

Several limitations must be taken into consideration. First, the major limitation of the study was that for some parameters, only a single data source was available (e.g., early retirement, production losses), or that parameters had to be estimated. Hence, some calculations might include cumulative errors. A good example is the calculation of the costs due to sickness benefit payments: The average gross and net income of employees in Germany was estimated. Afterwards, this estimation was used to calculate a daily rate for sickness benefit payments. Furthermore, no reduction rate could be calculated for the reduction of early retirement, since no empirical basis exists for this value and the reduction rate was set at an estimated value of −0.1. However, when we set the reduction rate for early retirement and the associated benefit at zero, the cost–benefit relationship was only slightly reduced at the third position after the decimal point (1.515 vs. 1.514), which can be attributed to the fact that the number of individuals entering early retirement each year represents only 0.21% of the patients affected each year. Second, we based some of our estimations on data provided by only one of the large statutory health insurance providers (BKK Bundesverband). The estimations might therefore not be transferable to patients with BPD who were enrolled in other insurance firms since members of other insurance providers might belong to different subgroups of the general population. However, the BKK Bundesverband health insurance provider represents a large proportion of the German population. Third, assuming that not all individuals diagnosed with BPD cause equally high costs, there might be only a subsample of patients who are highly stressed and incur high costs. Although we chose a prevalence of 0.7, which is comparably low (range: 0.5–3.9; Lenzenweger, 2008), this bears the risk of overestimating the possible benefits. Fourth, in contrast to van Asselt et al. (2007), no consideration was given to so-called out-of-pocket costs or informal care costs. Furthermore, no consideration was given to reduced productivity due to employees with BPD who were not sick-listed (so-called “presenteeism;” e.g., Henderson, Harvey, Overland,
Mykletun & Hotopf, 2011), which on the other hand makes the estimation conservative. Fifth, although the diagnosis of BPD is associated with a higher number of co-occurring diseases (e.g., cardiovascular or gastrointestinal diseases; El-Gabalawy, Katz & Sareen, 2010) and other mental disorders (e.g., mood, anxiety, and substance use disorders; Zanarini et al., 1998), we could not take the costs and benefits of their treatment into account. Sixth, visits to medical professionals and prescription of drugs were not taken into account in the current estimations. In order to include utilization of medical professionals and misallocations, patient-related data that cannot be generated by the current German accounting system would have to be analyzed. However, it may be expected that both the costs and the benefits of pharmacological treatment would turn out to be comparably low, since mainly antidepressants are prescribed for the treatment of BPD, and their effects on mood and BPD symptoms are assumed to be low (e.g., Simpson et al., 2004). Finally, we assumed the WTP for a QALY to be 8,000 EUR. This value is based on the findings of a German adaptation of the EuroVaQ evaluation (et al., 2013) and the scenario described is in line with our assumptions. However, the WTP of 8,000 EUR seems to be low compared to other psychotherapy-related cost–offset analyses (e.g., £30,000 per QALY, about 35,355 EUR; Layard et al., 2007) and might lead to underestimating the intangible benefits.

One strength of the present study is that different stages of willingness for therapy were taken into account. This allows the reader to estimate specific possible costs and benefits for different conservative or progressive scenarios. In addition, a formula was provided that allows the reader to calculate cost–benefit relationships under other assumptions. We included data from DBT studies in our calculations; however, if the relevant reduction rates can be calculated for other forms of psychotherapy, the estimations can be carried out for any form of therapy. Furthermore, our estimations were conducted with the aid of population-based data provided by health insurance providers and the German pension fund. The risk of bias due to retrospective self-reports or interviews has therefore been substantially reduced.
In negotiating with policy makers about funding the dissemination of any empirically supported treatment, it might be useful to report on not only the effectiveness of interventions, but also on their efficiency. In order to illustrate the effect of a disorder-related treatment, you might choose, for example, BPD-associated self-injurious behavior. If the annual emergency room visits can be reduced to the half, an estimated average amount of 2,721.89 EUR could be saved per year and per BPD patient who was treated. The “per-patient-rates” presented in the current study (e.g., days absent per BPD patient) make the impact of BPD on the economy more tangible.

Our estimation showed that the calculation of costs and benefits for a particular form of treatment at the population level is generally possible. The aim of the present study was not to justify just one single possible treatment approach (DBT, in this case) but to show that it is possible to conduct disorder- and treatment-specific estimations of costs and benefits on the population level with the aid of health insurance providers’ and pension fund data. Consequently, the calculations should be seen as a motivation to perform comparable estimations for other evidence-based treatment approaches, e.g., SFT or TFP. Future research should focus on longitudinal naturalistic studies combined with comprehensive cost–benefit analyses, in order to reach a reliable judgment as to whether the estimated cost–benefit relationships in the present estimation are realistic. When psychotherapy studies are carried out using different data sources (e.g., data from the health insurance provider and interviews with the patient’s significant other), factors including healthcare utilization, the ability to work, and quality of life should be taken into account.

The costs and benefits of a specific form of therapy additionally depend on the healthcare system, the current state of coverage, and the costs for dissemination, e.g., training and supervision of therapists, which was not taken into account in the present estimation. If initial costs had been included, the cost–benefit relation would most likely grow with the number of individuals treated and with growing coverage, respectively. It would then be necessary to consider time-trade-off effects (i.e., over which period of time will the benefits outweigh the initial costs plus the running
costs?). In countries where the number of inhabitants per therapist is greater, the costs for the dissemination are likely to be higher and the cost-offset might occur later than in a country where coverage is already more comprehensive.

For example, there are 30.32 mental health outpatient treatment facilities per 100,000 inhabitants in Germany, while there are only 1.95 in the USA (World Health Organization, 2011). However, even in Germany, BPD patients have only little access to disorder-specific, evidence-based therapies. In a survey in the area of Munich, Germany, 22% of the psychotherapists reported that they would not treat BPD patients on principle (Jobst, Hörz, Birkhofer, Martius & Rentrop, 2010). Although 51% of the therapists recommended disorder-specific treatment for BPD, only 3% of the therapists in this sample were trained in either DBT or TFP. Thus, although evidence-based therapies are known and recommended by therapists, only a minority in fact offer them. Consequently, stereotypes and prejudices towards BPD patients should be reduced and the training should be promoted more strongly for future dissemination of disorder-specific treatment forms for BPD.
Acknowledgements

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References


borderline personality disorder: cost-effectiveness of schema-focused therapy v. transference-


Zanarini, M.C., Frankenburg, F.R., Dubo, E.D., Sickel, A.E., Trikha, A., Levin, A. et al., Reynolds 
Psychology, 155*, 1733-1739.

Zanarini, M.C., Frankenburg, F.R., Khera, G.S. & Bleichmar, J. (2001) Treatment histories of 
borderline inpatients. *Comprehensive Psychiatry, 42*, 144-150.


Zimmerman, M. & Mattia, J.I. (1999). Differences between clinical and research practices in 
Table 1.
Calculation of the reduction rates for relevant symptoms

<table>
<thead>
<tr>
<th>Variable</th>
<th>Operationalization</th>
<th>at pre-treatment</th>
<th>at post-treatment</th>
<th>Reduction rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital days</td>
<td>Average annual hospital days</td>
<td>10.52</td>
<td>3.73</td>
<td>-0.645</td>
</tr>
<tr>
<td>Emergency room visits</td>
<td>Average annual emergency room visits</td>
<td>1.99</td>
<td>0.93</td>
<td>-0.533</td>
</tr>
<tr>
<td>Suicidal behaviour</td>
<td>Average annual emergency room visits for suicidal behaviour</td>
<td>1.01</td>
<td>0.93</td>
<td>-0.594</td>
</tr>
<tr>
<td>Reduced quality of life</td>
<td>EQ-5D</td>
<td></td>
<td>57.69</td>
<td>-0.107</td>
</tr>
<tr>
<td>Symptom severity / sickness benefit</td>
<td>ZAN-Scale</td>
<td>15.49</td>
<td>7.03</td>
<td>-0.512</td>
</tr>
</tbody>
</table>

Note. EQ-5D = EuroQol five dimensions questionnaire (EuroQolGroup, 1990); ZAN-Scale = Zanarini Rating Scale for Borderline Personality Disorder (Zanarini et al., 2003).
Table 2.

Reduction of direct, indirect and overall costs and additional intangible benefits for rates of willingness to be treated of 33% and 50% in 1,000,000 EUR

<table>
<thead>
<tr>
<th>willingness to be treated</th>
<th>Benefits in 1,000,000 EUR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>direct</td>
</tr>
<tr>
<td>33%</td>
<td>552.42</td>
</tr>
<tr>
<td>50%</td>
<td>837.01</td>
</tr>
</tbody>
</table>
Figure 1: increase of benefits, costs and net profit for different stages of willingness to be treated (10% to 100%)
Highlights

- A cost–offset estimation of psychotherapy for BPD was done at the population level.
- We estimated cost–benefit relationships at stages of willingness to be treated.
- The cost–benefit relationship remained constant at 1.52 for all scenarios.
- Other intangible benefits were calculated based on Quality-Adjusted Life Years.
- Findings indicate BPD-related treatment might be efficient at the population level.
Supplementary material

Appendix 1: Formula

\[
\text{cost—benefit relationship} = \frac{w \cdot c \left[ p \cdot N_{\text{wor}} (\text{GRW} + \text{PRL} + \text{SIB}) + p \cdot N_{\text{gen}} (\text{HOS} + \text{EME}) + \text{UNE} + \text{ERE} \right]}{w \cdot c \cdot p \cdot N_{\text{gen}} (K_{\text{ind}} \times 88.87 + K_{\text{gro}} \times 40.67 + K_{\text{c}} \times 31.30)}
\]

additional intangible benefits = QAL + MOR

GRW = red_{abs} \cdot abs_{bor} \cdot grw_{bor}; \ red_{abs} = 0.512, abs_{bor} = 13.43, grw_{bor} = 173€

PRL = red_{abs} \cdot abs_{bor} \cdot prl_{bor}; \ red_{abs} = 0.512, abs_{bor} = 13.43, prl_{bor} = 99€

SIB = red_{abs} \cdot sib_{bor} \cdot 45.48€; \ red_{abs} = 0.512, sib_{bor} = 8.9

HOS = red_{hos} \cdot hos_{bor} \cdot 381€; \ red_{hos} = 0.643, hos_{bor} = 8.7

EME = red_{eme} \cdot eme_{bor} \cdot (550€ + 2016.2€); \ red_{eme} = 0.533, eme_{bor} = 1.99

UNE = red_{une} \cdot N_{une} \cdot 9863.93€; \ red_{une} = 0.512, N_{une} = N_{gen} \cdot 0.65

ERE = red_{ere} \cdot N_{ere} \cdot 23260.08€; \ red_{ere} = 0.1, N_{ere} = 1197

QAL = red_{qal} \cdot 0.2 \cdot 8000€; \ red_{qal} = 0.107

MOR = red_{mor} \cdot risk_{mor} \cdot 8000€; \ red_{mor} = 0.594, risk_{mor} = 0.0049
**Comments.**

- **w** willingness for therapy
- **c** compliance
- **p** 12-month prevalence of BPD
- **N_{wor}** Number of individuals in the working population
- **N_{gen}** Number of individuals in the general population
- **N_{une}** Number of individuals who are unemployed due to BPD
- **N_{ere}** Number of annual early retirements due to BPD
- **N_{abs}** Number of annual absent days per individual affected by BPD
- **N_{sib}** Number of annual sicknes benefit days per individual affected by BPD
- **N_{hos}** Number of annual hospital days per individual affected by BPD
- **N_{eme}** Number of annual emergency department visits per individual affected by BPD
- **red_{abs}** Reduction rate for absent days
- **red_{une}** Reduction rate for unemployment
- **red_{hos}** Reduction rate for hospital days
- **red_{eme}** Reduction rate for emergency department visits
- **red_{ere}** Reduction rate for early retirement
- **red_{qal}** Reduction rate for loss of quality of life
- **red_{mor}** Reduction rate for mortality
- **risk_{mor}** Risk of suicide within one year
- **K_{ind}** Number of annual individual therapy sessions
- **K_{gro}** Number of annual group therapy sessions
- **K_{cri}** Number of annual crisis interventions
Appendix 2: Further calculations

(a) Unemployment benefits

In 2012, the monthly payment of unemployment benefits covering “HARTZ IV” and housing, including additional expenses, ranged between 819.73 EUR and 825.68 EUR. We based our estimations on an annual amount of 9,863.93 EUR, which corresponds to the total annual expenses per person.

(b) Sickness benefits

The sickness benefit in Germany which a health insurance company pays to a sick-listed worker is usually equivalent to 70% of the gross wage liable to contribution, but not greater than 90% of the net wage. The contribution ceiling is currently (2011) at a gross wage of 3,712.50 EUR, i.e., the sickness benefit payment cannot exceed 70% of this amount of money. The smallest of the three amounts is the amount of money that the sick-listed worker receives (see § 47 SGB V). In the present estimation, the smallest amount is “90% of the net wage” (1,364.40 EUR per month), yielding a sickness benefit payment of 45.48 EUR per day. This estimation was based on a gross wage of 2,359 EUR and a net wage of 1,516 EUR per month.

(c) Emergency department visits

According to Germany’s Federal Health Monitoring, the average costs for an ambulance transport and an emergency doctor’s deployment lay at around 550 EUR. We calculated the emergency department visits using the software “3M KODIP DRG scout”, provided by the company “3M Health Information Systems” (see http://solutions.3mdeutschland.de/wps/portal/3M/de_DE/3m-his/kh/loesungen-fuer-akut-kliniken/kodieren-und-gruppieren/3m-kodip-suite/). This is an economic–medical computer program for the calculation of flat rates per case based on the Diagnosis Related Groups (DRGs), certified by the Institute for Hospital Reimbursement System (Institut für das Entgeltsystem im Krankenhaus, InEK). The flat rates per case are specific for the current year and for the federal state. Our cost calculation took place in Lower Saxony in 2013: the
medical care for a minor cut injury of the arm costs 1,239.58 EUR, the costs for a serious cut
injury amount to 2,792.82 EUR. The annual costs caused by 1.99 emergency department
visits due to one minor and one serious self injury thus lead to an amount of 4,012.24 EUR
(4,032.4 EUR / 2 * 1.99) plus the costs of the ambulance transport and emergency doctor’s
deployment of 1,094.50 EUR (550 EUR * 1.99). Therefore, for each emergency department
visit, we assume a cost of 2,016.20 EUR.