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Running head: Costs in BPD patients before, during and after DBT

Societal cost-of-illness in patients with borderline personality disorder one year before, during and after dialectical behavior therapy in routine outpatient care

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Abstract

Societal cost-of-illness in a German sample of patients with borderline personality disorder (BPD) was calculated for 12 months prior to an outpatient Dialectical Behavior Therapy (DBT) program, during a year of DBT in routine outpatient care and during a follow-up year. We retrospectively assessed resource consumption and productivity loss by means of a structured interview. Direct costs were calculated as opportunity costs and indirect costs were calculated according to the Human Capital Approach. All costs were expressed in Euros for the year 2010. Total mean annual BPD-related societal cost-of-illness was €28,026 (SD = €33,081) during pre-treatment, €18,758 (SD = €19,450) during the DBT treatment year for the 47 DBT treatment completers, and €14,750 (SD = €18,592) during the follow-up year for the 33 patients who participated in the final assessment. Cost savings were mainly due to marked reductions in inpatient treatment costs, while indirect costs barely decreased. In conclusion, our findings provide evidence that the treatment of BPD patients with an outpatient DBT program is associated with substantial overall cost savings. Already during the DBT treatment year, these savings clearly exceed the additional treatment costs of DBT and are further extended during the follow-up year. Correspondingly, outpatient DBT has the potential to be a cost-effective treatment for BPD patients. Efforts promoting its implementation in routine care should be undertaken.

Keywords: Borderline personality disorder; Dialectical behavior therapy; Cost-of-illness; Cost-offset; Cost-effectiveness; Efficiency.
Introduction

Borderline personality disorder (BPD) is a severe mental disorder that is characterized by high instability in affect regulation, impulse control, interpersonal relationships and self-image (Lieb, Zanarini, Schmahl, Linehan & Bohus, 2004) and occurs in up to 2.7% of the general adult population (Trull, Jahng, Tomko, Wood & Sher, 2010). There are many indications that BPD is associated with high cost-of-illness. From a societal perspective, cost-of-illness include all costs regardless of the payer and consist of direct costs related to medical and non-medical resource consumption and indirect costs due to loss of productivity. BPD patients use mental health services to a greater extent than patients with major depression (Bender et al., 2001, 2006) and patients with other personality disorders (Bender et al., 2001; Hörz, Zanarini, Frankenburg, Reich & Fitzmaurice, 2010). Thereby, on average, BPD patients are first hospitalized for psychiatric reasons at the age of 21 and first seek many other psychiatric and psychotherapeutic treatments between the age of 18 and 25 (Zanarini, Frankenburg, Khera & Bleichmar, 2001), a critical period for professional development. Accordingly, there seems to be a strong relationship between BPD and poor occupational functioning. Skodol et al. (2002) found that in comparison to patients with major depression, a significantly higher proportion of BPD patients were disabled and significantly fewer were employed. Jackson and Burgess (2004) showed that among all personality disorders, BPD had the strongest association with lost days of role functioning. Furthermore, compared to remitted BPD patients, non-remitted BPD patients were more likely to have quitted or lost their jobs due to their impaired state of health (Frankenburg & Zanarini, 2004).

Despite these indications, BPD-related costs have rarely been investigated comprehensively. According to the only state-of-the-art cost-of-illness study assessing direct and indirect costs including 88 BPD patients seeking an outpatient psychotherapeutic treatment, BPD-related societal cost-of-illness in the Netherlands were substantial, amounting
to €21,120 (€16,852) per BPD patient per year (Van Asselt, Dirksen, Arntz & Severens, 2007). It is important to note that slightly more than 50% of total costs were indirect costs, mostly due to work disability, underlining the importance of completing comprehensive cost investigations. Additionally, several studies investigated BPD-related direct costs during the year preceding inpatient or outpatient psychotherapy. On average, these were €15,088 in Germany (24,000 DM; Jerschke, Meixner, Richter & Bohus, 1998), €38,771 (treatment group: US $44,487, treatment-as-usual (TAU) group: US $52,562; Bateman & Fonagy, 2003) and €16,779 in Great Britain (treatment group: £7,860, TAU condition: £5,240, each reported for a six-month period; Palmer et al., 2006) and €19,978 in Australia (AUS $25,526; Hall, Caleo, Stevenson & Meares, 2001). A direct comparison between these results is impeded by a wide range of cost components included in the cost calculations in these investigations.

At the same time that BPD is associated with high costs and BPD patients are heavy users of mental health treatments that are seldom specifically designed for their disorder (Jobst, Hörz, Birkhofer, Martius & Rentrop, 2010), there are several disorder-specific and clinically effective psychological treatments for BPD patients. Of these, Dialectical Behavior Therapy (DBT; Linehan, 1993) has been studied most intensely in numerous randomized controlled trials (RCTs) and has the greatest empirical evidence concerning clinical efficacy (Stoffers et al., 2012). In particular, DBT was observed to be effective in reducing self-injurious and suicidal behavior, as well as in reducing psychiatric hospital days and emergency room visits (e.g. Koons et al., 2001; Linehan, Armstrong, Suarez, Allmon & Heard, 1991; McMain et al., 2009). Moreover, evidence indicates that these improvements can be maintained over a two-year follow-up period (McMain, Guimond, Streiner, Cardish & Links, 2012).

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1 In the following sections, to improve comparability among studies, all presented costs are adjusted for the 2010 price level using country-specific inflation rates (Eurostat, 2013; The Federal Statistical Office, 2011b, RateInflation, 2013), converted into Euros (on January 4th, 2010 one Euro was worth 0.89 British Pounds, 1.44 US-Dollar and 1.59 Australian Dollar; on January 1st, 1999 one Euro was worth 1.96 Deutsche Mark) and annualized. Where costs were calculated for a treatment and control condition separately, we calculated average costs for the whole sample. In addition, original cost data are reported in parentheses or named after the adjusted costs.
Based on these results related to the clinical efficacy of DBT, one can reasonably assume that DBT also has great economic potential. Accordingly, Heard (2000) found that the total mean annual direct costs of BPD patients were €9,210 (US $9,889) lower when patients participated in outpatient DBT (€9,178 respectively US $9,856) compared to TAU (€18,388 respectively US $19,745) in the US. While treatment costs for outpatient psychotherapy were higher in the DBT group, these were offset by lower psychiatric inpatient and emergency room costs. Similarly, in an Australian trial by Pasieczny and Connor (2011), total direct costs per patient during a six month time interval were €8,301 (AUS $12,196) in the DBT group and €12,335 (AUS $18,123) in the TAU condition, resulting in cost savings of €4,034 (AU$5,927) that again were primarily due to significantly lower inpatient costs. In contrast to these findings, in a sample of self-harming patients with any personality disorder diagnosis, total mean annual direct costs in the DBT group (€6,310 respectively £5,685) exceeded those in the TAU group (€4,167 respectively £3,754) by €2,143 (£1,931; Priebe, Bhatti & Barn, 2012).

Further, Brazier et al. (2006) undertook economic evaluations of four RCTs that had investigated the efficacy of DBT. Total direct costs from the governmental perspective were estimated on the basis of data from the RCTs and a cost regression model. Whereas the estimated total mean annual direct costs of patients treated with DBT and TAU were on a comparable scale in two studies (DBT: €19,941 respectively £15,691, TAU: €21,475 respectively £16,898, Linehan et al., 1991; DBT: €22,151 respectively £17,430, TAU: €21,231 respectively £16,706, Van den Bosch, Verheul, Schippers & Van den Brink, 2002), the direct costs in the DBT group were considerably higher than in the TAU group in one study (DBT: €29,787 respectively £23,439, TAU: €18,828 respectively £14,815, Koons et al., 2001) and lower in another study (DBT: €20,007 respectively £15,743, TAU: €24,026 respectively £20,985, Turner, 2000).
In the present study, we assessed from the societal perspective the BPD-related cost-of-illness in a German sample of BPD patients in the 12 months prior to inclusion in a one-year outpatient DBT program. We further investigated BPD-related societal cost-of-illness during that specific year of outpatient DBT administered in the regular health-care system in the city of Berlin and during the following up year. Following the results of Heard (2000) and Pasieczny and Connor (2011), we hypothesized that mostly due to the reduction of BPD-related inpatient treatment, the overall societal cost-of-illness during the DBT treatment year are lower than those in the year preceding DBT treatment. Also, in accordance with the findings of McMain et al. (2012), we expected that the presumed cost reduction is maintained during the follow-up year.

**Materials and methods**

The present investigation was conducted as part of a Berlin-wide treatment study (“Berliner Borderline Versorgungsstudie”; abbr.: BBV) evaluating the effectiveness of DBT in a naturalistic setting on the basis of a pre-post design with follow-up assessments. BBV was conducted at Charité-Universitätsmedizin Berlin and approved by the Charité’s ethics committee. The methodology of this trial has been described in detail elsewhere (Stiglmayr et al., submitted for publication).

**Participants**

Patients were referred by hospital services, outpatient psychotherapists and psychiatrists, as well as by social services collaborating in a local professional BPD treatment network (“Borderline Netzwerk Berlin”). In addition, participants were informed about the study through the network’s homepage² and contacted BBV directly. After an initial telephone screening, all patients were assessed using the Structured Clinical Interview for DSM-IV

² www.borderline-netzwerk-berlin.de
(SCID-I/P; First, Spitzer, Gibbon & Williams, 2002 and SCID-II; First, Gibbon, Spitzer, Williams & Benjamin, 1997). All interviews were conducted by board certified psychotherapists or clinical psychologists who were currently in psychotherapy training and participated in a 22-hour SCID-I and II training with co-author T.F. and ongoing supervision from co-author B.R. Patients were included in the trial if they met at least five BPD criteria according to DSM-IV-TR (American Psychological Association, 2000) and provided written informed consent after obtaining written information and a full oral description of the study. Exclusion criteria were current or lifetime psychotic or bipolar disorder, dependence on alcohol, drugs or medicines during the last six months, body-mass-index below 18, IQ below 80, antisocial personality disorder, current outpatient psychotherapeutic treatment and acute suicidality. Initially, 78 patients were included to receive DBT. Of these, six patients never showed up at therapy, six patients later refused to participate in the assessments but remained in treatment, 19 patients dropped-out of DBT treatment within 12 months, and finally, 47 patients completed the DBT treatment year. Of the 47 DBT completers, 33 patients participated in the one-year follow-up assessment. Data were collected for the present study from July 2007 to November 2012. A part of these data (societal costs for the pre-treatment year) have already been published in a German-language journal (Wagner et al., 2013).

Dialectical Behavior Therapy

DBT is a manualized cognitive-behavioral treatment (Linehan, 1993a; Linehan, 1993b) that in its first treatment stage (stage 1) focusses on reducing life-threatening behavior, behaviors that interfere with therapy and behaviors that impair quality of live. Later on, in stage 2, further treatment targets are focused, e.g. symptoms of a comorbid posttraumatic stress disorder. Fundamentally, DBT combines validation techniques (e.g. empathy, mindfulness and acceptance) and change orientated interventions (e.g. contingency
management, cognitive modification, exposure). Furthermore, DBT is a multimodal treatment and according to Linehan consists of individual therapy, skills training group, telephone coaching and a consultation team for therapists. In the context of our study, the standard stage 1 DBT was delivered over one year. While all patients received weekly individual therapy (50 Min), 89.4% of patients participated in a weekly skills training group (120 Min), telephone coaching was offered as needed and about 80.8% of the therapists participated in a weekly or bi-weekly consultation team (50 min). After the DBT treatment year, there was an option to continue individual therapy if indicated. Individual DBT was delivered by 26 therapists who were all part of the “Borderline Netzwerk Berlin”. Of those, 24 were board certified psychotherapists (psychologists or psychiatrists, mostly cognitive behavioral therapists) and two were clinical psychologists in psychotherapy training. As a pre-condition for participation, therapists had to have attended at least four training workshops in DBT (64h). Skills training groups each were conducted by one board certified psychotherapist or two clinical psychologists in psychotherapy training. Thereby, it was required that one therapist in each skills group had conducted all four skills training group modules before.

*Data collection: Assessment of resource consumption and productivity loss*

From a societal perspective, resource consumption and productivity loss was assessed retrospectively by means of a structured face-to-face interview. The cost-interview was pilot-tested and improvements concerning face-validity, intelligibility and clarity were made before the assessments with study patients started. Items related to medical and non-medical resource consumption included psychiatric and general hospital days, days in psychiatric day programs and in assisted living, psychotropic drug intake, visits to emergency rooms, outpatient psychotherapists, psychiatrists, general practitioners, medical specialists, occupational therapists, physical therapists, community based counselors and crisis centers. Furthermore,
we assessed informal care, including significant others volunteering to take over domestic
tasks without payment, as well as incidents of deviant behavior (e.g. damage to property,
bodily harm) and its associated consequences such as a police operation or medical treatment
- the latter being used for monetary valuation of the incidents. BPD-related productivity loss
was captured through questions regarding employment status, source of income, gross
income, number of weeks of employment, unemployment and work disability since the last
assessment. In addition, employed patients were asked about their average work hours per
week and number of days they were absent from work.

Assessments were made for three periods: the year preceding DBT treatment, the DBT
treatment year and the follow-up year. These intervals are referred to as “pre-treatment”,
“DBT treatment” and “follow-up” throughout the remainder of this paper. The pre-treatment
assessment took place at the time of inclusion in the study and covered the previous 12
months. DBT treatment assessment was performed approximately 12 months after the health
insurance company had granted permission to attend outpatient psychotherapy and follow-up
assessment occurred about two years after the first granted psychotherapy session had been
attended. As a first step, the cost-interview questionnaire was sent to the participants for self-
evaluation. Subsequently, missing information was assessed during an interview appointment.
Here, we further evaluated if resource consumption and productivity loss was due to problems
that were BPD-related (such as non-suicidal self-injury, alcohol or drug abuse, mood
instability).

Regarding DBT-associated resource consumption, the number of individual DBT sessions
was derived from therapists’ personal records. The number of skills group sessions attended
and the total number of weeks each patient participated in a skills group were determined
based upon existing questionnaires that the patients were required to complete after each
skills group session. Consultation team participation was assessed by asking therapists about
the time interval of consultation meetings, the length of each session, and the number of patients they recruited. In order to estimate the average amount of telephone coaching usage, we interviewed a recognized expert in the field with longtime experience in treating BPD patients and in DBT supervision (co-author C.S.).

In addition, we used the Treatment History Interview (THI, Linehan, 1987) to determine the number of BPD-related psychiatric and general hospital admissions and the corresponding number of hospital days and days in psychiatric day programs, as well as the number of outpatient psychotherapies and outpatient psychotherapy sessions for the ten-year period preceding DBT treatment. As a reference, these data can be compared to the amount of inpatient treatment and outpatient psychotherapy used during pre-treatment, DBT treatment and follow-up.

Cost calculations

As assessment periods did not always cover 365 days, costs for pre-treatment, DBT treatment and follow-up were each calculated as annual costs. Further, only BPD-related costs were included in the analysis and all costs are expressed in Euros using the 2010 price level.

In order to calculate direct costs, resources used were multiplied by their corresponding unit cost (i.e., the cost of a certain medical or non-medical treatment). Currently, in Germany, there is no obligatory unit cost list, but the German “Working Group Methods in Health Economic Evaluations” (AG MEG; Krauth et al., 2005) has published proposals for the standardized monetary valuation of resource consumption that are made from a societal perspective and are based on the opportunity cost approach. Opportunity cost represents the value that could have been gained if a resource, e.g. spending for medical treatment, was invested in the best economic alternative available. In general, unit cost calculations were based on the suggestions of the AG MEG. Where available, unit costs were adapted to reflect the most recent statistics. Furthermore, costs were adjusted to 2010 price levels. For a detailed
description of the calculation of all unit costs, see Wagner et al. (in press). In Table 1, for
medical and non-medical services, the value of the corresponding unit cost is presented.

Insert Table 1

Likewise, DBT treatment costs were calculated as opportunity costs. Consequently, cost
estimations were based on the assumption that if therapists did not treat BPD patients or did
not participate in a consultation team within our trial, they could otherwise use that time to
treat patients in their outpatient practice. Accordingly, opportunity cost of a DBT therapist`s
work hour within our trial is equivalent to the cost of an outpatient individual psychotherapy
session in the German healthcare system. These were determined on the basis of the
compensations paid by The National Association of Statutory Health Insurances Physicians
(2010) and included all billable services.

Specifically, in order to calculate opportunity cost of individual DBT, the total number of
DBT-sessions used was multiplied by the cost of an outpatient individual psychotherapy
session. Further, to calculate the cost of skills training group attendance, we considered that
opportunity cost of a skills training group session arise independent of a patient`s presence.
Therefore, the number of weeks that a patient was member of a skills group (minus vacation-
time) was multiplied by the opportunity cost of a skills group session. In order to calculate the
opportunity cost of a skills group session per patient, we assumed that in addition to the two-
hour skills group, therapists weekly spent an extra half hour to prepare for the skills group
session and to communicate with individual therapists. Also, we considered whether a group
was conducted by a board certified psychotherapist or two psychologists in psychotherapy
training. Based on interviews with the participating trainees, we determined that the trainees
on average earned €40 for an individual psychotherapy session held as part of their psychotherapy training. For psychotherapists, we used the cost of an individual psychotherapy session within the German health care system which was determined on the basis of an outpatient psychotherapy course of 40 sessions. Finally, we considered how many patients participated in each of the skills groups. The opportunity cost of consultation team attendance for each patient was calculated by dividing the total annual hours the therapist spent in a consultation team by the number of patients the therapist recruited and multiplying that figure by the cost of an individual psychotherapy session. In the same way, hours of telephone coaching used were multiplied by the cost of an individual psychotherapy session.

In calculating indirect costs there are two main approaches: the Human Capital Approach and the Friction Cost Method. Whereas the Human Capital Method assesses the potential productivity loss regardless of the level of employment, the Friction Cost Method determines real productivity loss and is based on the assumption that in economies without full employment costs only accrue up until an employee is replaced by another. The friction period is defined as the time it takes to hire and instruct a new employee and to restore the initial production level. As a consequence, one major difference between these two approaches is that the Friction Cost Method does not take into account productivity loss associated with persons that are work disabled at the time of inclusion in a study. That is because work disability is usually preceded by a longer period of absence from work and the friction period usually has already passed when a person becomes work disabled (Van Asselt, Dirksen, Arntz & Severens, 2008b). Given the fact that a substantial portion of BPD patients are work disabled due to their disorder (Van Asselt et al., 2007) and work disability represents an important cost for society, we calculated indirect costs according to the Human Capital approach.
Here, we counted productivity loss due to BPD-related absence from paid work and productivity loss due to work disability that was at least partly BPD-related. In order to calculate costs related to absence from work, for each patient with a paid job, we multiplied the days absent from work by the individual labor costs, that is the gross wage plus non-wage labor costs. Work disability related costs were calculated based on the assumption that work disabled patients without their disorder would pursue a paid job. Therefore, we multiplied average monthly labor costs, based on average gender-adjusted gross wages weighted for full-time and part-time employment (Statistical Office for Berlin-Brandenburg, 2010) plus average non-wage labor costs (The Federal Statistical Office Germany, 2011a), by the number of months the patients were work disabled.

**Statistical analysis**

We conducted an analysis using data from completers. That is, mean amount of resource consumption, productivity loss and the corresponding costs for pre-treatment and DBT treatment were calculated based on data from the 47 patients who completed the 12-month DBT treatment period. Follow-up analyses were based on the 33 patients who participated in the follow-up interview. In order to determine whether changes in cost-of-illness between pre-treatment, DBT treatment and follow-up were statistically significant, we utilized non-parametric statistical tests, as cost data were not normally distributed. The main analysis was conducted with Friedman’s ANOVA and only included the 33 patients who participated in the follow-up interview. Therefore, we used $p = .05$ as our level of significance. Further, where the result of the ANOVA was significant, we calculated post-hoc Wilcoxon signed-rank tests to determine statistical significance of the changes between pre-treatment and DBT treatment and between DBT treatment and follow-up. The latter comparison again was based on the 33 patients who attended the follow-up assessment. Bonferroni correction was used to correct for
the number of tests. Correspondingly, we used $p = .025$ as our level of significance for pairwise comparisons.

Results

Study Participants

Socio-demographic and clinical characteristics at the time of study inclusion for the 47 patients who completed DBT treatment are shown in Table 2. Additionally, THI-data (average amount of BPD-related hospital and outpatient psychotherapeutic treatment utilization in the ten years prior to study inclusion) are presented (in Table 2).

Insert Table 2

Resource consumption and productivity loss

In Table 3, the mean annual amount of BPD-related resource consumption and mean annual amount of productivity loss during the three assessment periods is reported. In addition, the percentage of patients who used each service and the percentage of patients who had paid employment or were on work disability are presented for each time interval.

Insert Table 3

Treatment utilization of most services declined over time (Table 3). The overall reduction in BPD-related hospital days is most visible. In comparison to pre-treatment, hospital days
were markedly reduced during DBT treatment. Further, these improvements were maintained
during follow-up. Additionally, mean annual number of BPD-related hospital admissions
declined from 1.1 \((SD = 1.4)\) during pre-treatment to 0.3 \((SD = 0.9)\) during DBT treatment
and remained at similar levels \((M = 0.4; SD = 1.3)\) during follow-up. Of the 28 patients who
were treated in a hospital during pre-treatment, 10 patients participated in an inpatient DBT
treatment that primarily focused on reducing dysfunctional behavior (Bohus et al., 2004) and
38.2\% of all inpatient days during that year involved treatment within such an inpatient DBT
program. During follow-up, only one patient took part in an inpatient DBT-program to treat
comorbid posttraumatic stress disorder (DBT-PTSD; Bohus et al., 2013).

Conversely, mean annual number of individual psychotherapy sessions was considerably
higher during DBT treatment compared to pre-treatment. After the end of the DBT treatment
year, 32 of 33 patients who later showed up for the follow-up assessment continued individual
DBT treatment, but at a lower average frequency. During follow-up, two patients terminated
individual DBT and started an outpatient psychodynamic treatment. At the time of the follow-
up assessment, 45.5\% of the patients were still in individual DBT treatment, whereas 54.5\% had terminated DBT.

With respect to productivity loss, Table 3 shows that the mean annual number of BPD-
related days absent from work constantly decreased from pre-treatment to DBT treatment, and
from DBT treatment to follow-up for the entire sample. When calculated using only the
subgroup of the eleven patients who had been employed at any time during pre-treatment,
DBT treatment or follow-up, the mean annual number of days absent from work declined
from 55.5 days \((SD = 74.8)\) during pre-treatment to 31.8 days \((SD = 38.8)\) during DBT
treatment and declined again to 11.9 days \((SD = 13.3)\) during follow-up. In contrast, all
patients who were work disabled during pre-treatment remained work disabled during DBT
treatment and follow-up. Here, the slight mean annual increase in disability days during
follow-up was not due to more participants shifting to work disability, but to a different composition of the follow-up sample compared to the pre-treatment and DBT treatment sample. In Table 4, the number and percentage of patients on disability, unemployed, employed, student, trainee, and on parental leave at the time of inclusion in the study, at the end of DBT treatment and at the end of follow-up are presented.

**Insert Table 4**

**Direct and indirect costs**

Table 5 presents the total mean annual BPD-related societal cost-of-illness, total mean annual BPD-related direct and indirect costs during pre-treatment, DBT treatment and follow-up. Additionally, mean annual costs for medical and non-medical services, as well as mean annual costs associated with absence from paid work and work disability are detailed.

**Insert Table 5**

Apparently, total mean annual societal cost-of-illness for the DBT treatment year was considerably less than that for the pre-treatment year, and further declined during follow-up. Overall, compared to pre-treatment, costs were reduced by €9,268 during DBT treatment and by €13,276 during follow-up. Cost savings were especially due to marked reduction in the costs of BPD-related hospital days. Already during DBT treatment, those savings exceeded the costs of the total DBT program. Of the total mean annual DBT treatment costs during
DBT treatment shown in Table 5, €3,376 ($D = €873) were due to individual therapy, including transport costs, €1,016 ($D = €612) were due to skills training group, €1,074 ($D = €365) were due to therapists’ consultation team and €75 ($D = €0) were due to telephone coaching. During follow-up, the mean annual cost for individual DBT was €1,807 ($D = €1,242), €70 ($D = €126) for skills training group, €702 ($D = €370) for consultation team and €52 ($D = €31) for telephone coaching.

In contrast, overall indirect costs hardly decreased over time. Costs due to absence from work declined from pre-treatment to DBT treatment and again from DBT treatment to follow-up. It is important to note, however, that less than one fifth of the sample was employed. When calculated within the subgroup of employed patients, mean annual cost due to work absenteeism was €6,707 ($D = €9,766) during pre-treatment, declined to €3,488 ($D = €4,096) during DBT treatment, and fell further to €1,393 ($D = €1,422) during follow-up. At the same time, costs due to work disability slightly increased during follow-up compared to DBT treatment and pre-treatment in the entire sample, but remained unchanged within the sample of work disabled patients.

Finally, when changes in costs were tested for statistical significance, the decrease in total mean annual societal cost-of-illness reached statistical significance over the three years of our study ($\chi^2(2) = 13.15, p = .001$). Whereas total societal cost-of-illness did not significantly change from DBT treatment to pre-treatment ($z = -1.41, p = .159$), societal cost-of-illness was significantly reduced during follow-up relative to pre-treatment ($z = -2.53, p = .011$).

Regarding the single cost components included in our analysis, costs of BPD-related hospital days decreased significantly over the three years of our study ($\chi^2(2) = 25.52, p = .000$), as well as between pre-treatment and DBT treatment ($z = -4.32, p = .000$) and between DBT treatment and follow-up ($z = -3.77, p = .000$). Additionally, cost reductions related to visits to psychiatrists were statistically significant over the study period ($\chi^2(2) = 7.76, p = .021$), but
when pairwise comparisons were examined, only the reduction from pre-treatment to DBT treatment was significant ($z = -3.13, p = .002$). Further, significant overall reductions were observed for costs associated with visits to general practitioners ($\chi^2(2) = 17.75, p = .000$). Here, there was a significant reduction from DBT treatment to pre-treatment ($z = -3.13, p = .002$) and follow-up was significantly lower than pre-treatment ($z = -2.53, p = .011$). Ultimately, costs related to informal care were significantly reduced over the three years of the study ($\chi^2(2) = 7.05, p = .029$), but none of the pairwise comparisons reached statistical significance.

**Discussion**

**Main Findings**

In the present study, we assessed societal cost-of-illness in a German sample of BPD patients during three one-year periods: the year preceding outpatient DBT, the year of outpatient DBT in routine care and the follow-up year. Four major findings emerge from our study.

First, BPD poses a high economic burden that exceeds that of many other mental disorders. In the present study, BPD-related total societal cost-of-illness amounted to €28,026 per patient during the year preceding DBT treatment, whereas, the mean annual direct and indirect disorder-related costs were €1,799 (€1,628) for generalized anxiety disorder, €1,677 (€1,517) for panic disorder and €1,606 (€1,453) for social phobia in a German community sample (Andlin-Sobocki & Wittchen, 2005). Moreover, the mean annual direct costs related to the treatment of major depression were €2,934 (€2,073) within a sample recruited in German medical practices (Salize et al., 2004) and the total mean annual societal costs across the entire range of personality disorders were estimated at €12,045 (€11,126) in a Dutch sample seeking treatment in specialized mental health care institutes (Soeteman, Hakkaart-van
Roijen, Verheul & Busschbach, 2008). In contrast to the above comparisons, the mean annual societal costs of German patients with schizophrenia were comparatively higher than those calculated for BPD in the present study, ranging between €42,099 and €52,374 (Konnopka, Klingberg, Wittorf & König, 2007). During the year preceding outpatient DBT, the primary drivers of BPD-related societal cost-of-illness were inpatient treatment and partial hospitalization (50% of total societal cost) and work disability (25% of total societal cost). Second, the present study demonstrates that providing DBT in a routine, outpatient setting is associated with considerable cost savings for society that are apparent even during the first year of treatment. Moreover, these savings clearly offset the additional treatment costs associated with DBT. Thus, if DBT were offered as a first line intervention, costs related to hospital treatment and partial hospitalization could be substantially reduced. In addition, during DBT treatment, patients less frequently visited other medical services, such as general practitioners and psychiatrists. Furthermore, patients’ friends and family members were less frequently asked to assume domestic responsibilities, which may be indicative of a reduction of the families’ and friends’ emotional and financial burden.

Third, when compared to DBT treatment, total societal cost-of-illness was even further reduced during follow-up. Although DBT skills training groups were used much less frequently and individual DBT was reduced by 50% during follow-up, the reduction in the use of DBT did not result in an increase in the utilization of other medical or non-medical services. In particular, we found a lasting effect regarding the reduction of BPD-related inpatient treatment. Similar to the DBT treatment year, our patients had on average six BPD-related inpatient days during the follow-up year. Moreover, it is important to note that the total number of inpatient days during the follow-up year was significantly increased by one patient who participated in a 3-month inpatient DBT-PTSD program during that time. The reduced amount of inpatient treatment during the follow-up year represents a considerable
improvement over the average of 51 BPD-related hospital days per patient during the year preceding DBT treatment and the average of 15 BPD-related hospital days per patient per year during the ten year period preceding DBT treatment.

Fourth, in contrast to the marked reduction in direct costs, BPD-related indirect costs as a whole only slightly decreased over the course of our study. On the one hand, there was a steady reduction in costs associated with work absenteeism that was more clearly observed when these costs were calculated within a subgroup of employed patients. This result may be interpreted as a preliminary indication that during outpatient DBT, the indirect costs of employed BPD patients can be considerably reduced, while simultaneously improving their work functioning. Therefore, our finding is partially consistent with the investigation of Pistorello, Fruzzetti, MacLane, Gallop & Iverson (2012), who showed that in a comparatively high functioning sample of college students meeting at least three BPD diagnostic criteria, outpatient DBT had a significant effect on social adjustment. In contrast, there was little improvement concerning patients` employment status. In all three assessment periods, approximately two thirds of our sample were unemployed or on work disability, while only one third was employed, trainee or student. All work disabled patients retained their status over time. Regarding the unemployed, only two patients entered the primary labor market over the course of our study, but the same number of patients also became unemployed during this time period. To some extent, there was a positive development for unemployed patients, in that more unemployed patients began to engage in the sheltered labor market, (e.g., volunteer work, vocational preparation) over the course of our study. The latter findings generally are consistent with recent longitudinal studies (Gunderson et al., 2011; Zanarini, Frankenburg, Reich & Fitzmaurice, 2010) in which BPD patients` average psychosocial functioning remained at a low level over extended periods of time. More specifically, these findings are also consistent with a study by McMain et al. (2012), who found a high rate of
unemployment and reliance on disability benefits two years after treatment terminated in a
group of patients who had received outpatient DBT, as well as a group of patients who
received general psychiatric management.

Limitations

Several limitations of our study are important to note. First, our study lacks a control
c condition. As a consequence, we cannot rule out the possibility that cost reductions observed
during and after DBT would not also have occurred with non-specific care. Throughout the
course of our study, participants used a wide variety of medical services in addition to DBT.
Given this fact, it is possible that the observed cost savings are at least partially attributable to
improvements made in other interventions (e.g., pharmacological treatment). Also,
approximately one fifth of the sample was treated in an inpatient DBT program in the year
prior to outpatient DBT. Since evidence suggests that inpatient DBT is effective in treating
BPD patients (Bohus et al., 2004) and producing lasting improvements beyond treatment
termination (Dams, Schommer, Röpke, Heuser & Lammers, 2007; Kleindienst et al., 2008), it
is possible that inpatient DBT also facilitated the effectiveness of our outpatient DBT
program and could therefore be responsible for some of the effects on resource utilization
observed here.

Second, because our results are based on a relatively small sample of 47 BPD patients,
results may not generalize to the BPD population, and therefore, we caution against relying
solely on these data to extrapolate the societal cost savings that would be achieved if every
BPD patient was provided with outpatient DBT. Specifically, our sample included only BPD
patients who were seeking outpatient psychotherapy. On the one hand, the results of the
present study may overestimate cost savings, because treatment-seeking patients likely
experience a higher burden of distress during the period preceding psychotherapy and these
patients might also utilize treatments to a greater extent than the general population, thereby
inflating costs. Accordingly, in the present study, the number of days spent in hospital during the year preceding outpatient DBT was considerably higher than the annual number of hospital days utilized during the 10 year-period preceding DBT treatment. Whereas the utilization of inpatient treatment varied substantially over the 10-year period, the usage of outpatient psychotherapy was stable at a low level over the same period of time. Further, in the Coid et al. (2009) study of a British household population, more than 40% of people diagnosed with BPD reported that they had no contact with a general practitioner or mental health professional due to emotional problems in the past 12 months and about 87% never had a psychiatric admission in their lifetime. Thus, as shown by Hall et al. (2001), it takes longer to recoup the investments made in psychotherapy for BPD patients utilizing the health care system to a lesser extent. On the other hand, it is conceivable that our results underestimate societal costs, as some patients who do not seek psychotherapy or reject it may use more expensive forms of treatment, such as inpatient treatment, more frequently, which would result in an even greater potential for cost savings for these patients. Further, the patients who dropped out of DBT treatment or were not reachable for the follow-up interview were not included in the analysis. It is possible that those patients for whom DBT was not effective dropped out and that in comparison to an intention-to-treat analysis, efficiency was overestimated in the present completers-analysis (Hollis & Campbell, 1999). As a consequence, the results of the present study can only generalize to BPD patients receiving a 12-month outpatient DBT-program.

Third, our results must be interpreted in the light of the characteristics of the German health care and social welfare system as well as the German labor market and therefore may not easily be applied to other countries. In particular, the average length of inpatient psychiatric stay varies considerably from country to country. Across psychiatric disorders, the average length of inpatient stay is about 25 days in Germany (BAG-Psychiatrie, 2010), up to
90 days in South Korea (Chung, 2010) and only 10 days in the U.S.A. (Lee, Rothbard & Noll, 2012). More specifically, whereas in the present study, BPD patients on average spent 51 days in hospital during the year preceding outpatient DBT treatment, mean annual number of psychiatric inpatient days and days in day care was only about 16 days during the year preceding an outpatient psychotherapy in the Netherlands (van Asselt et al., 2007), about 13 days during the six months preceding an outpatient psychotherapy in Great Britain (Palmer et al., 2006) and about 12 days during the six months preceding an outpatient psychotherapy in Australia (Pasieczny and Connor, 2011). As a consequence and especially from a short-term perspective, when treating BPD patients with outpatient DBT, lower savings in total societal costs might be expected in those countries that rely to a lesser extent on inpatient treatment. Further, regarding our result that overall no improvement concerning patients` employment status was observed, it must be considered that vocational rehabilitation of people with severe mental disorders in Germany is strongly concentrated on the sheltered labor market where various programs such as outpatient work therapy exist (Eikelmann & Reker, 1993; Pfammatter, Hoffmann, Kupper & Brenner, 2000). In contrast to “supported employment”-programs that aim to return people directly to open employment on the primary labor market and providing them with support to maintain at work, sheltered programs often do not immediately seek to return individuals to employment on the open labor market and have been proven to lead to a significant rise in the work activity but not to a substantial increase in job placement in the primary labor market (Pfammatter et al., 2000). Additionally, the relative high degree of social protection within the German social welfare system might also represent a disinscentive to returning to work (McDaid et al., 2008).

Fourth, the accuracy of our measurement of resource consumption and productivity loss was limited by several factors. The assessment was based solely on patients` self-report. Hall et al. (2001) found high levels of inconsistency between the number of hospital admissions
reported by BPD patients and those recorded in hospital records for a retrospective period of 12 months. The validity of our data could have been improved by checking the patient self-report data against the records of medical providers or insurance companies. As discussed in detail elsewhere (e.g. van Asselt et al., 2007), there are many difficulties associated with obtaining data from medical providers or insurance companies in this population, such as the fact that BPD patients use a wide variety of different service providers. Furthermore, the retrospective period of 12 months for the use of medical services and work absenteeism in our cost-interview, and 10 years for the THI assessment period, have to be considered as long. In comparison, van Asselt et al. (2007, 2008a) chose a retrospective period of three months, while Soeteman et al. (2008) extrapolated annual costs based on a four-week and two-week recall period. Calculation of annual costs in each case was based on the assumption that the assessed period was representative of the entire preceding year. Moreover, in some cases it was difficult to clearly distinguish between BPD-related costs and costs due to other mental disorders. This was especially the case when a service use was reported in association with a symptom (e.g. binge eating or substance abuse) that is both a diagnostic criterion of BPD and of other mental disorders. In these cases, we utilized the results of the SCID-I interviews to come to a decision regarding the attribution of costs. In cases of ambiguity, costs were attributed to BPD. Furthermore, resource consumption and productivity loss was assessed comprehensively, but not exhaustively in the present study. For instance, productivity loss for employed patients could have been assessed in more detail by taking into consideration lost productivity resulting from reduced work hours or reduced performance at work (Li, Gignac & Anis, 2006).

Fifth, most of our patients continued their individual DBT during follow-up. Therefore, a longer term follow-up period is needed to investigate whether the reduction of service use and
the reduction of the corresponding costs will be maintained in the future after outpatient DBT is terminated altogether.

*Clinical Implications*

In typical community settings, only a minority of BPD patients has access to outpatient psychotherapy in general (Hermens, van Splunteren, van den Bosch & Verheul, 2011) and even fewer patients have access to a disorder-specific psychotherapy (Jobst et al., 2010). Therefore, the shortage of psychotherapists available for BPD patients is the most important factor explaining the treatment gap between standard care and optimal care, as recommended by clinical guidelines (Hermens et al., 2011). Accordingly, our findings suggest that in order to improve the quality and efficiency of BPD patients’ health care, there is a need for more specifically trained outpatient psychotherapists. In addition, psychotherapy in general should focus more on improving functional outcomes (e.g., employment interventions and recovery from disability). In the case of BPD, adjunctive rehabilitation strategies such as DBT-Accepting the Challenges of Exiting the System (DBT-ACES; Comtois, Kerbrat, Atkins, Harned & Elwood, 2010) are obviously needed to support BPD patients enrolling in college, participating in occupational training, or returning to work, thereby reducing dependency on social services.

*Future directions in research*

The findings of the present study are comparable to the cost-studies of Bateman & Fonagy (2003) and Hall et al. (2001) who found that disorder-specific psychodynamic partial hospital and outpatient treatment resulted in substantial overall cost savings. At the same time, it is difficult to place our results within a broader context by comparing them to current state-of-the-art research on the relative cost-effectiveness of different psychotherapies for BPD (Palmer et al., 2006; van Asselt et al., 2008a). In these studies, findings were based on the
calculation of an incremental cost-effectiveness ratio (ICER) (i.e., the difference in costs between two treatments divided by the difference in effectiveness). Palmer et al. concluded that cognitive behavioral therapy plus TAU is not more cost-effective than TAU alone; van Asselt et al. showed that schema-focused therapy (SFT) is a more cost-effective treatment for BPD than transference-focused psychotherapy (TFT). In future research, RCTs should compare DBT to conventional care and to other leading therapies for BPD in terms of costs per quality-adjusted life year (QALY) and costs per recovered patient, in order to draw more definitive conclusions about the efficiency of DBT and to expand the evidence base on the cost-effectiveness of psychotherapies for BPD. As a result, based on its ICER, the cost-effectiveness of DBT can be compared more readily to that of other interventions.

Furthermore, DBT can be incorporated into so-called ‘cost-effectiveness league tables’, which rank different treatments according to their costs per QALY. Soeteman & Kim (2013) suggest that these league tables be included in clinical guidelines and inform resource allocation decisions in health care policies.

**Conclusions**

The present study is the first to calculate pre-treatment costs in German BPD patients from a comprehensive societal perspective and to further follow these patients during a year of an outpatient DBT program in routine care and a follow-up year. In conclusion, our results demonstrate that the economic burden of BPD patients in Germany is high and higher than that of other mental disorders. Second, our results provide evidence that the treatment of BPD patients within a disorder-specific outpatient DBT program leads to substantial overall savings in societal cost-of-illness that are mostly due to considerable reductions in the costs of BPD-related hospital days. Already during DBT treatment these cost savings clearly exceed the additional treatment costs of DBT. Third, cost savings are further extended during the
follow-up year while the intensity of the DBT program is reduced. Our interpretation of the current results is that DBT is not only efficacious but also efficient in treating BPD patients. From a societal perspective it appears to be economical to offer outpatient DBT to BPD patients who are committed to therapy.

Acknowledgements

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<table>
<thead>
<tr>
<th>Cost category</th>
<th>Costs during pre-treatment year in € (n=47)</th>
<th></th>
<th>Costs during DBT-treatment year in € (n=47)</th>
<th></th>
<th>Costs during follow-up year in € (n=33)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD) Median</td>
<td>M (SD) Median</td>
<td>M (SD) Median</td>
<td>M (SD) Median</td>
<td>M (SD) Median</td>
<td>M (SD) Median</td>
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<tr>
<td>Direct medical and non-medical costs</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychiatric/general hospital, total</td>
<td>14.167 (20.899) 4.134</td>
<td>1.953 (5.720) 0 1.719 (4.975) 0</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Inpatient days</td>
<td>12.860 (20.292) 288</td>
<td>1.953 (5.720) 0 1.719 (4.975) 0</td>
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<td></td>
<td></td>
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<tr>
<td>Day program</td>
<td>1.307 (3.375) 0</td>
<td>0 0 0 0</td>
<td></td>
<td></td>
<td>0 0 0 0</td>
<td></td>
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<tr>
<td>Assisted living</td>
<td>1.758 (5.743) 0</td>
<td>1.713 5.175 0</td>
<td>1.190 3.702 0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychotropic drugs</td>
<td>657 (1.319) 96</td>
<td>485 (920) 86 330 (639) 57</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Emergency room</td>
<td>72 (182) 0</td>
<td>40 (109) 0</td>
<td>47 (134) 0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outpatient</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychotherapy, total</td>
<td>895 (1.783) 0</td>
<td>5.532 (1.145) 5.765 2.729 (1.486) 2.918</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Outpatient DBT</td>
<td>0 0 0 0</td>
<td>5.532 (1.145) 5.765 2.632 (1.573) 2.918</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Outpatient Psychotherapy, other than DBT</td>
<td>895 (1.783) 0</td>
<td>0 0 0</td>
<td>97 (433) 0</td>
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<tr>
<td>Psychiatrist</td>
<td>269 (334) 147</td>
<td>133 (157) 82 180 (236) 74</td>
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<td></td>
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<td>General practitioner</td>
<td>85 (120) 23</td>
<td>47 (98) 0</td>
<td>33 (113) 0</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Medical specialist</td>
<td>51 (146) 0</td>
<td>40 (132) 0</td>
<td>18 (53) 0</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Community support/Counselling</td>
<td>182 (394) 62</td>
<td>107 (322) 0</td>
<td>51 (162) 0</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Occupational therapy</td>
<td>26 (85) 0</td>
<td>67 (255) 0</td>
<td>37 (213) 0</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Physical therapy</td>
<td>15 (87) 0</td>
<td>27 (118) 0</td>
<td>25 (91) 0</td>
<td></td>
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<tr>
<td>Informal care</td>
<td>815 (2.265) 0</td>
<td>323 (1.378) 0</td>
<td>181 (949) 0</td>
<td></td>
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<td></td>
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<tr>
<td>Deviant behaviour</td>
<td>46 (191) 0</td>
<td>57 (147) 0</td>
<td>9 (38) 0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total direct Costs</strong></td>
<td><strong>19.038 (25.207) 5.793</strong></td>
<td><strong>10.524 (9.321) 7.100 6.549 (8.251) 4.111</strong></td>
<td><strong>8.204 (14.453) 0</strong></td>
<td></td>
<td><strong>14.750 (18.592) 4.594</strong></td>
<td></td>
</tr>
<tr>
<td>Indirect Costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Absence from work</td>
<td>1.570 (5.383) 0</td>
<td>816 (2.424) 0</td>
<td>248 (763) 0</td>
<td></td>
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<td>Work disability</td>
<td>7.418 (15.485) 0</td>
<td>7.418 (15.485) 0</td>
<td>7.953 (15.566) 0</td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total indirect Costs</strong></td>
<td><strong>8.988 (15.651) 0</strong></td>
<td><strong>8.234 (15.273) 0</strong></td>
<td><strong>8.201 (14.453) 0</strong></td>
<td></td>
<td><strong>14.750 (18.592) 4.594</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Total societal Costs</strong></td>
<td><strong>28.026a (33.081) 12.502</strong></td>
<td><strong>18.758 (19.450) 7.228b</strong></td>
<td><strong>14.750 (18.592) 4.594</strong></td>
<td></td>
<td><strong>14.750 (18.592) 4.594</strong></td>
<td></td>
</tr>
</tbody>
</table>

Note. All costs are adjusted for the 2010 price level.

aTotal societal cost-of-illness during pre-treatment year for the n = 33 patients who showed up for follow-up-interview was $M = €27.696 \ (SD = €32.692; \ Mdn = €12.502)$.

bTotal societal cost-of-illness during DBT treatment year for the n = 33 patients who showed up for follow-up interview were $M = €18.803 \ (SD = €16.632; \ Mdn = €7.707)$. 
Table 2  
Socio-demographic and clinical characteristics at the time of study inclusion and THI-data (average amount of BPD-related treatment utilization in the ten years prior to study inclusion)

<table>
<thead>
<tr>
<th>Variable</th>
<th>DBT-completers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years: M (SD)</td>
<td>30.1 (8.1)</td>
</tr>
<tr>
<td>Gender, n (%)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>43 (91.5)</td>
</tr>
<tr>
<td>Male</td>
<td>4 (8.5)</td>
</tr>
<tr>
<td>Marital status, n (%)</td>
<td></td>
</tr>
<tr>
<td>Single/divorced</td>
<td>18 (38.3)</td>
</tr>
<tr>
<td>In relationship/married</td>
<td>29 (61.7)</td>
</tr>
<tr>
<td>Education, n (%)</td>
<td></td>
</tr>
<tr>
<td>High school (grade 12/13)</td>
<td>14 (29.8)</td>
</tr>
<tr>
<td>Grade 10</td>
<td>28 (59.6)</td>
</tr>
<tr>
<td>Grade 9</td>
<td>4 (8.5)</td>
</tr>
<tr>
<td>No graduation</td>
<td>1 (2.1)</td>
</tr>
<tr>
<td>General psychiatric symptoms (BSI/GSI), M (SD) (scale range 0-4)</td>
<td>1.9 (0.6)</td>
</tr>
<tr>
<td>Depression (BDI), M (SD) (scale range 0-63)</td>
<td>31.1 (8.6)</td>
</tr>
<tr>
<td>Borderline symptom severity (BSL), M (SD) (scale range 0-380)</td>
<td>199.3 (51.4)</td>
</tr>
<tr>
<td>Number of SCID-II/BPD-criteria, M (SD)</td>
<td>6.5 (1.3)</td>
</tr>
<tr>
<td>Number of BPD-related hospital admissions during the last ten years (THI), M (SD)</td>
<td>3.4 (3.9)</td>
</tr>
<tr>
<td>Number of BPD-related inpatient days and days in day program during the last ten years (THI), M (SD)</td>
<td>152.7 (176.1)</td>
</tr>
<tr>
<td>Number of BPD-related outpatient psychotherapies during the last ten years (THI), M (SD)</td>
<td>1.0 (0.9)</td>
</tr>
<tr>
<td>Number of BPD-related outpatient psychotherapy sessions during the last ten years (THI), M (SD)</td>
<td>60.6 89.4</td>
</tr>
</tbody>
</table>

Note. THI = Treatment History Inventory, BSI = Brief Symptom Inventory, GSI = Global Severity Index, BDI = Beck Depression Inventory, BSL = Borderline Symptom List, THI = Treatment History Inventory. Varying n due to missings (BSI: n = 40; BDI: n = 43; BSL: n = 44).
## Table 3
Amount of BPD-related resource consumption and productivity loss during pre-treatment, DBT treatment and follow-up

<table>
<thead>
<tr>
<th>Cost Category</th>
<th>Pre-treatment-year M (SD) (N=47)</th>
<th>(%)</th>
<th>DBT-treatment-year M (SD) (N=47)</th>
<th>(%)</th>
<th>Follow-up-year M (SD) (N=33)</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
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<tr>
<td><strong>Direct medical and non-medical costs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychiatric/general hospital, total a</td>
<td>51.3 (74.2)</td>
<td>59.6</td>
<td>6.8 (19.9)</td>
<td>19.1</td>
<td>6.0 (17.3)</td>
<td>15.2</td>
</tr>
<tr>
<td>Inpatient a</td>
<td>44.7 (70.5)</td>
<td>51.1</td>
<td>6.8 (19.9)</td>
<td>19.1</td>
<td>6.0 (17.3)</td>
<td>15.2</td>
</tr>
<tr>
<td>Day program a</td>
<td>6.6 (17.1)</td>
<td>17.0</td>
<td>0 (0)</td>
<td>0</td>
<td>0 (0)</td>
<td>0</td>
</tr>
<tr>
<td>Assisted living a</td>
<td>32.3 (102.9)</td>
<td>10.6</td>
<td>38.8 (113.8)</td>
<td>10.6</td>
<td>38.3 (109.5)</td>
<td>12.1</td>
</tr>
<tr>
<td>Psychotropic drugs b</td>
<td>1.9 (1.9)</td>
<td>68.1</td>
<td>1.5 (1.4)</td>
<td>70.2</td>
<td>1.2 (1.3)</td>
<td>54.5</td>
</tr>
<tr>
<td>Emergency room c</td>
<td>0.8 (2.1)</td>
<td>29.8</td>
<td>0.5 (1.3)</td>
<td>19.1</td>
<td>0.5 (1.5)</td>
<td>18.2</td>
</tr>
<tr>
<td>Outpatient psychotherapy, other than DBT c</td>
<td>9.1 (18.2)</td>
<td>38.3</td>
<td>0 (0)</td>
<td>0</td>
<td>0 (0)</td>
<td>6.1</td>
</tr>
<tr>
<td>Individual DBT c</td>
<td>0 (0)</td>
<td>33.7</td>
<td>(9.2)</td>
<td>100.0</td>
<td>18.5 (12.8)</td>
<td>97.0</td>
</tr>
<tr>
<td>Skills training group c</td>
<td>0 (0)</td>
<td>16.9</td>
<td>(11.1)</td>
<td>89.4</td>
<td>1.2 (2.0)</td>
<td>33.0</td>
</tr>
<tr>
<td>Psychiatrist c</td>
<td>5.5 (6.8)</td>
<td>74.5</td>
<td>2.7 (3.2)</td>
<td>57.4</td>
<td>3.7 (4.8)</td>
<td>54.5</td>
</tr>
<tr>
<td>General practitioner c</td>
<td>3.7 (5.3)</td>
<td>57.4</td>
<td>2.1 (4.3)</td>
<td>38.3</td>
<td>1.5 (5.0)</td>
<td>15.2</td>
</tr>
<tr>
<td>Medical specialist c</td>
<td>1.3 (4.0)</td>
<td>19.1</td>
<td>1.1 (3.9)</td>
<td>12.8</td>
<td>0.5 (1.5)</td>
<td>12.1</td>
</tr>
<tr>
<td>Community support/Counselling c</td>
<td>2.9 (6.4)</td>
<td>51.1</td>
<td>1.7 (2.5)</td>
<td>25.5</td>
<td>0.8 (2.5)</td>
<td>15.2</td>
</tr>
<tr>
<td>Occupational therapy c</td>
<td>1.0 (3.3)</td>
<td>10.6</td>
<td>2.6 (10.0)</td>
<td>8.5</td>
<td>1.5 (8.4)</td>
<td>3.0</td>
</tr>
<tr>
<td>Physical therapy c</td>
<td>1.2 (7.1)</td>
<td>4.3</td>
<td>2.6 (11.1)</td>
<td>6.4</td>
<td>2.5 (9.0)</td>
<td>12.1</td>
</tr>
<tr>
<td>Informal care d</td>
<td>77.8 (216.3)</td>
<td>17.0</td>
<td>30.9 (131.7)</td>
<td>12.8</td>
<td>17.3 (19.7)</td>
<td>6.1</td>
</tr>
<tr>
<td>Deviant behaviour e</td>
<td>0.3 (1.1)</td>
<td>12.8</td>
<td>0.4 (1.1)</td>
<td>19.1</td>
<td>0.2 (0.9)</td>
<td>9.1</td>
</tr>
<tr>
<td><strong>Indirect Costs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absence from work a</td>
<td>13.0 (42.2)</td>
<td>23.4</td>
<td>7.4 (22.6)</td>
<td>23.4</td>
<td>2.2 (7.0)</td>
<td>18.2</td>
</tr>
<tr>
<td>Work disability a</td>
<td>69.9 (145.2)</td>
<td>19.1</td>
<td>69.9 (145.2)</td>
<td>19.1</td>
<td>77.4 (151.5)</td>
<td>21.2</td>
</tr>
</tbody>
</table>

*Note.* (%) relates to the percentage of participants to whom the item was applicable.

* Number of days.
* Number of drugs.
* Number of visits/sessions.
* Number of hours/number of incidents.
Table 1
Value of the unit cost for each medical and non-medical service

<table>
<thead>
<tr>
<th>Direct medical and non-medical costs</th>
<th>Unit costs (in €)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychiatric hospital (per day)</td>
<td>288</td>
</tr>
<tr>
<td>General hospital (per day)</td>
<td>Various</td>
</tr>
<tr>
<td>Psychiatric day program (per day)</td>
<td>160</td>
</tr>
<tr>
<td>Assisted living (per day)</td>
<td>23-114</td>
</tr>
<tr>
<td>Psychotropic drugs</td>
<td>Various</td>
</tr>
<tr>
<td>Emergency room (per visit)</td>
<td>87</td>
</tr>
<tr>
<td>Psychotherapy (per visit)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>94&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Psychiatrist (per visit)</td>
<td>49</td>
</tr>
<tr>
<td>General practitioner (per visit)</td>
<td>23</td>
</tr>
<tr>
<td>Medical specialist (per visit)</td>
<td>22-118</td>
</tr>
<tr>
<td>Community support/counseling (per visit)</td>
<td>65-70</td>
</tr>
<tr>
<td>Occupational therapy (per visit)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>26</td>
</tr>
<tr>
<td>Physical therapy (per visit)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Various</td>
</tr>
<tr>
<td>Informal care (per hour)</td>
<td>10</td>
</tr>
<tr>
<td>Consequences of deviant behavior (per incident)</td>
<td></td>
</tr>
<tr>
<td>Police operation</td>
<td>88</td>
</tr>
<tr>
<td>Fire department operation</td>
<td>725</td>
</tr>
<tr>
<td>Prison sentence (per day)</td>
<td>117</td>
</tr>
</tbody>
</table>

<sup>Note.</sup> All unit costs were adjusted for the year 2010 price level and rounded to whole decimal places.  
<sup>a</sup>Cost per session is dependent on the total number of sessions utilized by a patient since certain services are charged only quarterly in Germany. Cost indication is based on a total number of 40 sessions.  
<sup>b</sup>Cost per session is dependent on the total number of sessions utilized. Cost indication is based on a total number of 10 sessions.
Table 4
Employment status at the time of study inclusion, end of the DBT-treatment year, and end of the follow-up year

<table>
<thead>
<tr>
<th>Employment status, n (%), No.</th>
<th>Time of inclusion in the trial (n = 47)</th>
<th>End of DBT-treatment year (n=47)</th>
<th>End of Follow-up year (n = 33)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student at university</td>
<td>2 (4.3)</td>
<td>2 (4.3)</td>
<td>1 (3.0)</td>
</tr>
<tr>
<td>Student at school</td>
<td>2 (4.3)</td>
<td>1 (2.1)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Trainee</td>
<td>4 (8.5)</td>
<td>4 (8.5)</td>
<td>4 (12.1)</td>
</tr>
<tr>
<td>Employed</td>
<td>9 (19.1)</td>
<td>9 (19.1)</td>
<td>6 (18.2)</td>
</tr>
<tr>
<td>Unemployed (on welfare), total</td>
<td>21 (44.7)</td>
<td>21 (44.7)</td>
<td>14 (42.4)</td>
</tr>
<tr>
<td>With engagement</td>
<td>4 (19.0)</td>
<td>9 (42.9)</td>
<td>6 (46.2)</td>
</tr>
<tr>
<td>Without engagement</td>
<td>17 (81.0)</td>
<td>12 (57.1)</td>
<td>7 (53.8)</td>
</tr>
<tr>
<td>Work disabled</td>
<td>9 (19.1)</td>
<td>9 (19.1)</td>
<td>7 (21.2)</td>
</tr>
<tr>
<td>Parental leave</td>
<td>0 (2.1)</td>
<td>1 (2.1)</td>
<td>1 (3.0)</td>
</tr>
</tbody>
</table>

a Additional income/minor employment, vocational preparation, volunteer work.
b Percentages relate to the proportion of the total unemployed.
Highlights

- DBT treatment was delivered in routine outpatient care.
- Direct and indirect costs were assessed from a societal perspective.
- Compared to pre-treatment, substantial savings in societal costs were found during DBT.
- Cost savings were mainly due to reduced hospitalization.
- During follow-up year, savings in societal costs were further extended.