Clinical Neuropsychiatry (2015) ***12****, 2, 37-45*

SELF-INJURIOUS BEHAVIOUR AND SUICIDAL IDEATION DURING DIALECTICAL BEHAVIOUR THERAPY (DBT) OF PATIENTS WITH BORDERLINE PERSONALITY DISORDER*

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Abstract

Objective: The purpose of this study was to investigate the effect of dialectical behaviour therapy (DBT) and specific DBT modules on the longitudinal evolution of parasuicide of borderline patients (BPD). It was expected that a decrease in parasuicide would occur, in particular during therapy module 'crisis coping skills'.

Method: Hypotheses were tested using a sequential and replicated single-case experimental phase-design. Thirteen BPD patients made daily recordings of the frequency, urge, and severity of their self-injury and of their suicidal thoughts and behaviour.

Results: Parasuicidal behaviours showed a highly variable course but, overall, decreased during DBT, albeit that the change could not be specifically attributed to the module 'crisis coping skills'.

Conclusions: Results suggest that both the integral approach of DBT (using all DBT modules) and its long-term application may be responsible for the abiding reduction in parasuicide.

Key words: dialectical behaviour therapy modules, borderline personality disorder, single-case design, parasuicide

Declaration of interest: none

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Introduction

One of the most common personality disorders diagnosed in the context of a psychiatric hospital is the borderline personality disorder (BPD). BPD has a lifetime prevalence of 5.9% (Grant et al. 2009) and is characterized by inadequate social functioning, emotional vulnerability and dysregulation, impulsivity, a disruptive dependence on the environment, and a high percentage of psychiatric comorbidity. Parasuicidal behaviour, the intentional self-injury or self-directed life-threatening behaviour with or without an intent to die (cf. Gunnell and Frankel 1994) is highly prevalent among BPD (e.g., Soloff et al. 2002, Van den Bosch et al. 2002). Between 46% and 92% of BPD patients attempts suicide, between 3% and 10% completes suicide (Zanarini et al. 2008), and between 69% and 80% shows self-injurious behaviour (Van den Bosch et al. 2002).

It is assumed that parasuicidality is mainly a chronic and central symptom of BPD (Koekkoek and Kaasenbrood 2008, Van Beek and Van Luijn 2007) which is used to cope with painful emotions, communicate discontent and suffering, and react to a lack of control over one's life (Koekkoek and Kaasenbrood 2008). Although parasuicidal behaviour, especially self-injury, can provide BPD patients with short-term relief from their emotional burden and suffering, it often damages bodily tissue irrevocably and is associated with a high degree of morbidity, functional impairment, and other negative consequences for well-being (Linehan 1993a, Brown et al. 2002). Even more, the positive short-term consequences of self-injury behaviour reinforces its use and can help to prevent learning adaptive coping skills (Brown 1998). These are important reasons why BPD historically had high rates of treatment failure, which in turn brings about high societal costs (Van Asselt et

* The article is an adaption of an article that was published before in the Netherlands: "Dialectische gedragstherapie voor de behandeling van BPS Het grillige en langdurige beloop van parasuïcide" in *Tijdschrift voor Psychotherapie* (2010) 36, 190-203

Submitted December 2014, accepted April 2015

al. 2007), and why reducing parasuicide is one of the central foci in BPD treatment.

Fortunately, a growing body of research shows that parasuicide can be successfully treated. An often used outpatient-treatment for parasuicide among BPD is dialectical behaviour therapy (DBT), which is originally developed by Marsha Linehan (1996). This treatment exists of a cycle of four modules which patients, preferably, undergo twice.

Evidence supporting DBT as an efficacious treatment for BPD is substantial. There are twelve *randomized controlled trials* (RCTs) on DBT treatment of BPD (diagnosed using the DSM), of which ten also report on parasuicidal outcomes (Bedics et al. 2011, Carter et al. 2010, Harned et al. 2014, Kliem et al. 2010, Neacsiu et al. 2014, Panos et al. 2013). In their meta-analysis, Kliem and colleagues (2010) could use six of these RCTs to calculate an overall effect size of DBT on parasuicidal behaviour. They found that all studies showed significant reductions on suicidal ideation, suicidal attempts and/or on self-injury behaviours with an average effect size of .60; three of these studies showed a significant reduction in suicidal ideation and behaviour for the DBT group compared to the group who received *treatment as usual* (TAU) at post-treatment (Koons et al. 2001, Linehan et al. 1991, Linehan et al. 1993, Van den Bosch et al. 2005, Verheul et al. 2003), and after the following six-month period (Linehan et al. 1993, Van den Bosch et al. 2005). Another study showed that DBT had an unique effect in reducing suicide attempts compared to 'community treatment' by experts at post-treatment and at the one year follow-up (Linehan et al. 2006). Further, it was demonstrated that patients who received DBT showed greater reductions in parasuicidal behaviour compared to patients receiving 'dynamic supportive treatment' (Clarkin et al. 2007). This behaviour however was no different compared to the parasuicidal behaviour of patients receiving transference-focused psychotherapy (Clarkin et al. 2007), treatment as usual combined with a waiting list condition (Carter et al. 2010), or general psychiatric management (McMain et al. 2009).

A disadvantage of the before-mentioned studies is that they were all based on a RCT design with only a pre- post- (and follow-up) treatment assessment. This way only two or three measurement points are compared, whereas the erratic course of BPD over time, especially of parasuicide, is one of its most central features. This is for example nicely illustrated by a study of Zanarini and colleagues (2008), who studied the long term evolution of parasuicide. They showed that although the percentage of self-injury and suicide attempts decreased (which were possible partly due to treatment) over a 10 year period, strongest reductions were found in the first two years after baseline. Next to that, differences were found in the way each of these self-injury and suicidal behaviours evolved during this period. Furthermore, the findings of van Goethem and colleagues (2012), who measured changes in parasuicidal behaviours during the first and second cycle of DBT, suggest that these behaviours also fluctuate and evolve differently *during* DBT treatment.

To get a better understanding of the evolution of parasuicide during DBT, a single-case or small-N design is useful as it is a method in which the variability and changes in parasuicide during DBT can be measured for the whole treatment group and the individual patient. In addition, it can be flexibly used in clinical practice and it can be used to explore the link between the course of patients' parasuicidal behaviour and specific DBT treatment modules, which makes it possible to get a first indication of whether the effectiveness of DBT is mainly due to one specific treatment module or due to DBT as a whole (see for example Andion et al. 2012, Soler et al. 2012, Stepp et al. 2008). More research on the effectiveness of specific elements of DBT would contribute to a better understanding of the mechanisms (of change) that underlie DBT, and could be used to improve the efficacy and efficiency of DBT (Lynch et al. 2007).

The goal of the current study is therefore to examine the parasuicidal behaviour and thoughts of individual patients during one or two DBT-cycli with a *single-case design* and to explore whether a reduction of parasuicide may mainly be caused by a specific module of DBT or whether this reduction may be attributed to a more general effect of the therapy. We expect that the strongest reduction in parasuicide occurs during the DBT module 'skills for coping with a crisis'. Indication has been found that maladaptive ways of coping with one's emotions, such as dissociation from one's feeling, are related to more frequent parasuicidal behaviour over time (e.g., Zanarini et al. 2011). As during the DBT module 'skills for coping with a crisis' BPD patients learn adaptive, active ways to cope with an emotional crises instead of using maladaptive coping strategies (such as self-injury) we expected that this module would be particularly effective in reducing parasuicide (Linehan 1993b).

Method

Participants

During the inclusion period, 20 patients were referred to DBT by the division for outpatient care of a Dutch outpatient mental health institution in the south-east of the country. Thirteen of the 20 patients agreed to participate in the current study. Among the seven patients who were not included in our study, two patients dropped out before treatment had started, four patients dropped out during treatment (for a variety of reasons, including lack of motivation and personal problems unrelated to the treatment), and one patient started treatment after the inclusion period for participants had ended.

Five of the thirteen participating patients were studied for thirteen months, during which they received two cycli of DBT. The remaining eight patients were studied for seven months, during which they received one cyclus of DBT treatment. Attrition bias checks using t-tests to compare these two patient groups revealed that they did not differ on their parasuicidal behaviour at pre-treatment. The studied patient group included three males and ten females who were between 23 and 64 years old ($M = 45.5$; $SD = 11.86$).

An overview of the characteristics of the thirteen patients at pre-treatment are presented in **table 1**. In this **table** it is shown that patients had high to extreme high scores on psycho-neuroticism measured with the Symptom Checklist (SCL-90-R, Arrindell Ettema 2004) compared to a sample of the general population. According to the DSM-IV classification system (SCID-I, Groenestijn et al. 1994) various disorders on the I axis could be identified: post-traumatic stress disorder ($N = 5$), obsessive–compulsive disorder ($N = 2$), panic disorder ($N = 4$), social phobia ($N = 4$), specific phobia ($N = 2$), alcohol abuse ($N = 1$) depressive disorder ($N = 5$), dysthymic disorder and eating disorders ($N = 5$; bulimia nervosa, binge eating, anorexia nervosa in the past). All patients met the criteria for Borderline Personality Disorder according to the Structured Clinical Interview for DSM-IV Axis II personality disorders (SCID-II,

Table 1. *Characteristics of the group*

Patient number	Age	Sex m/f	Baseline SCID I	Baseline SCID II	Baseline BPDSI total	Baseline BPDSI parasuicide	Baseline SCL90: psycho-neuroticism	Baseline UCL: very high scores on
3	64	F	1,2	a,b,e,f,g borderline	42.21	1.92	very high	I,II
4	61	M	-	borderline	23.31	1.69	very high	I
6	46	F	1,2,3,4,5	borderline	24.48	2.08	very high	I
8	23	M	4,9	borderline	13.77	0	very high	I, II, III
10	62	F	2,10,16	a,b,d borderline	11.16	0	very high	I, IV
11	42	F	2,3, 8,14	a,d borderline	21. 96	2.46	very high	I
12	43	F	1,2,3,4,5, 8.11,15	a,d,h borderline	39.15	2.23	very high	I, III
13	33	M	12	borderline	24.75	0.85	high	I, IV
14	47	F	1,4,6,7	borderline	7.29	0	very high	I. III
15	52	F	3,6,7,11	a,e,c borderline	32.04	3.54	very high	I
16	41	F	13	b borderline	20.25	0.69	very high	I, II
17	38	F	1,3,6,11	a borderline	32.67	3.85	very high	I, III
18	40	F	-	borderline	30.24	0.31	high	I, II, III, IV, V

Note. 1 = panic disorder; 2 = post-traumatic stress disorder; 3 = depressive disorder; 4= social phobia; 5 = specific phobia; 6 = agoraphobia; 7 = phobia for small spaces; 8 = obsessive-compulsive disorder; 9 = alcohol abuse; 10 = dysthymic disorder; 11 = binge eating disorder; 12 = phobia for heights; 13 = phobia for spiders; 14 = anorexia nervosa in the past; 15 = bulimia nervosa; 16 = substance use disorder: medicine.
a = depressive; b = passive-aggressive; c = schizoid d = avoidant; e = paranoid; f = obsessive; g = compulsive; h = dependent.
I = passive reaction; II = expression of emotions; III = avoidance; IV = palliative reaction; V = reassuring thoughts.

Weertman et al. 1997). Other personality disorders identified were: avoidant (N = 3), obsessive-compulsive (N = 1), depressive (N = 6), paranoid (N = 2), passive-aggressive (N = 3), dependent (N = 1) and schizoid (N = 1) personality disorder. Next to that, patients' frequently showed maladaptive coping behaviours according to the Utrechtse Coping Lijst (UCL, Schreurs et al.1988); all patients showed *extreme* high scores on the subscale 'passive reaction' and almost all participants showed extreme high scores on the subscale 'avoidance' compared to the general population. Lastly, patients' total score on the Borderline Personality Disorder Severity Index (BPDSI, Arntz 1999, adapted instrument of Weaver and Clum 1993) varied between 7,29 and 42,21 (M = 25.11; SD = 10.83), and their score on the parasuicide subscale ranged from 0 to 3,85 (M = 1.51; SD = 1.16) on a scale from 0 ('never') to 10 ('daily self-injury, suicidal plans or suicidal ideation') during the last three months.

Measures

Self-observation list. To assess the course of patient's parasuicide, a self-observation list was used to perform daily recordings of their parasuicidal behaviours. This self-observation list is a combination of the diary cards used in DBT treatment (Linehan 1996) and the frequency list from the parasuicide scale of the borderline severity index version IV (BPDSI-IV, Arntz et al. 2003, Arntz et al. 2005) The BPDSI, a semi-structured interview that assess the nine DSM-IV criteria for BPD (American Psychiatric Association 2000), has shown to have excellent internal reliability (Giessen-Bloo et al. 2010, Cronbach's α = 0.96, SD = 1.76), and the parasuicide subscale had a satisfactory reliability (Cronbach's α = 0.81, SD = 0.51).

On the diary card (Linehan 1996), the patient daily gave a score from 0 to 10 on the domains 'severity of suicidal ideation' and 'urge for self-injury'. On the frequency list, the patient daily reported the times he had performed various self-injury behaviours (intentionally hit oneself, or hit or graze against something with your head, fist, knuckles, or other body parts, scratched or pinched oneself, bit oneself, cut or carved oneself, burned oneself, prick oneself with needles) and suicidal behaviours (wanted to kill yourself, told others you wanted to kill yourself, made plans to kill yourself, taken steps to kill yourself, having tried to kill yourself).

Summarized the self-observation list measured: (a) the severity of suicidal ideation (diary card), (b) the frequency of suicidal ideation and behaviours (BPDSI), (c) the urge for self-injury (diary card) and (d) the frequency of self-injury behaviours (BPDSI).

Procedure

During this DBT *intake*, patients agreed upon starting in a *pre-treatment* phase of DBT. During this phase, patients had (minimally three) weekly meetings

with their individual therapist (experienced, social psychiatric nurses, psychologists, psychiatrists who had successfully finished a ten-day course on DBT) to work on on a hierarchy of mutually agreed, general and personal treatment goals. These goals mainly addressed therapy interference behaviour, quality of life issues, and high risk self-injury and suicidal behaviour. After the treatment goals were set, patients started to fill out their self-observation list on a daily basis. In this pre-treatment phase, the patient was invited for a psycho-diagnostic examination and asked for his written consent to take part in our study, which was judged and approved by the medical-ethical review committee of the institution.

DBT treatment started when psycho-diagnostic examination was completed. DBT treatment, as described by Linehan (1996, 2002), took two times 28 weeks consisting of four parts: individual treatment, skills training, phone consultation and team consultation. During DBT, patients also daily filled out the self-observation list, which was weekly discussed with the patient's therapist.

The skills-training included four modules, which the patients successively underwent twice during one year of treatment. The four modules were: 'mindfulness skills', 'interpersonal effectiveness skills', 'the emotion regulation skills', and 'skills for coping with a crisis'. In this last module, which consisted of eight weekly group sessions, patients learned concrete skills to endure and survive a crisis that cannot be immediately resolved. The main goal of this module is to learn patients to endure an unpleasant situation without aggravating the situation and prevent them from using maladaptive, impulsive behaviours, such as self-injury, and learn them adaptive coping skills (Linehan 1993b).

To get a notion of patients' long-term functioning, patients were interviewed by phone one to one and a half year after DBT treatment had ended. During this interview patients were asked how they were generally doing on the four aspects of the self-observation list since treatment had finished.

Design and plan of analysis

In this study we used a single-case design (Van Breukelen 1995). This is a research design in which one patient is intensively examined using repeated measures during a certain period in time. With the single-case design we were able to intensively examine the erratic course of BPD on the level of the individual patient. Furthermore, the design is relatively easy to implement in clinical practice, especially because the daily registration of patients' parasuicide on the self-observation list is already part of the regular treatment process. This way the study neither requires an extra time investment of the patient nor of the therapist.

In this research we used a sequential and replicated single-case experimental phase-design (Barlow and Hersen 1984) with four dependent variables on suicidality and self-injury (variables a to d on the self-observation list) and five levels of the independent variable: the 'pretreatment phase' and the four DBT modules. We used a ABCDEBCDE-design: module A (baseline) was de pre-treatment phase in which no skills-training was provided yet. In module B to E the DBT skills-trainings were provided: in module B 'the mindfulness'; in module C 'the interpersonal effectiveness'; in module D 'the emotion regulation'; and in module E 'the skills for coping with a crisis'. After this (first cyclus), patients followed the DBT skills treatment once more (second cyclus).

Data analyses. Time-series charts with a trend-line together with randomisation tests were used to analyse the data from the single-case-experiments (Morley 1996, Todman and Dugard 2001). For every patient, we used MS Excel to make: a time-series chart for every variable of interest, a trend-line per module, and a trend-line for the whole period of treatment.

Then these trend analyses (which are solely based on the visual analyses of the data) were combined with randomisation tests (Matyas and Greenwood 1990, performed with the SCRT computer program, Onghena and Van Damme 1994) to reduce the risk of making type-one errors. In single case studies there is dependence of the measurements, which makes it impossible to use parametric statistical tests (which are based on random sampling, Onghena 1992). Alternatively, a non-parametric test is needed, which most frequently involves a randomisation test. A randomisation test is an algorithm which determines whether the results on the dependent variable(s) are unique for the research phase of interest (treatment module) compared to chance (see for more information on randomisation tests: Edgington, 1975, 1980, Onghena 1992). In other words, the test determines how extreme the empirical findings are compared to findings based on randomised data (Onghena and Edgington 2005).

Using these methods, first module A (pre-treatment) was compared to the other DBT modules (modules B-E). Then the pre-treatment baseline phase, combined with subsequent modules B to D, were compared with the 'module for coping with a crisis'(E).

Table 2. *Overview of the trend-lines*

	Decreasing trend-line (decrease start with module:)	Decreasing trend-line within the first E-module (N=13)	Decreasing trend-line within the second E-module (N=5)
Severity of suicidal thoughts	9 (C: 3x, D: 3x, E: 3x)	5	1
Frequency of suicidal behaviour (plans or attempts)	8 (C: 3x, D: 2x, E: 3x)	5	1
Urge for self-injury	8 (C: 3x, D: 2x, E: 2x)	3	0
Frequency of self-injury	5 (A: 1x, B: 1x, C: 2x, D: 1x)	3	3

Note. A: baseline phase; B: module 'mindfulness skills; C: module 'interpersonal effectiveness skills'; D: module 'emotion regulation skills'; E: module 'skills for coping with a crisis'.

Results

A summary of the individual trends of patients' parasuicide is presented in **table 2**. We found a decreasing trend: a reduction in the severity of suicidal ideation among nine patients; in the frequency of suicidal behaviour among eight patients; in the urge for self-injury among nine patients; in the frequency of self-injury among five patients.

A reduction in the frequency and severity of suicidal ideation mainly occurred during the modules 'interpersonal effectiveness skills', 'emotion regulation skills', and 'skills for coping with a crisis'. The reduced urge for self-injury mainly occurred during the modules 'emotion regulation skills', and 'skills for coping with a crisis'. During this latter module, 'skills for coping with a crisis', five patients showed a reduction in severity and frequency of suicidality and three patients showed a reduction in urge and frequency of self-injury. An example of one of these latter patients is depicted in **figure 1**, in which is shown that the urge and frequency of self-injury decreases during DBT (on the left), especially during the module 'skills for coping with a crisis' (on the right).

The time-series charts showed an erratic course: a large variability within and between the scores of

Figure 1. *Examples of a general trend-line during treatment and of a trend-line during a treatment module*

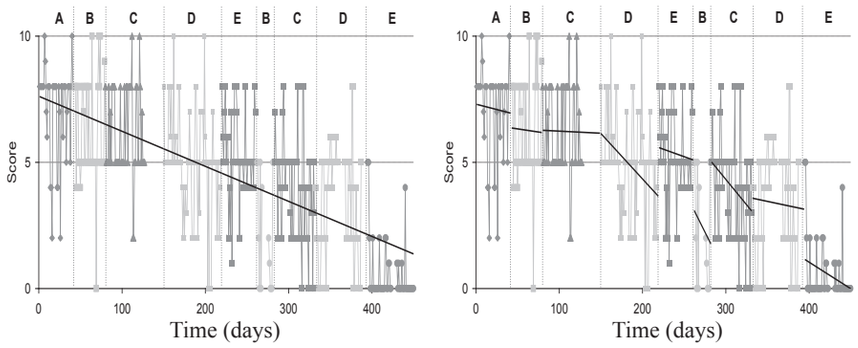


Figure 2. *Example of the erratic course of parasuicide during treatment*

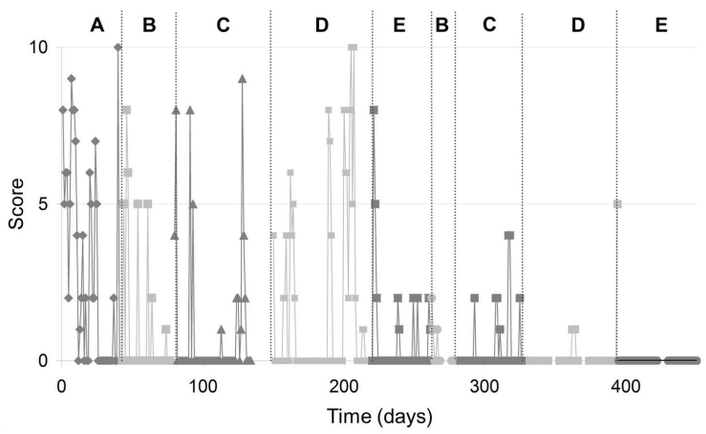
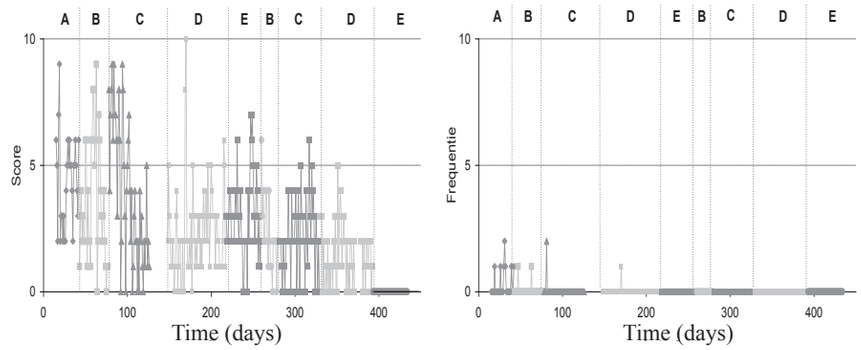


Figure 3. *Example of the effect of DBT treatment on the urge and frequency of self-injury*



different parasuicidal behaviours. A clear example of this course is depicted in **figure 2**. Eleven patients showed the same pattern of 'severity of suicidal ideation and of 'the frequency of suicidality'. Four patients showed the same pattern of 'urge of self-injury' and 'frequency of self-injury'. Three patients showed a reduction in their urge for self-injury, which however remained present, whereas their 'frequency of self-injury' reduced to zero. This latter pattern is shown in **figure 3**, in which the urge for self-injury (on the left) and the frequency of self-injury (on the right) are presented.

The results of the randomisation tests are presented in **table 3**. The first randomisation test, in which module A (*pre-treatment baseline*) was compared to the other DBT modules (module B to E), showed (a) a significant reduction in the frequency of self-injury among three patients, (b) a reduction in the severity of suicidal ideation among one patient, and (c) a reduction in the frequency of suicidality among one patient. The second randomisation test, in which module A to D were compared to module E, showed a significant reduction in urge of self-injury among one patient and a significant reduction in the severity of suicidal ideation among one patient during module E ('skills for coping with a crisis).

Of the thirteen patients who took part in our study, eleven also took part in our follow-up interview. Ten patients indicated that their suicidality and self-injury had reduced since they followed DBT, while one patients indicated to experience little change in his parasuicidal behaviour. Eight patients showed no self-injury anymore, one patient showed daily self-injury, one patient showed self-injury once per month, and another patient said he injured himself once per one and a half months.

Table 3. *Results of the Randomisation Tests*

	Baseline versus DBT				Module A-D versus E1			
Patient numb.	SS	FS	USM	FSM	SS	FS	USM	FSM
3	0.11	0.08	0.69	0.05*	0.52	0.35	0.93	0.95
4	0.91	0.21	0.42	0.01*	0.60	0.71	0.87	0.78
6	0.40	0.18	0.18	0.05*	0.41	0.77	0.85	0.83
8	0.66	0.59	0.85	0.88	0.04*	0.09	0.39	0.27
10	0.40	0.68	0.68	1[2]	0.93	0.98	0.78	1[2]
11	0.86	0.87	0.51	0.38	0.10	0.10	0.88	0.81
12	0.22	0.34	0.68	º	0.63	0.14	0.03*	º
13	0.08	0.00*	0.92	1[2]	0.66	0.78	0.14	1[2]
14	0.05*	0.21	0.58	0.97	0.24	0.72	0.34	0.49
15	0.64	0.28	0.17	0.08	0.42	[2]	0.85	0.82
16	[1]	[1]	[1]	º	0.36	0.71	1[2]	º
17	[1]	[1]	[1]	º	0.42	0.87	0.01[3]	º
18	[1]	[1]	[1]	[1]	0.85	1[2]	0.45	1[2]

Note. SS = severity of suicidal thoughts; FS = frequency of suicidal behaviour; USM = urge for self-injury; FSM = frequency of self-injury.
º = no data available ; [1] = *no baseline* ; [2] = all scores are equal to zero ; [3] = *false positive*: number in phase B equals zero.
*= $p < 0.05$: the difference between the examined phases is significant.

Discussion

The goal of the current study was to examine the course of the parasuicidal behaviour of BPD patients during DBT and explore whether a reduction of parasuicide could be attributed to a specific module of DBT or whether this reduction is due to a more general effect of DBT. Overall our results suggest that DBT *as a whole* is responsible for treating suicidality and self-injury. Our initial expectation that these decreases in parasuicide would especially occur during the module 'skills for coping with a crisis' could not be confirmed by trend analyses nor by the results of the randomisation test. Trend analyses showed that, for the majority of BPD patients, one or more of the parasuicidal behaviours decreased. Reductions were also found using the randomisation tests, although the number of reductions were smaller as the large variability in individual scores probably caused attenuated statistical power. Trend analyses also showed that the DBT modules 'interpersonal effectiveness skills', 'emotion regulation skills', and 'skills for coping with a crisis' were most important in reduction of the severity and frequency of suicidality. The modules 'emotion regulation skills', and 'skills for coping with a crisis' were most important in reducing the need and frequency of self-injury. Further, according to the randomisation test, only one patient showed significant decreases in parasuicide (specifically in the urge for self-injury and in the severity of suicidal ideation) during 'skills for coping with a crisis' compared to changes during the other DBT modules. The lack of a specific effect in this module or of any of the other modules, suggests that following the whole DBT treatment may be important to reduce parasuicidal behaviour. It also provides some indication that the treatment should be seen as an integrated whole with elements that build on each other and reinforce each other's' effects (e.g., Stepp et al. 2008).

The daily registration of self-injury and of suicidal ideation and behaviour gave a clear view of the erratic course of parasuicide among BPD patients (in accordance with Zanarani et al. 2008, van Goethem et al. 2012). Patient's ratings of one parasuicide behaviour showed frequent, often extreme, changes which matches the instability and impulsivity that characterize BPD. Over time, the variability of these parasuicide-ratings usually reduced. It took a long time, however, before the reduction in suicidality and self-injury abided.

Also strikingly large between-patient differences

were found in the course of parasuicide, as can be seen in the time-series charts. This also applies to the moment at which the decreasing trend of parasuicidal behaviour occurred during DBT, which is in accordance with the diverse expressions of BPD. Furthermore, for some patients we found that self-injury behaviour eventually disappeared while the urge for self-injury reduced but remained present. This means that although patients still thought about self-injury, they used their acquired skills to prevent these thoughts of leading to actual self-injury behaviour. The difference between the urge for self-injury and actual self-injury behaviour should be further examined, as well the efficacy of self-injury compared to adaptive coping skills in reducing tension among BPD patients (see for example, Svaldi et al 2012).

There are some limitations in the current study of which three should be mentioned here. First, due to the unalterable sequence of the treatment modules, a time-effect and order-effect and thus an effect of the whole DBT treatment may have occurred. To be able to determine the specific effect of each DBT-module, these modules should be followed in a random order. Furthermore, a control group should be included to determine whether found changes are caused by DBT and specific DBT modules. Second, although the self-observation list used to assess parasuicide was composed of established instruments, this combined form has not been tested for its reliability and validity before. Furthermore, although self-reports are widely used to assess parasuicide, they can suffer from bias in BPD (Ebner-Priemer et al. 2006). Third, caution should be paid on generalizing our findings to the wider BPD population, because this study contained a small sample of BPD patients.

Nonetheless, longitudinal research including numerous measurement points, such as *single-case* research, is one of the most appropriate research methods for clinical practice; it can be integrated into treatment relatively easily, and is hardly an extra burden for the parasuicidal patient. In concordance with former research (e.g., Rizvi and Nock 2008) we therefore conclude that *single-case* research is, a time- and cost-effective alternative for research on suicidal and self-injury behaviour and also has advantages concerning internal and external validity., Another advantage is that the interim-results of the study can directly be used to improve individual treatment. For example, the results of the time-series charts can be periodically reported to the therapist. These results provide the therapist with more knowledge on the course of the patient's parasuicide which, in turn enables the therapist to anticipate on this development.

Lastly, to date, the primary objective of care is its efficient organization. It is therefore crucial to keep focussing on the effectiveness of treatment. Our study contributes to this objective by providing knowledge on effective ingredients of DBT. It suggests that it may be important to follow all elements of DBT when treating parasuicide among BPD, as no specific effect of the module 'skills for coping with a crisis' was found. Furthermore, as recommended by Linehan (1996), following the DBT treatment cycle for two times seems to be important to attain a sustainable reduction of parasuicidal behaviours.

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