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Efficacy of emotion-regulating improvisational music therapy to reduce depressive symptoms in young adult students: A multiple-case study design

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ABSTRACT

Depression is a serious mental health problem. Therefore, Emotion-regulating Improvisational Music Therapy (EIMT) to prevent depression was developed. The main purpose of this study was to assess effects of EIMT on reducing depressive symptoms in young adult students. A multiple-case study design was used with multiple methods. Eleven cases (female students) were completed and analysed. Nine out of 11 students reported reliable reductions in depressive symptoms at post-test and four-week follow-up. All students reported significant improvement in emotion regulation at post-test and nine out of 11 at four-week follow-up. The group showed significant reduction of depressive symptoms and significant improvement in emotion regulation at post-test. Results remained after four-week follow-up for both outcomes. Qualitative analysis supported these results. Using piecewise multilevel regression analyses, a small significant effect was found for negative, but not for positive affect. Main limitations are a one-site study, with female students and researcher in dual-role. Further research is needed to provide support for generality. Findings demonstrate that EIMT as a preventive intervention can be beneficial for young adult students within a university context to decrease depressive symptoms and negative affect and improve emotion regulation. Multisite studies are indicated to study effects and mechanisms of EIMT.

Introduction

Depression is the most prevalent mental illness worldwide (Vos et al., 2015) and is often a seriously impairing condition (Kessler et al., 2009). It can be viewed as an emotion regulation disorder that impairs the capacity to label and identify affective states (Compare, Zarbo, Shonin, Van Gordon, & Marconi, 2014). Difficulties with emotion regulation are considered to be an important risk factor for the development of depression (Berking, Wirtz, Svaldi, & Hofmann, 2014). Indeed, people who experience depressive symptoms, also tend to experience difficulties in regulating their unpleasant emotional state (Herwig et al., 2018) and show a decrease in positive affect (Joormann & Stanton,

2016).

Young adults are at increased risk of developing depression with a peak rate of onset from 18 to 25 years (Breedvelt et al., 2018) and evidence suggests that the prevalence of depression amongst young adults is high (Barker, Beresford, Bland, & Fraser, 2019). Young adult students face many stressors that can adversely affect their academic performance (Andrews & Wilding, 2004), hence depression represents a significant health concern for universities with up to a third of students affected at any one time (Ibrahim, Kelly, Adams, & Glazebrook, 2013). As such, more attention should be given to the prevention of depression in university settings (Aalbers et al., 2019; Ibrahim et al., 2013).

Indicated prevention is delivered to those at risk for mental illness

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who may experience signs of mental health problems that have not yet developed into diagnosable clinical conditions (Conley, Shapiro, Kirsch, & Durlak, 2017). Common indicated preventive programmes for young adult students are often based on cognitive therapy (Breedvelt et al., 2018; Conley et al., 2017). However, some students may have problems expressing their thoughts and feelings verbally and so the examination of other preventive interventions, such as music therapy are indicated (Aalbers et al., 2019).

Music therapy is the clinical and evidence-based use of music within a therapeutic relationship, conducted by a certified music therapist with the aim of accomplishing individualised goals (American Music Therapy Association, 2018). People use music in everyday life to regulate emotions (Juslin, 2019). Music can reduce stress (De Witte, Spruit, van Hooren, Moonen, & Stams, 2020) and evoke emotions (Koelsch, 2015) and music therapists are trained to use music in their therapeutic relationship to evoke change. Music therapy consists of two main methods, i.e. active and receptive. In active methods participants make music and in receptive methods participants listen to music (Aalbers et al., 2017; Aalbers et al., 2019; Bruscia, 1987; Bruscia, 2014; Edwards, 2016; Wheeler, 2015). A Cochrane review and meta-analysis showed that music therapy, including improvisational music therapy, is effective for depression, decreasing depressive symptoms and anxiety and improving functioning (Aalbers et al., 2017; Erkkila et al., 2008, 2011). Maratos, Crawford, and Procter (2011) suggested that improvisational music therapy may be effective because of the active music making within the therapeutic framework, offering opportunities for aesthetic, physical and relational experiences. Many music therapists consider emotion regulation as a potential benefit of music therapy (Marik & Stegemann, 2016). Recently, the first author developed Emotion-regulating Improvisational Music Therapy (EIMT; (Aalbers et al., 2019) as an indicated preventive programme using music in a therapeutic relationship (De Witte, Pinho et al., 2020), to improve emotion regulation in stressful situations in young students with depressive symptoms. EIMT belongs to the active method of music therapy.

In EIMT, emotion regulation is seen a key feature in depression (Gross, 2014; Herwig et al., 2018; Joormann & Stanton, 2016) and emotion dysregulation an important risk and maintaining factor (Berkling et al., 2014). The music therapist uses the music therapy synchronisation technique to attune with the participant for the purpose of change (Aalbers et al. under revision; Aalbers et al., 2019; Bruscia, 2014; Bruscia, 1987). The synchronisation technique is a mirroring technique, playing what the student does simultaneously in various levels of precision using musical components like pulse or dynamic ((Aalbers et al., 2019; Aalbers et al. under revision; Bruscia, 1987). EIMT addresses five emotion regulation components (Scherer, 2009), i.e. expression, feeling, bodily responses, appraisal, and action-tendencies. By focusing on these emotion regulation components, EIMT aims to improve emotion regulation and reduce depressive symptoms.

Since EIMT has not been previously studied, a multiple-case study design, using qualitative and quantitative data collection (Fetters & Molina-Azorin, 2019; Fetters, Curry, & Creswell, 2013; Creswell & Plano Clark, 2010) was used to assess effects. The design is an efficient first step in evaluating and refining a novel intervention where multiple cases are measured on a regular basis (Gustafsson, 2017; Kazdin, 2011; Van Yperen et al., 2017). It aims to repeatedly demonstrate, per case, that behavioural change takes place when the intervention is applied. The more frequently that cases show behavioural change, the more plausible found effects can be attributed to the intervention (Kazdin, 2011; Van Yperen et al., 2017). Qualitative data was used to enhance understanding of the quantitative results and vice versa, thus validating one database with the other (Creswell, 2015). The Experience Sampling Method (ESM) was chosen as a structured diary technique making it possible to study experiences in everyday situations (Scollon, Kim-Prieto, & Diener, 2003) as shown e.g. in Hartmann et al. (2015), Randall, Rickard and Vella-Brodrick (2014), Telford, McCarthy-Jones, Corcoran and Rowse (2012). The main purpose of the study was to

assess the effects of EIMT in decreasing depressive symptoms in young adult students. Objectives were: (1) Does EIMT reduce depressive symptoms?; (2) Does EIMT improve emotion regulation?; (3) Does EIMT increase positive affect (PA) and decrease negative affect (NA)?

Method

Design

A multiple-case study design was used, including a pre-test, post-test and follow-up assessment using validated questionnaires to collect quantitative data and evaluate EIMT on depressive symptoms and emotion regulation (Fig. 1; Procedural diagram for collecting data). Qualitative data was collected by interviewing students concerning depressive symptoms and emotion regulation. The ESM was applied at the baseline-, intervention- and follow-up-phase using beep-questionnaires on a mobile-phone to collect quantitative data to study PA and NA. The duration of these phases was: (A₁) Baseline-phase consisting of one to three weeks, dependent on randomisation serving as a non-treatment-phase; (B) Intervention-phase of ten weeks with ten weekly EIMT-sessions; (A₂) Follow-up-phase consisting of a four-week non-treatment-phase. The CENT 2015/CONSORT 2010 checklist was used as a reporting-guideline. A process-evaluation was embedded in the design and discussed in (Aalbers et al. under revision).

Participants

Eligible participants were students studying at a university of applied sciences in Leeuwarden, the Netherlands. Inclusion criteria were: (a) having depressive symptoms, assessed with the Inventory of Depressive Symptomatology-Self-Report (IDS-SR; Rush et al., 1986; Rush, Gullion, Basco, Jarrett, & Trivedi, 1996) with a score of >13; (b) aged between 16–40 years; and (c) Dutch speaking. Exclusion criteria were: (a) imminent suicidal thoughts and behaviour; (b) past or current psychotic features; (c) currently receiving music therapy or treatment for depressive symptoms elsewhere. Twenty-two students were assessed for eligibility. Fifteen students met the inclusion criteria, signed informed consent and were enrolled. Eleven students completed the study. Institutional ethics approval was obtained by the Medical Ethical Committee of Medical Centre Leeuwarden (RTPO 1036). Data was stored according to the European Union general data protection regulation (Aalbers et al., 2019; Hoofnagle, van der Sloot, & Borgesius, 2019).

Intervention - EIMT

The EIMT programme aimed to improve emotion regulation and, in return, decrease depressive symptoms after ten weekly sessions lasting 60 min each (Aalbers et al., 2019) (Aalbers et al. under revision). EIMT was person-centered (Greenberg, 2017) and provided face-to-face to individuals by three female music therapists. Two were music therapy trainees and one was a certified Master-trained music therapist, who was the developer/trainer of EIMT. All had more than five years experience in mental health care (medical doctor; nurse; music therapist). To ensure treatment-integrity, all were intensively trained to use EIMT and supervised according to plan. Also, all monitored therapist-integrity and worked with the EIMT-manual. The supervisor was a certified music therapist, trained in EIMT, but not involved in conducting EIMT to prevent bias. The EIMT-manual described a certain degree of flexibility i.e. to apply the synchronisation technique (Aalbers et al., 2019; Bruscia, 1987) and reflection in a way that suited the needs of each individual from moment to moment. The music therapy synchronisation technique, reflection and an emotion regulation card were used to address emotion regulation. The synchronisation technique was used by the therapist as a mirroring technique, doing what the student does simultaneously. Therapists were allowed to make choices concerning the level of precision using musical components like pulse and/or dynamic (Aalbers

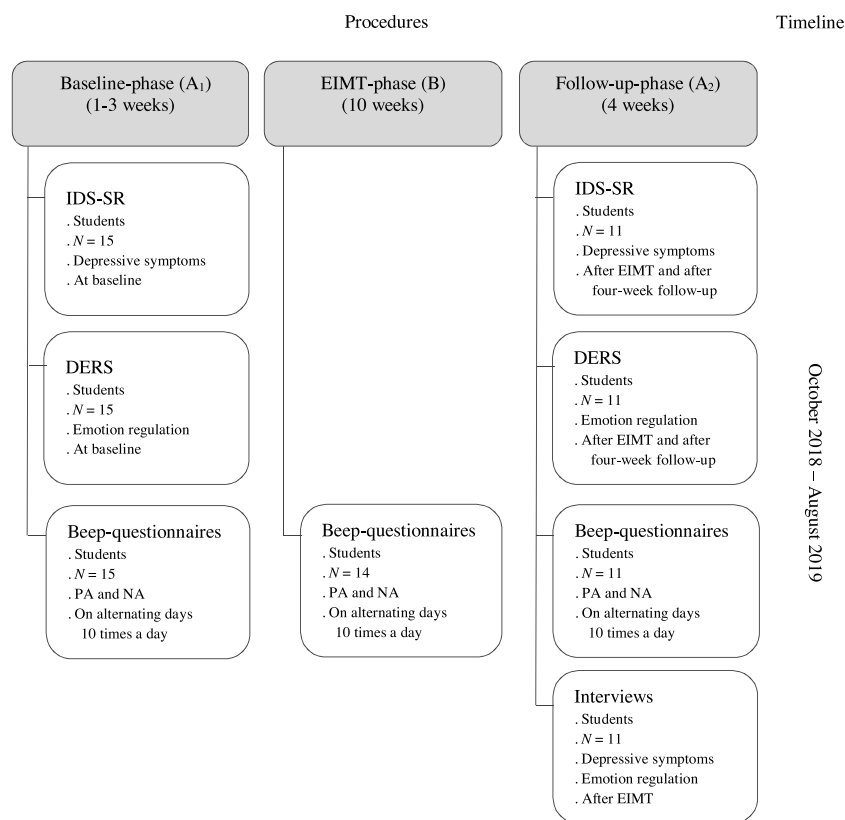


Fig. 1. Procedural diagram for collecting data for the multiple-case study.

et al., 2019; Bruscia, 1987). Both student and music therapist improvised on instruments, i.e. cello, marimba or djembe. The therapist invited the student to choose an instrument and mirrored the students' choice, then encouraged the student to initiate musical improvisation. Thereafter, the therapist constantly synchronised the students' play to attune and emotionally resonate, e.g. using rhythm or sounds. After each improvisation, the student and therapist verbally reflected, using the emotion regulation card. The emotion regulation card visualised emotion regulation processes and referred to the five emotion regulation components (Aalbers et al., 2019; Scherer, 2009).

The programme consisted of three phases. The first phase (three sessions) focused on assessing healthy and unhealthy emotion regulation and formulating a music therapy plan together. In the second phase (five sessions), the emphasis shifted to experience and change emotion regulation components. Phase three (two sessions) was designed to maintain healthy emotion regulation in daily life, evaluate and say goodbye. To increase adherence, students received an emotion regulation card and the music therapist and student came up with and discussed homework. Each session was identically structured and consisted of the following phases, i.e. welcome, discuss homework, improvisation, reflection, improvisation, reflection, come up with homework, and short evaluation of the session. Homework is not very common in music therapy unlike in cognitive therapy (Mausbach, Moore, Roesch, Cardenas, & Patterson, 2010). Homework involved discussing what may be helpful to do and practise at home to improve emotion regulation in daily situations, e.g. listen or play music, walk or talk to feel or express. EIMT took place in an accessible music room in the university building with sufficient levels of privacy and few ambient sounds (Aalbers et al., 2019).

Instruments

To measure depressive symptoms, the Inventory of Depressive

Symptomatology Self Report (IDS-SR; Rush et al., 1986, 1996) was used. The IDS-SR is a 30-item validated and sensitive self-report questionnaire measuring severity of depressive symptoms and measures all symptom domains, as listed in the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013). Each item has four statements that reflect degrees of symptom severity, scored on a four-point scale from 0 to 3 (0 = no symptoms; 3 = maximum symptoms). The total-score is based on 28 items and ranges from 0–84. A sum-score from 0 to 13 was defined as not depressed, 14–21 as mildly depressed, 22–30 as moderately depressed, 31–38 as severely depressed and ≥ 39 as very severely depressed (Rush et al., 1996). In a study amongst 596 adult outpatients with chronic, nonpsychotic major depressive disorder (MDD), high internal consistency was found ($\alpha = .92$) (Rush et al., 2003). Students completed the IDS-SR online at baseline, after EIMT and after four-week follow-up.

To measure emotion regulation, the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) was used. The DERS is a validated 36-item self-report measure to assess six emotion regulation dimensions: nonacceptance, goals, impulse, strategies, clarity, and awareness. Each item is scored on a five-point Likert-scale (1 = almost never; 5 = almost always) based on how often students believe each item pertains to them. The total-score ranges from 36–180. In a study amongst 428 adolescent outpatients high internal consistency was found ($\alpha = .76-.89$). The DERS exhibited robust correlations with psychological problems reflecting emotion dysregulation, specifically depression. Intercorrelations amongst DERS-subcales ranged from negligible to high (range: $r = .04$ to $r = .68$) (Weinberg & Klonsky, 2009). A study amongst 870 Dutch adolescents supported these results (Neumann, van Lier, Gratz, & Koot, 2010). Students completed the DERS online at baseline, after EIMT and after four-week follow-up.

To measure PA and NA, a beep-questionnaire on a mobile telephone (PsyMate device; <http://www.psymate.eu>) was used to assess PA ('happy', 'energetic', 'relaxed', 'satisfied') and NA ('anxious', 'irritated',

'lonely', 'sad'). Each of the eight items were scored on a seven-point Likert-scale ranging from 1 to 7 (1 = not at all; 7=very). During each phase (A₁-B-A₂), at ten random moments on alternating days, between 7.30–22.30 hours, students were asked to assess short questions, e.g. 'I feel happy'; 'I feel relaxed'. Method, items, frequency and moments were based on earlier conducted ESM-studies for depression (Dunn, 2012; Hartmann et al., 2015; Telford, McCarthy-Jones, Corcoran, & Rowse, 2012). Final decisions of items were made after discussions with the research team, an expert in ESM and student-counsellors. Data was collected online, and automatically processed to an anonymised central database (Van Os, Delespaul, Wigman, Myin-Germeys, & Wichers, 2013).

To evaluate depressive symptoms and emotion regulation qualitatively, semi-structured face-to-face interviews were administered and audiotaped to retrospectively evaluate experienced depressive symptoms. Each student was interviewed by the principal researcher (SA) in the same week they finished EIMT. Prior to each interview, the researcher examined IDS-SR and DERS and used these as topics for the interview focusing on main issues for each student starting with how the student felt.

Procedure

Data was collected from October 2018 till August 2019 at NHLStenden University of Applied Sciences in Leeuwarden, the Netherlands. Students were recruited through posters, flyers, banners, and student-counsellors. The study followed standard procedures: when a student experienced study problems, they could contact the student-counsellor office. When students reported depressive symptoms, the student-counsellor informed students about interventions, including EIMT. Interested students were asked to give permission to send e-mail, name, and telephone number to the principal-researcher. The researcher contacted the student, planned a face-to-face eligibility assessment and provided verbal and written information about the EIMT-study, including an information-letter and informed-consent-form. Students who agreed to participate were screened for eligibility. Students who met inclusion criteria were contacted after a seven days reflection-period and could sign the informed-consent-form. The researcher invited students to complete the IDS-SR and DERS online at pre-test entering the baseline-phase (A₁ phase) and log onto and use the Psmate-app. Students received a Psmate-manual for support. Also, the researcher randomised students to wait one to three weeks before starting EIMT. The random allocation sequence was generated by an independent statistician (MS) using SPSS version 24 (IBM Corp., 2016). The researcher assigned students to EIMT by e-mailing the music therapist student-name, telephone number, and informed them when to start. The music therapist contacted the student to plan a first EIMT-session (B-phase). Immediately before this session, the researcher contacted the student to log-out and login the Psmate-app entering the B-phase. The researcher monitored data collection processes using a logbook and contacted student on a regular basis via WhatsApp to encourage data collection. Immediately after finishing EIMT, the researcher contacted the student to log-out and login the Psmate-app to enter the follow-up-phase (A₂ phase). Also, students were invited for post-test assessment, completing IDS-SR and DERS online the same week. The researcher checked scores and assessed depressive symptoms and emotion regulation in an interview. At the end of four-week follow-up, the student completed the IDS-SR and DERS online and logged-out of the Psmate-app leaving the study. Students received EIMT for free and could receive additional sessions after the study. Students who did not meet inclusion criteria could contact the student-counsellor for further actions.

Analysis

To analyse the extent of change in depressive symptoms and emotion

regulation per student, pre-test, post-test and four-week follow-up IDS-SR and DERS sum-scores were studied using the Reliable Change Index (RCI) as described in Jacobson and Truax (1992). In order to analyse the extent of reduction of depressive symptoms and increase in emotion regulation for the group, pre-test, post-test and four-week follow-up IDS-SR sum-scores of the group were studied using Friedman and Wilcoxon tests (Sheskin, 2011). All analyses were applied in SPSS version 24 (IBM Corp., 2016). Post hoc tests had a Bonferroni correction applied. The effect size of EIMT for the group was calculated using Z (Sheskin, 2011).

To test whether PA and NA-items constituted two distinct factors, confirmatory factor analysis was used in R (R core Team, 2013) with lavaan (Rosseel, 2012). The two-factor model showed acceptable fit of data, as indicated by some fit indices (CFI = .935, TLI = .904), although the RMSEA was quite large (RMSEA = .120). For this model the $\chi^2(19) = 822$. Compared to the one-factor model ($\chi^2(20) = 2088$), which did not show acceptable fit (CFI = .833, TLI = .766, RMSEA = .187), the two-factor model was a significant improvement ($\chi^2(1) = 1266$, $p < .001$). Subsequently, all students' individual patterns were examined by visual inspection. To obtain a relatively clear picture for each day, the mean score of that day for a particular student was computed. To test an overall effect, two (for NA and PA, respectively) piecewise multilevel regression analyses (Center, Skiba, & Casey, 1985; Huitema & Mckean, 2000) were performed. Piecewise regression models incorporate two linear trends in the model, one before EIMT and one during or after EIMT. This implies that four parameters are estimated and the intercepts and slopes of two regression lines are compared before and after (or during) EIMT. The first parameter in this model is called the intercept indicating the estimated start value of PA or NA of the process. The second parameter indicates change in PA (or NA) immediately after starting EIMT. The third parameter is the trend in the pre-intervention-phase and the fourth parameter, the change in trend in the post-intervention-phase from the pre-intervention trend. Based on preliminary tests, it was considered that measurements from the intervention-phase (B) and the post-intervention-phase (A₂) belonged to one phase.

To examine experienced depressive symptoms and emotion regulation qualitatively, recordings of interviews were transcribed verbatim and processed in MAXQDA 2020 (VERBI Software, 2019). For privacy reasons, transcripts were coded and anonymised. Data analysis involved coding data, i.e. dividing transcripts into small units such as sentences and phrases, assigning a label to each unit and grouping codes into themes. The coding label was an exact word of the student (in vivo coding) or small phrases composed by the researcher close to exact words of the student. These open codings were grouped into broader themes based on the concepts of "depression" and "emotion regulation" (Creswell & Plano Clark, 2010). To enhance reliability, independent researchers experienced in qualitative data analysis randomly double-coded the transcripts (MW) and checked the analysis (MB).

Results

Participant flow and baseline characteristics

Between September 2018 and August 2019, recruitment and follow-up took place. Twenty-two participants ($n = 21$ female; $n = 1$ male) were assessed for eligibility. Seven were excluded. Three did not meet inclusion criteria ($n = 3$ had other treatment). Four declined to participate ($n = 3$ decided to start another treatment; $n = 1$ did not report reason). Fifteen female students signed informed consent, were enrolled and allocated to three different baseline lengths. Four were lost to follow-up, meaning that the researcher lost contact with the student at some point during the research project (Song & Chung, 2010). One of these stopped during the baseline-phase (A₁) due to beep-questionnaire-stress. Three others discontinued during the EIMT-phase (B) ($n = 2$ after one EIMT-session [$n = 1$ due to beep-questionnaire-stress, busy school work

and problems with scheduling EIMT and $n = 1$ due to problems with attendance due to severe physical illness] and $n = 1$ after three EIMT-sessions due to beep-questionnaire-stress and study-stop). Eleven students completed the study. Four of these received EIMT from the principal researcher (S2; S8; S9; S11; 34 of 99 sessions). S2 had a change of music therapist due to illness of the music therapist (Fig. 2; CONSORT flow-diagram participant flow).

Ages of the 11 students ranged from 19 to 30 years ($M_{age} = 23.45$, $SD = 3.33$). Based on the IDS-SR, the group had a mean score of 37.64 ($SD = 9.8$) (severely depressed). One student scored between 14–21 (mildly depressed), one between 22–30 (moderately depressed), three between 31–38 (severely depressed) and six ≥ 39 (very severely depressed) (Table 1).

Depressive symptoms

Nine out of 11 students showed reliable reductions (eight strong improvement; one moderate improvement) in depressive symptoms after EIMT. Two others remained stable (S4; S10). Similar results were gained after four-week follow-up (Table 2).

The non-parametric Friedman test showed a significant decrease of depressive symptoms across the 11 students ($X^2(2) = 15.42$, $p < .01$). Pairwise Wilcoxon tests using Bonferroni correction ($p < .017$) demonstrated that post-test depression values were significantly different from pre-test values ($Z = -2.81$; $p = .005$) as they were at four-week follow-up ($Z = -2.8$; $p = 0.005$) (Table 3/supplemental file).

Using thematic group-analyses, all students reported improvements

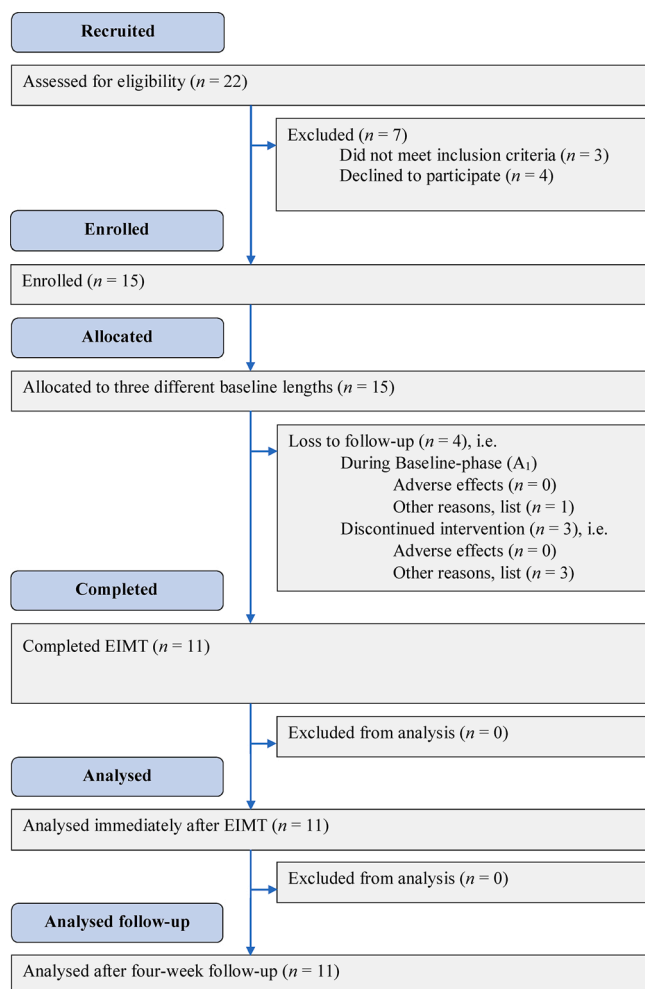


Fig. 2. CONSORT flow-diagram of participant flow through study.

in depressive

symptoms after EIMT. All *felt better*, were less *sad* and less *tense*, but one still felt *tense* (S9 study deadline). All felt less or not *anxious*. Several felt less or not *irritated* and experienced less or no *panic*. One still experienced some *panic* (S9 study deadline). Many experienced more *pleasure and interest*, e.g. enjoyed things more, like listening to or making music, reading, going to school or work, or experienced more joy together, meeting friends or family more often. A few lost *weight* due to loss of *appetite* (S9 Ritalin; S10 nausea, study stress (S9), food intolerance (S10) or increased movement (S1; S9). One gained weight due to not feeling at home after moving (S8). Many experienced an improved *sleep*, i.e. fell easier to sleep, slept better throughout the night, slept sufficient hours or felt more rested. Many experienced less *psychomotor agitation* and a couple experienced less *retardation*. One experienced less of a heavy feeling. Many reported having more *energy*, e.g. feeling less tired or better able to perform activities. Many experienced less *feelings of worthlessness or guilt*. Several experienced a better self-concept. One experienced some worsening in recurrent thoughts of what others may think of them, doing things differently (S5). Several experienced improved *concentration*. A few were more positive about their future, one experienced life as less empty and a couple did not have recurrent thoughts of death anymore.

Emotion regulation

All students showed reliable changes ($n = 10$ strong improvement; $n = 1$ moderate) after EIMT. At four-week follow-up, nine students gained similar results ($n = 8$ strong; $n = 1$ moderate). One remained stable. S2 reported a strong worsening of emotion regulation and reported to be recently diagnosed with attention deficit hyperactivity disorder (ADHD) (Table 4).

The non-parametric Friedman test showed a significant improvement of emotion regulation across the eleven students ($X^2(2) = 11.09$, $p < .01$). Pairwise Wilcoxon tests using Bonferroni correction ($p < .017$) demonstrated that emotion regulation values at post-test were significantly different from pre-test values ($Z = -2.76$; $p = 0.006$) as they were at four-week follow-up ($Z = -2.8$; $p = 0.008$) (Table 5/supplemental file).

Using thematic group-analyses, all students reported improvements in emotion regulation after EIMT. All felt better able to *accept* their feelings, i.e. mostly their negative feelings. A few felt better able to accept their possibilities or behaviour. A few felt better able to accept themselves. All experienced less difficulties with *goal-directed behaviour*. Many felt more motivated, and several felt better able to do and finish things. Several felt better able to make decisions or experienced more action tendencies. A few felt more open for their environment. All experienced more *impulse control*. Several felt easier to weigh up what to do or felt that feelings were less overwhelming. Many experienced more emotional *awareness*. Several felt better able to feel or were more aware of feelings and bodily responses. Some experienced they paid more attention to feelings. A couple experienced more variety in feelings or were more aware of their behaviour. All students experienced a wider variety in *emotion regulation strategies* to make themselves feel better. All felt better able to cope with themselves, their feelings, others, work, or study. Also, all felt better able to reappraise situations, e.g. worry less, think more positive, think more logically, or take situations less seriously. Furthermore, all experienced feeling better able to talk about their feelings, both negative and positive. Many felt better able to do things to feel better, like be more open for others or make or listen to music. Many experienced more emotional *clarity* i.e. felt better able to make sense of their subjective feelings, mostly their negative feelings. None reported a worsening of emotion regulation.

PA and NA

Fig. 3. shows data for PA and NA for each student with a linear fit line for each phase of the design included to highlight trend, together with

Table 1
Baseline demographic and clinical characteristics of the 11 students.

ID	Age	Ethnicity	Live	Education level	Payed work	Study grant	Musical instrument	IDS-SR	DERS
S1	22	German	away	high	no	no	yes	45	138
S2	22	German	away	middle	yes	no	yes	31	96
S3	23	German	away	high	no	yes	yes	34	102
S4	21	German	away	middle	no	no	yes	18	83
S5	25	Dutch	away	middle	yes	no	no	43	142
S6	30	Dutch	away	middle	no	no	yes	44	115
S7	19	Dutch	at home	middle	yes	yes	yes	25	109
S8	22	Dutch	away	high	no	yes	yes	42	99
S9	29	German	away	high	no	yes	yes	47	96
S10	23	Dutch	away	middle	no	yes	no	36	94
S11	22	Dutch	away	middle	yes	yes	yes	49	111
Mean	23.45	-	-	-	-	-	-	37.64	107.73
SD	3.33	-	-	-	-	-	-	9.8	18.28

Note. ID = identification; Education = Level of successfully completed education.

Table 2
Impact of EIMT on primary outcome depressive symptoms using IDS-SR within students.

ID	T0	T1	T2	RCI T0-T1	Change T0-T1	RCI T0-T2	Change T0-T2
S1	45	24	26	5.05	++	4.57	++
S2	31	16	16	3.61	++	3.61	++
S3	34	14	13	4.81	++	5.05	++
S4	18	18	10	0	+-	1.92	++
S5	43	24	18	4.57	++	6.01	++
S6	44	22	38	5.29	++	1,44	+-
S7	25	18	15	1.68	+	2.41	++
S8	42	9	7	7.94	++	8.42	++
S9	47	24	18	5.53	++	6.98	++
S10	36	33	36	.72	+-	0	+-
S11	49	26	18	5.53	++	7.46	++

Note. ID = identification; IDS-SR = Inventory of Depressive Symptomatology Self-Report; T0 = pre-test; T1 = post-test; T2 = follow-up; RCI = Reliable Change Index (++ = strong improvement; + = moderate improvement; +- = stable).

the 95 % confidence band. The red part represents the pre-intervention-phase, the green part the intervention-phase and the blue part the post-intervention-phase. The figure illustrates large individual differences in patterns and a lot of variability within individuals. The patterns for PA seem more often positive (increasing scores) and for NA more often negative.

Table 6 and Fig. 4. (Fig. 5./6./supplemental files) show the results of the piecewise multilevel regression analyses across the eleven students for PA and NA, respectively. Random effects were assumed for the intercept and the phase change. Due to convergence problems, no random slope effect was included; the slope effect was only included as a fixed effect in these models. For PA there was a positive trend visible. However, all effects were small and not statistically significant. Both before and after EIMT there was no significant trend. The variance of the random intercept effect was 0.512. For the random phase change effect, the variance was .396. Correlation between the two random effects was -.74. The intraclass correlation for PA was .73. For NA there was a negative trend visible. The trend in the EIMT-phase (B) was small but

Table 3
Impact of EIMT on primary outcome depressive symptoms using IDS-SR across students.

	N	T0 Mean (SD)	T1 Mean (SD)	T2 Mean (SD)	T0-T1-T2 X^2 * (p)	T1-T0 Z ** (p)	T2-T1 Z (p)	T2-T0 Z (p)
Depressive symptoms	11	37,64 (9.82)	20,73 (6.57)	19,55 (9.92)	15.42 (.000)	-2.81 (.005)	-1.07 (.28)	-2.8 (.005)

Note. IDS-SR = Inventory of Depressive Symptomatology Self-Report; T0 = pre-test; T1 = post-test; T2 = follow-up; * X^2 = Friedman test; ** Z = Wilcoxon test.

statistically significant. Other effects were not statistically significant. The variance of the random intercept effect was .718, and for the random phase change effect .263. Correlation between the two random effects was -.42. The intraclass correlation for NA was .44.

Discussion

Results showed a decline in depressive symptoms after EIMT. This effect remained after four week follow-up. Overall, qualitative data supported these results, i.e. all students felt better, less sad, less tense and less or not anxious anymore. Several felt less or not irritated or panicked anymore. Many experienced more pleasure and interest, slept better, felt more energy, felt less psychomotor agitation or less retardation and felt less worthlessness or guilt. Several experienced a better self-concept and improved concentration. Some reported being more positive about their future, feeling life as less empty or not having recurrent thoughts of death anymore. Some lost or gained weight. One worried sometimes what others may think of her, doing things

Table 4
Impact of EIMT on secondary outcome emotion regulation using DERS within students.

ID	T0	T1	T2	RCI T0-T1	Change T0-T1	RCI T0-T2	Change T0-T2
S1	138	85	86	6.76	++	6.63	++
S2	96	83	116	1.66	+	-2.55	--
S3	102	67	60	4.46	++	5.36	++
S4	83	100	79	2.17	++	.51	+-
S5	142	104	113	4.85	++	3.7	++
S6	115	73	101	5.36	++	1.79	+
S7	109	83	75	3.32	++	4.34	++
S8	99	73	77	3.32	++	2.81	++
S9	96	67	57	3.7	++	4.97	++
S10	94	75	69	2.42	++	3.19	++
S11	111	80	66	3.95	++	5.74	++

Note. ID = identification; DERS = Difficulties in Emotion Regulation Scale; T0 = pre-test; T1 = post-test; T2 = follow-up; RCI = Reliable Change Index (++ = strong improvement; + = moderate improvement; +- = stable; -- = strong worsening).

Table 5
Impact of EIMT on secondary outcome emotion regulation using DERS across students.

	N	T0 Mean (SD)	T1 Mean (SD)	T2 Mean (SD)	T0-T1-T2 X^2 * (p)	T1-T0 Z ** (p)	T2-T1 Z (p)	T2-T0 Z (p)
Emotion regulation	11	107.73 (18.28)	80.91 (12.13)	81.73 (20.27)	11.09 (.004)	-2.76 (.006)	-.27(.79)	-2.8 (.008)

Note. DERS = Difficulties in Emotion Regulation Scale; T0 = pre-test; T1 = post-test; T2 = follow-up;
* X^2 = Friedman test; ** Z = Wilcoxon test.

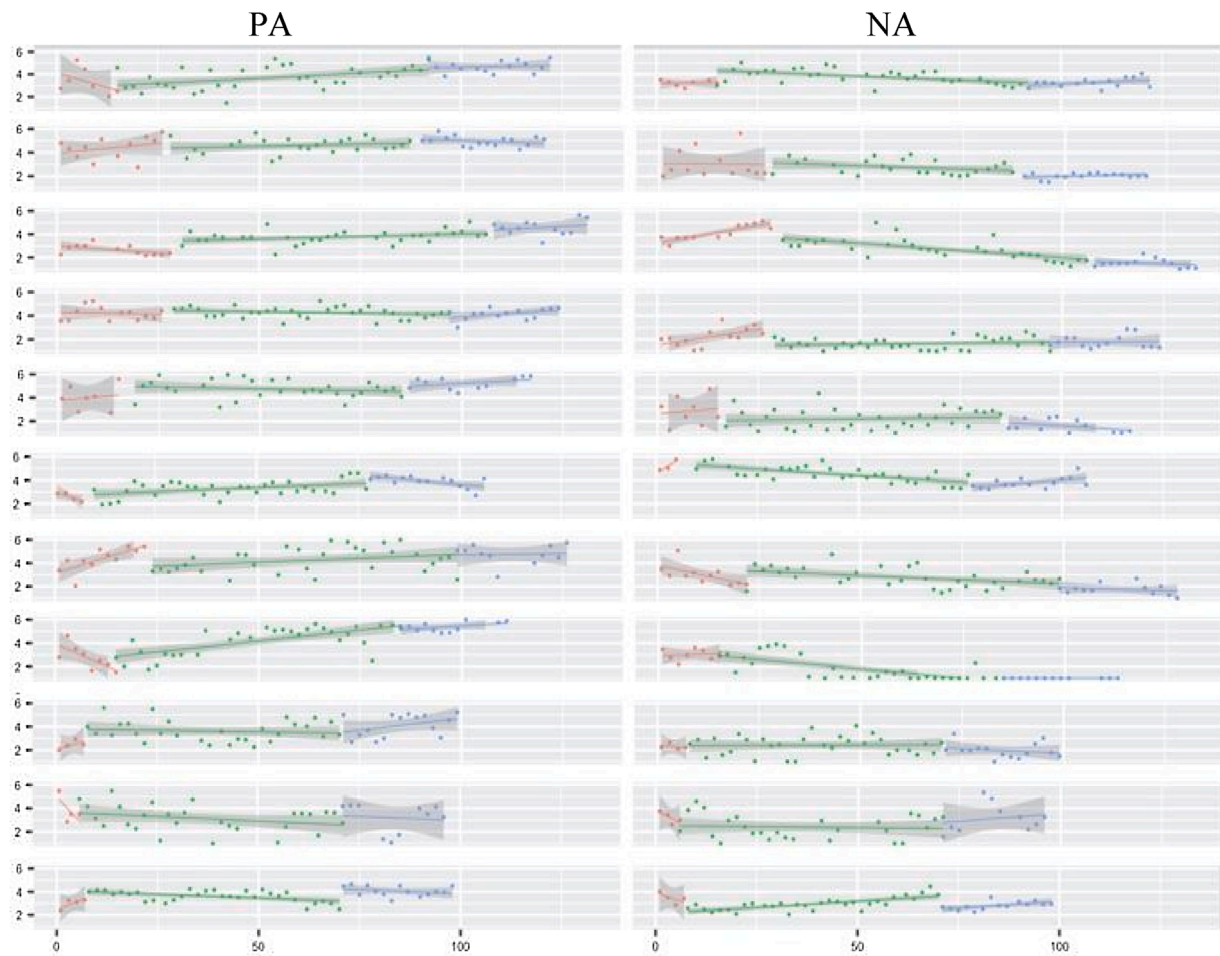


Fig. 3. Trend graphs for PA and NA scores showing pre-intervention (A₁), intervention (B) and follow-up (A₂) phase and day for each student.

Table 6
Results piecewise multilevel regression analysis of PA and NA across students.

Outcome	Parameter	Estimate	SE	df	t	p	CI	
							2.5 %	97.5 %
PA	Intercept	3.403	.259	14.46	13.157	.000	2.884	3.920
	Phase change	.145	.255	18.57	.570	.576	-.362	.649
	Slope_fase1	.007	.013	500.93	.518	.605	-.019	.033
	Slope_change_fase2	.002	.013	496.37	.144	.886	-.025	.028
NA	Intercept	3.125	.285	11.77	10.946	.000	2.547	3.702
	Phase change	.117	.217	21.67	.538	.596	-.312	.545
	Slope_fase1	.018	.012	481.81	1.519	.129	-.005	-.041
	Slope_change_fase2	-.028	.012	475.53	-2.358	.019	-.052	.004

Note. Intercept = estimated start value of PA or NA of the proces; Phase change = change in PA or NA immediately after starting EIMT; Slope_fase1 = trend in the pre-intervention-phase; Slope_change_fase 2 = change in trend in the post-intervention phase from the pre-intervention trend; CI = confidence interval.

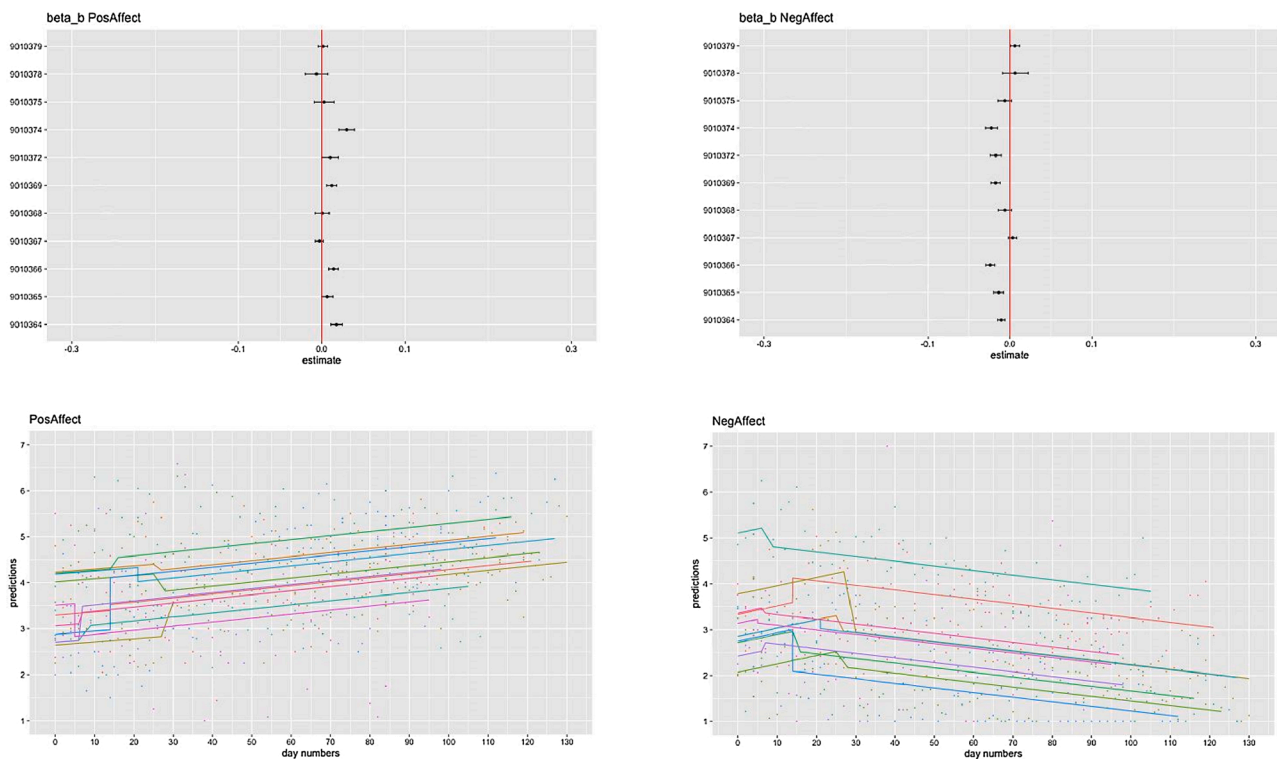


Fig. 4. Piecewise multilevel regression analysis plots and graphs for PA and NA showing intervention-follow-up (BA₂) phase for each student.

differently. The quantitative results are in line with previous randomised controlled trials on the effects of improvisational music therapy amongst adults with MDD (Erkkilä et al., 2011) and children and adolescents with a diverse range of diagnoses to include behavioural and emotional problems and developmental disorders (Porter et al., 2017). In Erkkilä et al. (2008, 2011) psychodynamic improvisational music therapy, based on principles of analytical music therapy (Priestley, 1994), was applied to encourage and engage a client in expressive musical interaction to address thoughts, images, emotional content and expression (Erkkilä et al., 2008). This approach resulted in a decrease in depressive symptoms and anxiety and an improvement in functioning. In Porter et al. (2017) the intervention was based on the principles of the Alvin model 'Free improvisation' (Bruscia, 1987) to encourage a client to create music and free sounds to address communication and interpersonal skills resulting in a decrease of depressive symptoms and improved communication and self-esteem. EIMT was different from interventions in these studies as it was based on the principle that emotion regulation was considered a key factor in depression (Berkling et al., 2014; Gross, 2014) and that EIMT may decrease depressive symptoms by focusing on emotion regulation as a possible working factor using the synchronisation technique (Aalbers et al., 2019; Bruscia, 1987; Koelsch, 2015). More specifically, EIMT addresses the five components of emotion regulation (Scherer, 2009). Added value of the study is that emotion regulation was monitored as a secondary outcome.

Concerning emotion regulation, results showed improvements after EIMT that were maintained at four-week follow-up. Qualitative data supported these results, i.e. all felt better able to accept negative feelings and show goal-directed behaviour, e.g. be more open, feel motivation and action tendencies, make decisions, do and finish things. All experienced more impulse control, e.g. weigh up what to do or feel less overwhelmed. Many experienced more emotional awareness, like being able to pay attention to feelings, feel feelings and bodily responses and experience variety in feelings. All experienced a wider variety in emotion regulation strategies to make themselves feel better, e.g. reappraise situations, worry less, think more positive and logically, talk about feelings, do things to feel better like make or listen to music. Many

experienced more emotional clarity, i.e. felt better able to make sense of their negative feelings. None reported a worsening of emotion regulation.

To our knowledge, this was the first study to examine emotion regulation in improvisational music therapy. The results seem to give support for the assumption that EIMT affects emotion regulation. This is in line with Fachner, Gold, and Erkkilä (2013) who found that improvisational music therapy may induce neural reorganisation in fronto-temporal areas in adults with MDD, indicating effects on cortical activity in depression and suggesting a positive impact on anxiety. These findings emphasise the importance of future research to elucidate causal relationships and examine whether emotion regulation may be a mechanism in EIMT to alleviate depressive symptoms. Regarding experiences with EIMT, both students and music therapists reported its elements were helpful to affect emotion regulation, e.g. improvisation evoked feelings; the synchronisation technique (Bruscia, 1987) helped to attune and emotionally resonate, synchronisation to evoke meaningful moments, deep feelings and feeling heard; musical instruments evoked feelings of success and facilitated feeling physically and expressing; the musical component rhythm seemed helpful for music therapists to synchronise with the students' improvisation (Aalbers et al. under revision).

For PA, no effect in time was observed. However, over time students experienced more pleasure and interest and enjoyed things more, like listening to or making music or going to school or work. Students seemed to not focus on improving PA, but rather tried to improve emotion regulation strategies to cope with negative feelings. One of the things to bear in mind is that different concepts are studied. Depressive symptoms, affect and emotion regulation are different dimensions, e.g. experiencing pleasure after EIMT is different from feeling happy in daily situations and different from having strategies to cope with feelings (Ekkekakis, 2013). For future music therapy studies, it is worthwhile to thoroughly describe principles and outcomes of interventions. Using measures in line with these concepts may lead to a richer understanding of complex interventions, such as improvisational music therapy (Craig et al., 2008; Tonkin-Crine et al., 2016).

Regarding NA, there was a small reduction during and after EIMT, which was maintained at four-week follow-up. These findings are convergent with the decrease in depressive symptoms (IDS-SR; Rush et al., 1986, 1996) and results from the interviews suggest that students seemed particularly focused on regulating negative feelings to feel better in daily situations. Erkkilä et al. (2011) also found that improvisational music therapy decreased anxiety and Punkanen, Eerola, and Erkkilä (2011) suggested that depressed individuals tend to evaluate emotions negatively compared to healthy controls in music therapy. These findings support the usefulness of the students' strategy to focus and improve emotion regulation strategies of negative feelings in particular.

Limitations

Some limitations should be noted. Only female students from one site participated in this study. Nevertheless, the sample size was sufficient to explore and gain insight in the effects of EIMT as novel intervention for young adult students with depressive symptoms. Further research is needed, with similar population groups and at other sites, to replicate findings and provide support for generality (Kazdin, 2011). Trials are indicated (Aalbers et al., 2017), but multiple-case study designs may be well-accepted in contexts with limited caseloads or situations where interventions were not implemented before (Aalbers, Spreen, Bosveld-van Haandel, & Bogaerts, 2017; Kazdin, 2011). Also, the follow-up timepoint in this study was four weeks after EIMT. Therefore, we do not know how long-lasting the effects really are (Kazdin, 2011). Thirdly, the principal researcher had an unexpected dual-role being researcher-therapist that may lead to bias and overestimation of the effect. Using additional Wilcoxon and Friedman tests, no significant differences were found in levels of depressive symptoms at post-test and follow-up between students that were treated by the researcher-therapist and the two music therapy-trainees. A question which remains unanswered is to what extent the frequent administration of the beep-questionnaires may have led to a confounding effect, e.g., inadvertently influencing the magnitude of the effects (Howards, 2018; Munkholm, Faurholt-Jepsen, Ioannidis, & Hemkens, 2020; Verhagen, Hasmi, Drukker, van Os, & Delespaul, 2016). Furthermore, many of the participating students, including three of four students who dropped-out early, reported feeling stressed due to the frequency of the beep-questionnaires and the use of the mobile-phone. Beep-questionnaires can be useful to gain insight into experienced effects of EIMT in daily situations of participants (Scollon et al., 2003). The ESM yields a rich data set covering information on mental states and may reduce the need of separate questionnaires measuring different constructs, including gaining insight in social networks at different timepoints (Verhagen et al., 2016). Nevertheless, when participants experience stress due to the chosen data-collection strategies, this may lead to impact on a study in terms of unnecessarily high dropout rate not specifically related to experiences with EIMT. Lastly, regarding the qualitative analysis, due to the presentation of the data at group level, less can be said about meaningful experienced health outcomes of individual students.

Implications

EIMT was developed and administered to improve emotion regulation and reduce depressive symptoms (Aalbers et al., 2019). It is recognised that improving emotion regulation is important across a variety of forms of psychopathology (Jazaieri, Urry, & Gross, 2013). Our findings may raise the question whether people of other groups and/or with other mental health problems may also take advantage of EIMT. Further implementation and testing may be indicated to strengthen evidence on the efficacy and gain insight in mechanisms of EIMT, on a wider population and in other contexts.

Also, to our knowledge, this improvisational music therapy study was the first to use ESM and study affect. For music therapists and

clients, it may be of value to use ESM to gain insight into experiences in everyday situations (Scollon et al., 2003). Researchers should consider the frequency of beep-questionnaires and control for confounding in future studies (Howards, 2018; Munkholm et al., 2020; Verhagen et al., 2016). Furthermore, longer time-frames are needed to strengthen the evidence on the long-term efficacy of EIMT (Kazdin, 2011; Van Yperen et al., 2017). Lastly, in future studies, it may be worthwhile to acknowledge integrity of the cases and also study qualitative data within individuals.

Conclusion

This study provides support for the effects of Emotion-regulating Improvisational Music Therapy (EIMT) as an indicated preventive programme for young adult students with depressive symptoms within a university context, to decrease depressive symptoms and negative affect and to improve emotion regulation. Further implementation of EIMT in university contexts and other contexts and with other populations is indicated, including monitoring change in health outcomes and studying mechanisms.

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Declaration of Competing Interest

None.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.aip.2020.101720>.

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