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Eye Movement Desensitization and Reprocessing (EMDR) Therapy as a Feasible and Potential Effective Treatment for Adults with Autism Spectrum Disorder (ASD) and a History of Adverse Events

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Abstract

The study investigated whether EMDR is a feasible therapy for adults with ASD and a history of adverse events, and whether it is associated with reductions in symptoms of PTSD, psychological distress and autism. Participants received 6 to 8 weeks treatment as usual (TAU), followed by a maximum of 8 sessions EMDR added to TAU, and a follow-up of 6–8 weeks with TAU only. Results showed a significant reduction of symptoms of post-traumatic stress (IES-R: $d = 1.16$), psychological distress (BSI: $d = 0.93$) and autistic features (SRS-A: $d = 0.39$). Positive results were maintained at follow-up. The results suggest EMDR therapy to be a feasible and potentially effective treatment for individuals with ASD who suffer from the consequences of exposure to distressing events.

Keywords EMDR · Trauma · PTSD · Autism spectrum disorder · ASD · *Diagnostic overshadowing*

Introduction

Until now the feasibility and effectiveness of trauma-focused treatment for adults with autism spectrum disorder (ASD) has not been studied systematically, despite studies suggesting an *elevated risk* for experiencing adverse events and revictimization (Kerns et al. 2015). ASD can be characterized as a different way of sense-making and as a problem with self-regulation, which is reflected in problems in social communication and interaction and restricted and repetitive patterns of behavior or interests (De Jaegher 2013). These problems make individuals with ASD more susceptible to psychosocial consequences of exposure to trauma and adverse events (Roberts et al. 2015). For example, Wood and Gadow (2010) hypothesized that ASD-related sensory hyper-reactivity to daily stimuli, social confusion, incomprehension and rejection by others may lead to clinically significant anxiety. It has been argued that exposure to adverse events inhibits the ability to detect violations (DePrince 2005) and exacerbates already impaired emotion regulation problems in youth with ASD (Mazefsky et al. 2013). These factors may negatively influence the ability to cope with future stressors and elevate the risk of revictimization (Classen et al. 2005; Culatta et al. 2017).

For a good understanding of our study, it is important to clarify the terms 'trauma' and 'adverse events'. First, in order to define trauma, we have used criterion A in relation to post-traumatic stress disorder (PTSD) in accordance with the Diagnostic and Statistical Manual *DSM-5* (2013). The term a*dverse events* is used to refer to a broader concept of negative or distressing events. With regard to the latter, there is a growing body of research that pertains to the prevalence of exposure to adverse events in children with ASD, and the consequences in terms of physical and mental

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health (Hall-Lande et al. 2015; Berg et al. 2016; Rigle 2017). For example, in a population-based study, Berg et al. (2016) found that children with ASD reported a significantly higher level of exposure to neighborhood violence, parental divorce, mental illness and substance abuse in the family, and significantly higher levels of cumulative adverse childhood experiences compared to children without ASD. This difference is especially pronounced in lower income families (Kerns et al. 2017).

Few studies have investigated the consequences of exposure to trauma and the prevalence of PTSD in *children* with ASD (Mandell et al. 2005; Methar and Mukadess 2011; Brenner et al. 2017). For example, Methar and Mukaddes (2011) found that 26% of 69 clinically treated children with ASD reported a history of trauma, and that 17% of this sample could be diagnosed with PTSD. Recently, a study by Brenner et al. (2017) found that only 7 of the 99 autistic children and adolescents who were exposed to physical, sexual, and/or emotional abuse were diagnosed with PTSD. Their caregivers reported more severe and externalized symptoms, especially fearful behavior and temper tantrums, than those who had been exposed to abuse, but not diagnosed with PTSD. Those who are not diagnosed with PTSD reported significantly more trauma related symptoms than those who did not report abuse. According to our knowledge, no previous study has investigated the consequences of exposure to trauma and prevalence of PTSD in *adults* with ASD.

Exposure to trauma does not automatically result in PTSD and has been found to be associated with many other forms of psychopathology, with the strongest link to anxiety and depression (Copeland et al. 2007). Anxiety and mood symptoms were found in 50 up to 70% of children and adults with ASD (Bruin et al. 2007; Hofvander et al. 2009; Lugnegård et al. 2011). One study showed that nearly 90% youth with ASD and clinical-level mood symptoms reported at least one trauma, compared to 40% of those without mood symptoms (Taylor and Gotham 2016). Thus, also in people with ASD there seems to be a strong association between exposure to trauma and presence of depressive disorders.

Several authors reported a risk of *overlooking* a history of adverse events, trauma and symptoms of PTSD in adults with ASD, because the different sense-making in persons with ASD may prevent them from recognizing and communicating about their experiences (King 2010; Kerns et al. 2015). Another possible reason for overlooking this is that symptoms attributed to ASD might in fact be stress reactions to adverse events or trauma, a phenomenon termed *diagnostic overshadowing* (Grubaugh et al. 2008). For example, hyperarousal and numbing—symptoms of PTSD—overlap with the autistic symptom of hyper- respectively hypo-reactivity to sensory stimuli. Feelings of detachment of others—a symptom of PTSD—overlap partly with deficits in social-emotional reciprocity (Brenner et al. 2017). A reduced ability to mentalize and recognize emotions is seen in both people with PTSD and in people with ASD (Plana et al. 2014). Also, there is an overlap between the ASD related symptoms of perseveration and rumination, mood disorder related behavioral symptoms and the criterion *negative cognitions and mood* due to PTSD. Hence, both trauma and symptoms of PTSD can be overlooked or overshadowed by autistic features and therefore remain untreated.

Eye movement desensitization and reprocessing (EMDR) therapy and trauma focused cognitive behavioral therapy (TF-CBT) are the preferred methods for treating PTSD in the general population (Bisson et al. 2013; World Health Organization 2013). However, little is known about the feasibility of trauma-focused treatments in adults with ASD, and whether these treatments have the potential to be effective for adults with ASD who suffer from the consequences of exposure to adverse events and trauma. Especially people with severe PTSD symptoms but no formal diagnosis of PTSD [for example because they do not meet criterion A of trauma according to *DSM-5* (2013)], are at risk to be excluded for trauma treatment (Van den Berg et al. 2017). This affects persons with ASD, who—as argued—are at elevated risk of experiencing a history of adverse events. In addition, people with ASD are often excluded from participating in research (Spinazzola et al. 2005). Interestingly, until now only two case studies have been published describing the treatment of trauma with EMDR therapy in adults with ASD with an average level of intellectual ability (Kosatka and Ona 2014; Mevissen 2008), both with promising results. There are indications that some of the symptoms attributed to the diagnosis of autism in people with ASD and intellectual disabilities diminish after treatment with EMDR therapy (Barol and Seubert 2010; Mevissen et al. 2011, 2012). However, the feasibility and effectiveness of EMDR therapy and TF-CBT for PTSD symptoms in adults with ASD with an estimated IQ of 80 and above have not been demonstrated as yet.

Clinicians may hesitate to address the memories of trauma in adults with ASD, because of fear that psychiatric symptoms will increase. Also, clinicians lack confidence in their ability to help them with their trauma related symptoms and focus instead on other pressing treatment issues like finding solutions for daily stressors (Frueh et al. 2006). Thus, knowledge of the feasibility and potential effectiveness of EMDR therapy may contribute to the adequate treatment of symptoms of PTSD in adults with ASD.

The first aim of the present study was to investigate whether EMDR therapy has the potential to be a treatment for adults with ASD and a history of adverse events by testing whether it is feasible to deliver EMDR therapy without adapting the standard EMDR procedure for children (De Roos et al. 2014), and without a procedure focused on stabilizing, i.e., coping with trauma related symptoms preceding

EMDR therapy. The second aim was to determine whether a maximum of eight sessions EMDR as an adjunct to treatment as usual (TAU) was associated with reductions in symptoms of PTSD, the severity of psychological distress and autistic features in adults with ASD. Our hypothesis was that (1) EMDR therapy was feasible without adaptations of the standard EMDR procedure for children and (2) the symptoms of PTSD and the severity of psychological distress like depression and anxiety would decrease significantly following treatment with EMDR therapy added to TAU in comparison to the waiting list condition of TAU only, and that the results would persist over a follow-up period of 6–8 weeks. Given the likelihood of *diagnostic overshadowing* we also hypothesized that application of EMDR therapy is associated with a reduction of autistic features, especially with problems in social communication and interaction.

Methods

Design

The study had a non-randomized add-on design consisting of three phases, in which participants were their own controls. In the first phase participants received TAU during 6 to 8 weeks while on the waiting list for EMDR therapy. The second phase consisted of up to 8 sessions EMDR in addition to TAU. The third phase comprised of a follow-up period with the TAU only condition. All procedures performed were in accordance with the ethical standards of the institutional research committee. The study was registered in the Dutch Trial Register (NTR) as 4909.

Participants

Participants were adults with ASD and a history of one or more adverse events and/or trauma, who experienced their functioning in daily life as impaired due to exposure to these events. The DSM-IV diagnosis of ASD had been established earlier by experienced clinicians according to national guidelines (Kan et al. 2013), using multiple sources of information to establish a diagnosis of ASD such as diagnostic interviews with patients and relatives, semi-structured clinical interviews based on the Autism Diagnostic Interview revised (ADI-R) (Lord et al. 1994), a DSM-IV checklist, and all available information from school- and child psychiatric services concerning childhood development. Participants were recruited between October 2014 and June 2016 from outpatient services of three mental health institutes and two private practices, all specialized in ASD in The Netherlands. All persons with ASD and a suspicion of PTSD were approached by clinicians of these institutes and private practices as potential participants and subsequently

informed about the study. The potential participants were adults with persistent psychological complaints. Next, the EMDR therapists who participated in the study assessed participant suitability for EMDR therapy and checked the inclusion and exclusion criteria. If the potential participants fulfilled the criteria, the EMDR therapists asked them for informed consent.

Inclusion criteria:

– Age ≥ 18 years old.
– Estimated IQ above 80, based upon previous levels of education.
– A clinical DSM-IV-TR diagnosis of autistic disorder, Asperger's disorder or PDD-NOS.
– A clear relationship between symptoms of PTSD and adverse events, reflected in a score of 4 or higher on the 'thermometer card' of the Adapted Anxiety Disorders Interview Schedule-Children (ADIS-C) section PTSD version for adults with mild to borderline intellectual disabilities (Mevissen et al. 2016).
– Consent from the participant to record the EMDR therapy sessions on video or audio for supervision and assessing therapy integrity.

Exclusion criteria:

– Not proficient in the Dutch language.
– Current psychotic or manic symptoms.
– Under influence of alcohol, drugs and sedatives during the treatment sessions.
– Participants with severe complex trauma symptoms for whom the referring clinician, EMDR therapist and EMDR supervisor estimated that the limitation of 8 sessions EMDR is inadequate for treating the traumatic memories.

Measurement Instruments

PTSD Symptoms

The Impact of Event Scale-Revised (IES-R) is a self-report measure of PTSD symptoms (Weiss and Marma 1997; Asukai et al. 2002; Creamer et al. 2003; Olde et al. 2006). The IES-R consists of 22 symptoms that are likely to occur after exposure to adverse events. Respondents are asked to indicate how frequently they suffered from these symptoms during the past 7 days. This is rated using a 5-point scale ranging from 0 (not at all) to 4 (extremely). The IES-R yields a total score for the severity of PTSD symptoms (range 0–88). Subscale scores can be calculated for Intrusion, Avoidance and Hyperarousal. In the current sample Cronbach's alphas of the different subscales ranged from 0.79 to 0.94.

The Adapted ADIS-C section PTSD version for adults is a semi-structured interview to assess trauma, adverse events and trauma related symptoms in adults with mild to borderline intellectual disabilities and to establish a PTSD diagnosis according to DSM-IV-TR and DSM-5. The first part of the interview consists of 30 questions about different types of trauma and adverse events. There are three answer categories: 'Yes', 'no' or 'otherwise', and one open ended question. When the participant responds with 'yes', the participant is asked subsequently: 'What happened?', 'How did you react to that?' and 'How old were you when it happened?' All the different types of trauma and adverse events the participant ever has experienced are noted on a timeline. The participant is asked which event currently causes most distress. The second part of the interview consists of 40 questions about trauma related symptoms for example: 'Do you get angry more often since those events happened?' with three answer categories (i.e., 'Yes', 'no' or 'otherwise'). The final interview question refers to the interference in daily life functioning, visualized on a thermometer card: 'To what degree do you think your daily life functioning actually is impaired by the event(s) you have experienced?' The participant reported the interference score at the end of the semi-structured interview while the timeline is in front of the participant, to underline the relationship between daily life impairment and the adverse events. A score of 4 (Adapted ADIS-C-section PTSD cutoff for PTSD) or higher on the thermometer card was used as an inclusion criterion (Mevissen et al. 2016; Mevissen et al. 2018). Aspects of reliability and validity of the Adapted ADIS-C section PTSD version for adults have been studied in a total of 106 adults with mild to borderline intellectual disabilities of whom 34 had ASD (Mevissen et al. 2018).

Psychological Distress

The *Brief Symptom Inventory* (BSI) is a self-report measure of psychological distress and symptoms of psychopathology, and is the short version of the Symptom Checklist-90-R (SCL-90-R, Derogatis 1975a). It consists of 53 statements about the presence of symptoms in the past week. Items are scored on a Likert scale ranging from 1 (not at all) to 4 (extremely). The BSI includes three scales that capture global psychological distress and nine subscales: Somatization (SOM), Obsessive–Compulsive (OC), Interpersonal Sensitivity (IS), Depression (DEP), Anxiety (ANX), Hostility (HOS), Phobic Anxiety (PHB), Paranoid Ideation (PAR) and Psychoticism (PSY). The BSI has satisfactory reliability and test–retest reliability (Beurs and Zitman 2006). In the current sample Cronbach's alphas of the total scores of the BSI ranged from 0.95 to 0.96.

Autistic Traits

The *Social Responsiveness Scale-Adult version* (SRS-A) is a self-report measure of autistic traits in adults, concerning specifically the problems in social communication and interaction (Dutch-Flemish version. Noens et al. 2012). The SRS-A contains 64 Likert-scaled (0–3) items. The measure generates a singular scale with a maximum score of 191 for behavior shown in the last 6 months. In the current study participants were asked to rate the presence of a variety of characteristics of social behavior in the last 6 to 8 weeks to measure differences before and after EMDR therapy. Reliability and validity were established in a German sample (Bölte 2012). Results provide adequate preliminary support for the application of the SRS-A. Subscale scores can be calculated for Social Awareness, Social Communication, Social Motivation, Restricted Interests and Repetitive Behavior. In the current sample Cronbach's alphas of the different subscales ranged from 0.79 to 0.92.

Interventions

Treatment as Usual

TAU consisted of the most common treatments for adults with ASD aimed at coping with ASD, psychological distress and comorbid problems. TAU included pharmacotherapy, psychoeducation, supportive counseling, job coaching, support with housekeeping and so called case management. Psychoeducation is the term used for an ongoing exploration by a therapist and the patient of whether and how difficulties in daily life relate to autistic symptoms. The duration of this type of supportive treatment ranges from weeks to a few years. When no treatment was required except for trauma treatment, TAU was minimal or no treatment was offered. TAU did not include trauma-focused interventions. The EMDR therapist was not involved in TAU.

EMDR Therapy

EMDR therapy is a protocolized treatment, aimed to reduce the negative influence of traumatic memories or intrusions (Shapiro 2007). Therapy starts with history taking and a case conceptualization. In this study, history taking was performed by administering the event section of the Adapted ADIS-C section PTSD adult version during baseline assessment. EMDR therapy was not preceded by any stabilizing method or procedure focused on coping with trauma related symptoms (De Jongh et al. 2016). The Dutch version of the standard EMDR procedure for children was used (De Roos et al. 2014), because the concrete language used in this protocol is suitable for people with ASD. In EMDR therapy the primary aim is on those traumatic memories that cause the

current PTSD symptoms. EMDR therapy continues with a short introduction about how EMDR works, shortly after which the patient focusses on the traumatic memory. The therapist then asks the patient to bring up the memory and to focus on the most distressing image, eliciting the dysfunctional negative cognition (NC) of oneself in relation to the image, as well as the accompanying emotions and the body disturbance that go along with it. Next, the therapist moves his or her fingers back and forth in front of the patient's eyes as fast as the patient can follow. Repeatedly, the patient is asked to report about emotional, cognitive, somatic and/or imagistic experiences that arise. A new set of eye movements follows and this procedure is repeated until the disturbance related to the memory reaches a SUD (Subjective Unit of Disturbances scale) of zero out of ten and an adaptive and positive statement about oneself (PC, Positive Cognition) is rated as fully believable on a VoC (Validity of Cognition) scale. The end of the session is dedicated to closing down the session positively and preparing the patient for the interim in between sessions (Mevissen et al. 2017). A core feature of the procedure is carrying out a sufficient demanding bilateral working-memory-task which is accomplished by the rapid eye movements (De Jongh et al. 2013; Engelhard et al. 2011).

Procedures

Symptoms of PTSD, psychological distress and autistic features were assessed by the EMDR therapist at four points in time: (T1) indication and inclusion, 6–8 weeks prior to EMDR therapy, (T2) just before the start of EMDR therapy, (T3) after the last EMDR session, (T4) at the end of the follow-up phase after 6–8 weeks. TAU was continued during all the phases of the study.

Baseline Assessment (T1)

The EMDR therapist examined whether the participant was considered suitable for EMDR therapy, checked the inclusion and exclusion criteria and asked for informed consent. The therapist recommended to avoid changes in medication during the period that EMDR therapy was applied. Adverse and traumatic events the participant had been exposed to were indexed using the event section of the semi-structured interview Adapted ADIS-C section PTSD (Mevissen et al. 2016). These events were written on a timeline. After administration of the symptom section the thermometer card was used to determine the interference score which represents the subjective level of daily life impairment as a result of exposure to the potentially adverse and traumatic events on participants' timeline. The timeline was also used for the EMDR case conceptualization. Therefore the participant rated the subjective level of distress varying from between 0 and 10 for each time-line event (0 = totally not distressing, 10 = very much distressing). The EMDR therapist provided the standard instruction for completing the self-report questionnaires after which the participant independently filled out the IES-R, the BSI and the SRS-A. Participants were told there was a waiting period for EMDR therapy, during which they would continue with TAU.

Assessment Before Start EMDR Therapy (T2)

After 6–8 weeks TAU, the EMDR-therapist administered the Adapted ADIS-C section PTSD (symptom section and thermometer card according to the T1 timeline) and the participant filled out the IES-R, the BSI and the SRS-A. Participants were then treated with a maximum of 8 EMDR sessions of 75 min, scheduled weekly or 2-weekly. The therapist completed short standardized reports of the therapy sessions and noted the number of the session, the chosen targets for the EMDR session, the chosen bilateral stimulus, observed changes and recent adverse events in the last week(s), the SUD, VoC, any deviations of the standard EMDR protocol and changes in medication.

Assessment After EMDR Therapy (T3)

After completion of EMDR therapy the EMDR-therapist administered the Adapted ADIS-C section PTSD (symptom section and thermometer card according to the T1 timeline) and the participant completed the IES-R, the BSI and the SRS-A.

Follow-Up Assessment (T4)

After 6–8 weeks the EMDR-therapist administered the Adapted ADIS-C section PTSD (symptom section and thermometer card based according to the T1 timeline) and the participant filled out the IES-R, the BSI and the SRS-A. Participants received an incentive of €10 after finishing the follow-up assessment.

Treatment Integrity

Treatment integrity of the study was obtained firstly, by supervision of the case conceptualization of the relation between adverse events, trauma and psychological symptoms of the participants. Secondly, the therapists made audio or video recordings of all EMDR sessions and did not know beforehand which recordings would be reviewed, except the first audio or videotaped EMDR session to ensure the correct application of the EMDR protocol. Therefore, the standard competence assessment form used in the supervision for EMDR therapists in the training of the Dutch EMDR association was used to provide feedback in a systematic

way. Supervision was offered by the third author, a licensed EMDR Europe Consultant, experienced in the treatment of individuals with ASD. She also instructed the therapists in the application of the Adapted ADIS-C section PTSD version for adults. The first author had contact with all the therapists about the progress and gave consultation on the research protocol when required. All EMDR therapists had attended a training in EMDR accredited by EMDR Europe, and received supervision for this therapy. On average, the therapists had 6.7 years of experience with EMDR therapy (mean 6.7, median 4, SD 6.4). The therapists were experienced for at least two years in treating adults with ASD.

Power and Sample Size Calculation

Before starting the study a sample size calculation was made. Literature on the effect of EMDR therapy reports average to large effect sizes (Bisson et al. 2013). We used a paired-samples *t* test (one-sided testing). An assumption of no sphericity correction, alpha = 5%, power = 90%, $r = 0.5$ and a large effect (0.8) resulted in a needed number of participants of N = 15 (G*Power 3, Faul et al. 2007). Given an estimated drop-out ratio of 20%, at least 18 participants had to be included.

Statistical Analyses

The statistical package SPSS-22 was used to analyze the data. Descriptive statistics were used to describe the demographic characteristics and baseline measurements of the total sample. A repeated measures multivariate analysis of variance (repeated measures MANOVA) was performed on the set of dependent variables (thermometer card of the Adapted ADIS-C section PTSD, the IES-R, BSI and SRS-A) to examine possible differences in mean scores over time. Effect sizes were calculated with Cohens'd, using the formula: Cohen's d = (M2 − M1)/SDpooled (Cohen 1992). Significance level alpha was set at 5%.

Results

Participants

Thirty-six participants with ASD and suspect of PTSD symptoms were referred to participate in the study. Twenty-seven participants with ASD and symptoms of PTSD enrolled in the study (for the flowchart see Fig. 1).

Five participants (18.5%) dropped out for several reasons, none directly related to EMDR therapy. Four did so during the waiting period for EMDR giving the following reasons: (1) one participant judged that EMDR therapy in addition to TAU would be too time consuming, anticipating problems

at work, (2) one participant had to stop because of physical health problems, (3) one participant withdrew because of the travelling time to the EMDR therapist, (4) one participant no longer wanted to fill out anymore questionnaires after T1, for unknown reasons. During the period of EMDR therapy one person, already known with having a depressive disorder and suicidal ideation, withdrew because of increased suicidal ideation in response to increased problems at home, but unrelated to the EMDR sessions. One participant completed the EMDR therapy, but the measurements could not be used because many questionnaires were incomplete as she did not seem to understand a lot of questions. In hindsight, her intellectual abilities were overestimated at the time of inclusion.

Twenty-one participants completed the study ($n = 21$). One SRS-A questionnaire at T2 and one follow-up measurement were missed. The mean scores of these missing questionnaires were imputed. The average number of EMDR sessions of the completers was seven. There were two early completers (after three and four sessions EMDR) who had a single trauma causing PTSD. The EMDR therapists chose for a supportive session instead of an EMDR session for 12 participants, because exacerbation of stress in these participants. In all cases EMDR therapy could be continued. One person continued EMDR therapy after follow-up for treatment of other adverse events.
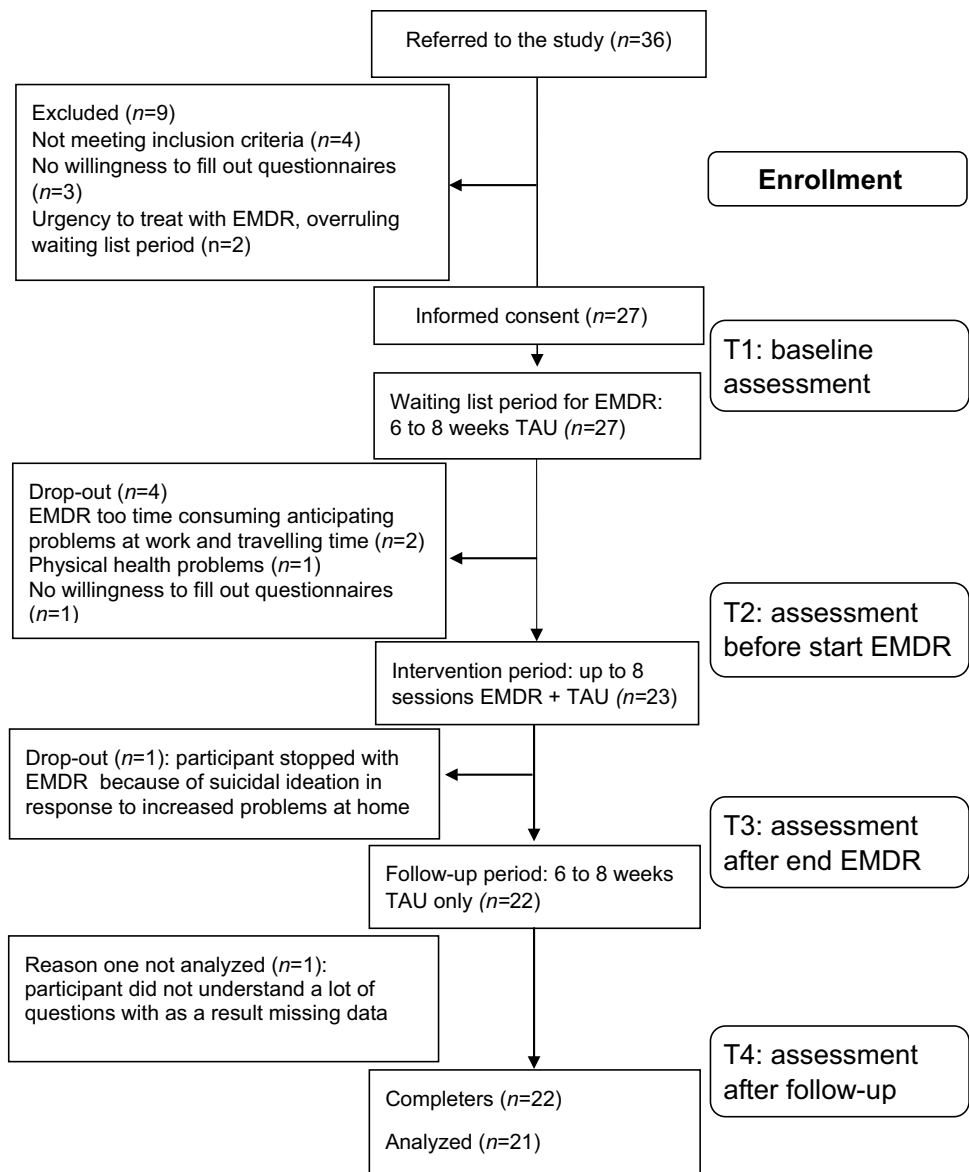
Although changes in medication were discouraged, five participants (23.8%) had minor changes in medication: one participant was prescribed a higher dose and one participant was prescribed a lower dose of an antipsychotic medication, one participant received a higher dose and one participant received a lower dose of an antidepressant, one participant received a different type of antidepressant during follow up.

The mean number of weeks between T1 an T2 was 7.14 weeks (SD = 1.11), the mean number of weeks between T2 and T3 was 11.89 (SD = 3.45), the mean number of weeks between T3 and T4 was 8.33 (SD = 3.59). EMDR therapy was added to long-term treatments as usual in 90.5% of the sample (mean = 5 years; SD = 4.17). Of the two participants (9.5%) who did not receive TAU, one person had experienced a one off traumatic experience. For the other person EMDR therapy was the last step following a long-term treatment and additional treatment was no longer necessary. Table 1 displays the characteristics of the participants who completed the study and whose data could be analyzed.

Treatment Integrity

The EMDR supervisor had contact with all participating EMDR therapists about the case conceptualizations of the participants during the waiting period for EMDR therapy. She also reviewed the first EMDR session of every participant and provided feedback to the EMDR therapists. There were no major deviations of the standard EMDR procedures

Fig. 1 Flow chart of the participants: adults with ASD and a history of adverse events (Reproduced with permission from CONSORT 2010 flow diagram for study trial)

Referred to the study (*n*=36)

Excluded (*n*=9)
Not meeting inclusion criteria (*n*=4)
No willingness to fill out questionnaires (*n*=3)
Urgency to treat with EMDR, overruling waiting list period (n=2)

Enrollment

Informed consent (*n*=27)

T1: baseline assessment

Waiting list period for EMDR: 6 to 8 weeks TAU (*n*=27)

Drop-out (*n*=4)
EMDR too time consuming anticipating problems at work and travelling time (*n*=2)
Physical health problems (*n*=1)
No willingness to fill out questionnaires (*n*=1)

T2: assessment before start EMDR

Intervention period: up to 8 sessions EMDR + TAU (*n*=23)

Drop-out (*n*=1): participant stopped with EMDR because of suicidal ideation in response to increased problems at home

T3: assessment after end EMDR

Follow-up period: 6 to 8 weeks TAU only (*n*=22)

Reason one not analyzed (*n*=1): participant did not understand a lot of questions with as a result missing data

T4: assessment after follow-up

Completers (*n*=22)

Analyzed (*n*=21)

as measured with the Dutch standard supervision assessment form for EMDR therapy.

Qualitative Aspects of EMDR in People with ASD

Although the standard procedures associated with EMDR therapy were used, the therapists took into account aspects of the specific information processing of people with ASD, particularly in the assessment of trauma history and trauma-related symptoms. E.g., a feature of the social communication impairments associated with autism is the difficulty to spontaneously share relevant information. Therefore, that what is not explicitly asked often remains undisclosed. This issue was addressed by making use of the concrete, visualized and structured way in which trauma, adverse events and trauma related symptoms are probed by the Adapted

ADIS-C section PTSD (version for adults with mild to borderline intellectual disabilities), such that also in adults with ASD unprocessed memories could be identified. This instrument seemed to be appropriate to investigate trauma history and trauma related symptoms in adults with ASD. Besides, the standard EMDR procedure for children (Dutch version, De Roos et al. 2014) has been used, because the language in this protocol is more concrete compared to the EMDR protocol for adults. An area of concern was the time needed for participants to become familiar with the therapist and to fill out questionnaires. In hindsight, a majority of the EMDR therapists and participants indicated the need for a preparatory session prior to the start of the first EMDR session in order to have more time to reach agreement about the case conceptualization, to practice the method of EMDR therapy and to fill out the questionnaires. The participants

Table 1 Characteristics of the participants

	Characteristics of participants (sample $n=21$)	n (% of total)
Mean age	34.48 (SD=11.73)	
Gender	Male	13 (61.9)
	Female	8 (38.1)
Education	11-th grade high school	7 (33.3)
	High school	3 (14.3)
	Community college	10 (47.6)
	University	1 (4.8)
Trauma [a] according to *DSM-5*	Physical abused by parents	3 (14.3)
	Witness of violence between parents	2 (9.5)
	Sexual assault by father	1 (4.8)
	Sexual abuse by sister	2 (9.5)
	Unexpected death close relatives	3 (14.3)
	Suicide attempt parent	2 (9.5)
	Suicide attempt as child	1 (4.8)
	Assault/rape	2 (9.5)
Other adverse events	Bullied at school and work	11 (52.4)
	Emotional mismatch parents and child	4 (19)
	(Secrecy) adultery mother	1 (4.8)
	Adverse treatments in hospital as a child	1 (4.8)
	Jarring divorce parents, partner	2 (9.5)
	Experiencing crime (racketeering, burglary)	2 (9.5)
Autism spectrum disorder	Asperger syndrome	6 (28.6)
	PDD-NOS	15 (71.4)
Comorbidity[b]	PTSD[c]	14 (66.6)
	Depression	9 (42.9)
	Anxiety disorders	0 (0)
	ADHD	5 (23.8)
	Personality disorder	3 (14.3)
	Other	2 (9.5)
	None	2 (9.5)
Treatment as usual (TAU)[d]	Supportive counseling	11 (52.4)
	Psychoeducation autism	2 (9.5)
	Job coaching, support at housekeeping	7 (33.3)
	Other	5 (23.8)
	None	2 (9.5)
Medication[e]	Antidepressant	12 (57.1)
	Antipsychotic medication	6 (28.6)
	Benzodiazepine	4 (19)
	Other medication	5 (23.8)
	None	5 (23.8)

[a]Total % is more than 100%, because most of the participants had several traumas and adverse events to be treated

[b]Most participants had more than one comorbid disorder besides ASD

[c]33.3% had severe disturbances in self-regulatory capacities besides the core symptoms of PTSD (*DSM-5* 2014), so called complex PTSD

[d]A part of the participants had more than one TAU

[e]A part of the participants used more than one kind of medication

indicated that they felt overloaded by the new therapist, new treatment and the mental effort of filling out the questionnaires besides the trauma related stress. A few participants received one EMDR session on a two-weekly basis because of the travel distance to the EMDR therapist and the mental stress for these participants associated with travelling. All participants described in the follow-up session that they had found the EMDR sessions stressful. Interestingly, 86% of the participants indicated that they would choose EMDR therapy again.

Statistical Results

A repeated measures MANOVA was used to analyze possible changes in mean scores over time on the set of dependent variables (see the results in Table 2 for the average scores of the adapted ADIS-C section PTSD, IES-R, BSI and SRS-A and Table 3 for the nine subscales of the BSI).

Mauchly's Test of Sphericity indicated that the assumption of sphericity was violated for the ADIS-C ($X^2(5) = 16.95$, $p = 0.005$) and the SRS-A ($X^2(5) = 13.60$, $p = 0.019$). For

these two variables a Greenhouse–Geisser correction was applied. A significant multivariate Time effect was found, $F(12, 9) = 11.43$, $p < 0.001$, resulting from significant changes in mean scores on: the thermometer card of the Adapted ADIS-C section PTSD, $F(1.9, 39.3) = 49.14$, $p < 0.001$, the IES-R, $F(3, 60) = 29.49$, $p < 0.001$, the BSI, $F(3, 60) = 21.60$, $p < 0.001$, and the SRS-A, $F(2.0, 40.2) = 19.30$, $p < 0.001$. Pairwise comparisons showed that the mean score of the thermometer card of the Adapted ADIS-C section PTSD did not differ significantly between T1 and T2, but that the mean score decreased significantly at T3 and T4 (see Fig. 2) showing a large effect size ($d = 1.81$) on T3 and a moderate effect size ($d = 0.62$) on T4. The analysis showed that the mean IES-R score did not differ significantly between T1 and T2, but that the mean score decreased significantly at T3 ($d = 1.16$), and remained stable until T4 (see Fig. 3). The mean BSI score did not differ significantly between T1 and T2, but decreased significantly at T3 ($d = 0.93$), and remained stable until T4 (see Fig. 4). This also applies to all subscales of the BSI, except symptoms of Phobic Anxiety which declined significantly between T2 and T4. The mean SRS-A score did not differ significantly between T1 and

Table 2 Mean scores (standard deviation) on four questionnaires at four time points for adults with ASD before and after EMDR treatment, tests of significance and effect size estimates

Questionnaires	T1: baseline Means (SD)	T2: start EMDR Means (SD)	T3: end EMDR Means (SD)	T4: follow-up Means (SD)	Cohen's d (T3–T2)	Cohen's d (T4–T3)
ADIS	6.48 (1.08)	6.60 (1.02)	3.62 (2.09)*	2.41 (1.83)**	1.81	0.62
IES-R	44.76 (17.93)	41.19 (20.20)	20.57 (14.91)*	15.50 (11.79)	1.16	ns
BSI	1.76 (0.66)	1.72 (0.75)	1.06 (0.66)*	0.87 (0.51)	0.93	ns
SRS-A	88.67 (27.46)	86.30 (27.37)	75.19 (29.28)*	65.50 (32.12)**	0.39	0.32

ns not significant, *ADIS* thermometer card of the Adapted Anxiety Disorders Interview Schedule-Children, section post-traumatic stress disorder version for adults, *IES-R* Impact of Event Scale-Revised, *BSI* Brief Symptom Inventory, *SRS-A* Social Responsiveness Scale-Adult version
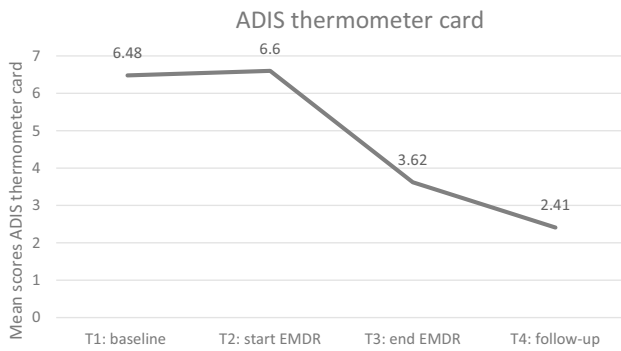
*T3 < T2 (p < 0.05), **T4 < T3 (p < 0.05)

Table 3 Mean scores (standard deviation) on the 9 subscales of the Brief Symptom Inventory at four time points for adults with ASD before and after EMDR treatment, tests of significance and effect size estimates
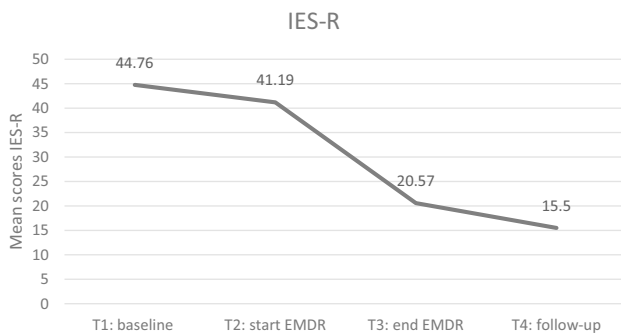
BSI	T1: baseline Means (SD)	T2: start EMDR Means (SD)	T3: end EMDR Means (SD)	T4: follow-up Means (SD)	Cohen's d (T3–T2)	Cohen's d (T4–T3)
SOM	1.26 (0.68)	1.38 (0.95)	0.61 (0.56)*	0.46 (0.42)	0.99	ns
OC	2.29 (0.77)	2.29 (0.77)	1.43 (0.82)*	1.08 (0.82)	1.08	ns
IS	2.25 (1.10)	2.01 (1.13)	1.40 (1.01)*	1.29 (0.80)	0.57	ns
DEP	2.10 (0.88)	2.00 (0.97)	1.25 (0.92)*	1.13 (0.79)	0.97	ns
ANX	1.96 (1.01)	1.81 (1.05)	1.13 (0.90)*	0.98 (0.82)	0.70	ns
HOS	1.33 (0.81)	1.32 (0.97)	0.71 (0.56)*	0.58 (0.39)	0.77	ns
PHB	1.50 (0.98)	1.36 (0.97)	1.01 (0.94)	0.71 (0.72)**	ns	0.36
PAR	1.86 (1.06)	1.79 (1.20)	1.12 (0.93)*	0.98 (0.84)	0.62	ns
PSY	1.61 (0.88)	1.49 (0.78)	0.93 (0.82)*	0.77 (0.65)	0.70	ns

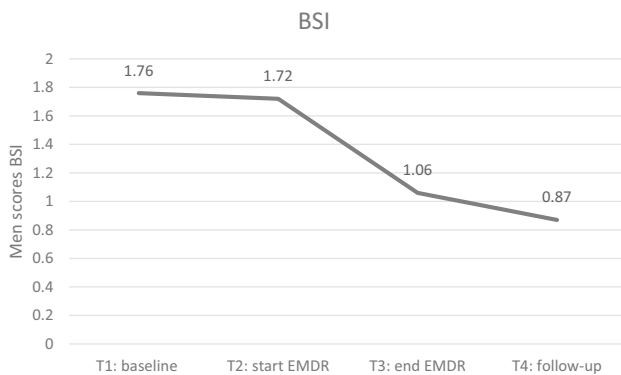*T3 < T2 (p < 0.05), **T4 < T3 (p < 0.05)

ns not significant, *BSI* brief symptom inventory, *SOM* somatization, *OC* obsessive–compulsive, *IS* interpersonal sensitivity, *DEP* depression, *ANX* anxiety, *HOS* hostility, *PHB* phobic anxiety, *PAR* paranoid ideation, *PSY* psychoticism

Fig. 2 Mean scores ADIS thermometer card at four moments in time

Fig. 5 Mean scores SRS-A at four moments in time

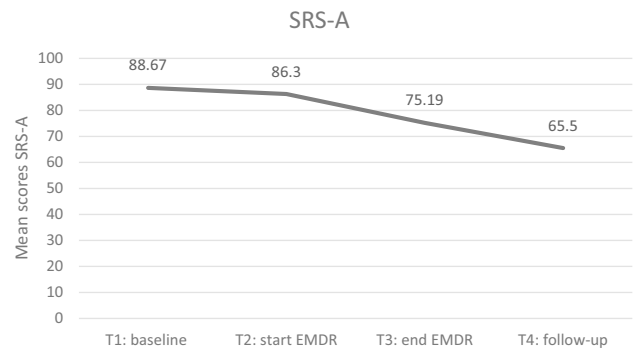**Fig. 3** Mean scores IES-R at four moments in time

Fig. 4 Mean scores BSI at four moments in time

T2, but the mean score decreased significantly at T3 and T4, showing small effect sizes between T2 and T3 ($d = 0.39$) and between T3 and T4 ($d = 0.32$), see Figs. 2, 3, 4 and 5.

Discussion

The present study is the first study that investigated the feasibility and potential effectiveness of EMDR therapy added to TAU (i.e., aimed at coping with the consequences of ASD)

in adults with ASD and a history of adverse events. The results showed that it appeared feasible to use the EMDR standard protocol for children in this target group without a phase of psychotherapeutic trauma stabilizing techniques prior to therapy. Furthermore, a significant reduction of PTSD symptoms, psychological distress and autistic features concerning social motivation and communication following EMDR therapy, on top of the TAU condition, was found. Moreover, the participants experienced a significant lower level of daily life impairment related to the traumatic events following EMDR therapy.

Because TAU was not found to be associated with a decline in psychological distress during the waiting period prior to EMDR therapy, it would seem that TAU did not help to decrease these symptoms of psychopathology. In the next phase however, when TAU was augmented with EMDR therapy, the results showed a significant decline in psychological distress, especially for somatization, depression and obsessive–compulsive symptoms. Thus, even a small dose of EMDR therapy was associated with significant effects on a wide variety of psychological symptoms. Given the low drop-out rate of 18.5%, being comparable to the average drop-out in psychotherapies for PTSD (Swift and Greenberg 2014), the large effect sizes on symptoms of PTSD and psychological distress, and the fact that the positive results were maintained at 6–8 weeks follow-up, suggest that these results are of clinical importance.

The significant reduction of autistic features concerning social motivation and communication following EMDR therapy, and at follow-up, albeit with a small effect size, is remarkable. A possible explanation for this finding might be that the clinical manifestation of autistic symptoms decreases when people with ASD experience less trauma related stress and psychological distress, as somatization, depression and obsessive–compulsive symptoms. To this end, it is conceivable that psychosocial factors like exposure to adverse events and trauma enhance the expression of autistic core features. This explanation is partly in line with findings of previous studies (Brenner et al. 2017; Roberts

et al. 2015; Berg et al. 2016). For instance, one study found no significant difference in the severity of ASD core symptoms between children whose parents reported abuse and children whose parents did not report abuse (Brenner et al. 2017). In contrast, Roberts et al. (2015) found a significant association between severity of autistic traits, a history of sexual and physical abuse in childhood and PTSD among adult women with autistic traits. Likewise, Berg et al. (2016) found that severity of childhood ASD was linked to higher cumulative adverse events in childhood. Hence, it is conceivable that PTSD symptoms are a moderator for the severity of ASD symptoms, such that exposure to trauma and other adverse events exacerbate autistic core features like deficits in social-emotional reciprocity (e.g., reduced sharing of interests, emotions, or affect; Wood and Gadow 2010). Another possible explanation for the observed reduction of autistic features in the present study is that symptoms ascribed to phenotypic features of ASD may in fact be symptoms of PTSD, a phenomenon termed *diagnostic overshadowing*. For example, hyperarousal as a consequence of exposure to trauma may be interpreted as an autistic feature similar to hyper-reactivity to sensory stimuli. Also, trauma related avoidance of social situations can be confused with autistic features similar to problems in social communication. In other words, symptoms of PTSD can be masked by symptoms of autism, therefore symptoms of PTSD, previously seen as features of ASD, might have declined as a result of EMDR therapy.

Although we found a clear relationship between PTSD symptoms and previous exposure to adverse events, a third of the participants did not meet all criteria of PTSD according to *DSM-5*. The most important reason is that about half of the sample reported to have been bullied. Bullying does not comply with the definition of trauma in the PTSD section of *DSM-5*. The high prevalence of being bullied corresponds with previous studies that pertained to bullying in children with ASD (Roekel et al. 2010; Maïano et al. 2016), and underlines that exposure to bullying is associated with severe psychiatric outcomes in adulthood (Sourander et al. 2016; Nielsen et al. 2015). In the present study disturbing memories of being bullied (e.g., social situations where participants felt excluded and intimidated) could be treated successfully with EMDR therapy, suggesting that the scope of EMDR therapy is broader than full blown PTSD (Cvetek 2008; De Jongh et al. 2013). Another reason might be that adverse events that are considered to be mildly annoying for people without ASD, may be perceived as distressing or even traumatic by people with ASD and vice versa (Taylor and Gotham 2016), because of a different sense-making.

The high comorbidity between ASD and depression (42.9%) in the total sample corresponds with previous findings (Bruin et al. 2007; Hofvander et al. 2009; Lugnegård et al. 2011; Taylor and Gotham 2016). Of the participants who did not meet the official criteria of PTSD, 80% percent had a comorbid depressive disorder. It can be hypothesized that depressive symptoms and a strong avoidance of affects mask intrusions. Therefore, it might be wise to carefully assess adults with ASD and comorbid depressive disorder for exposure to trauma and adverse events in their history.

Study Limitations and Strengths

The present study has a number of limitations. First, there was no possibility of including a control group, thus limiting conclusions regarding the effectiveness of EMDR therapy. However, a non-randomized add-on design was chosen instead, in which participants were their own controls in that the EMDR therapy on top of TAU condition was compared to the TAU only condition, before and after EMDR therapy. Besides, TAU was augmented with EMDR, because the clinical condition being treated was considered to be so serious that it might be considered unethical to treat patients with an experimental intervention alone. This seemed appropriate given that eighty percent of the sample had comorbid psychiatric conditions (especially depression and ADHD) and/or structural problems at home or at work. EMDR therapy was added and addressed the adverse events or trauma that caused the highest levels of distress. Indeed, it is unclear to which extent the results can be attributed to EMDR therapy alone. However, the fact there were no significant changes during the TAU only period, supports the notion that EMDR therapy contributed to the results. Second, one could argue that there is a risk of setting participants up to expect no significant change in the time period of TAU only. However, 90.5% of the participants had already had TAU for a long time prior to the study due to their persistent and severe psychological complaints. Next, patients are familiar with waiting periods for therapies, so a waiting period before EMDR therapy was not uncommon to them. A third limitation is that data regarding the reliability and validity of the Adapted ADIS-C section PTSD version for adults have not been published (Mevissen et al. 2018). Yet, it should be noted that in the current study the instrument was not used to adjust a valid and reliable PTSD diagnosis. Rather it was used to systematically detect and visibly represent the adverse and traumatic events participants had been exposed to in order to (1) facilitate participants personal judgement of event-related daily life impairment (inclusion criterion), and (2) give direction to the EMDR therapy. A fourth limitation of the present study is that the EMDR therapists administered the questionnaires, which might have led to underreporting of symptoms by participants who filled out the questionnaires. However, the therapists were trained in providing the standard instructions after which participants filled out the self-report questionnaires by themselves. Finally, the number of participants in the present study was modest. Follow-up

research with a larger sample size and randomizing to different treatment conditions is necessary. Conversely, one of the main strength of the present study is that it mimicked real-world conditions (Najavits 2015) in that the feasibility and effectiveness of EMDR therapy were investigated as an add-on to the standard clinical practices in the treatment of people with ASD. In addition, a minimum of exclusion criteria was used. For example, there were no restrictions related to comorbidity, except current manic and psychotic symptoms. A third strength is that treatment integrity checks were performed, which contributed to proper case conceptualizations and limited drifts in the application of the EMDR protocol by the therapists. Finally, the EMDR therapy started after only one assessment session, which limited the influence of knowing the therapist as a possible confounder. In addition, several therapists (ten in total) performed the EMDR therapies.

Conclusions

The results of the present study are supportive of the notion that EMDR therapy is feasible and can safely be used as an adjunct to TAU in adults with ASD. EMDR therapy added to TAU was found to be associated with a reduction of (subthreshold) PTSD symptoms, a wide variety of psychological symptoms including somatization, depression, obsessive–compulsive symptoms and problems with social motivation and social communication. Although the findings suggest that EMDR has the potential to be an effective treatment for adults with ASD and a history of adverse events, it should be noted that the current study was based upon a small sample of participants and contains several methodological limitations. Therefore, randomized controlled trials with sufficient power to detect differences are greatly needed to confirm the present findings, and to test the hypothesis that EMDR therapy is more effective than treatment as usual in reducing symptoms of PTSD in adults with ASD. More generally, the issue as to how PTSD and trauma syndromes manifest or may be masked by symptoms of ASD is an intriguing one which should be explored in further research. We hope that the results of this study contribute to more awareness of the impact of trauma and adverse events in adults with ASD, and will stimulate future studies into the efficacy of trauma-focused therapies for this target group.

Author Contributions Ella Lobregt-van Buuren conceived of the study, coordinated the study, performed the measurements and the statistical analysis, interpreted the data and drafted the manuscript; Bram Sizoo participated in the design, statistical analysis, interpretation of the data and helped to draft the manuscript; Liesbeth Mevissen participated in the design, trained and supervised the EMDR-therapists and helped to draft the manuscript; Ad de Jongh participated in the design, interpreted the data and helped to draft the manuscript. All authors read and approved the final manuscript.

Compliance with Ethical Standards

Conflict of interest Ad de Jongh receives income from published books on EMDR therapy and for the training of postdoctoral professionals in this method. The other authors declare that they have no conflict of interest.

Ethical Approval All procedures performed were in accordance with the ethical standards of the institutional research committee.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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