Peer-reviewed version available at *Int. J. Environ. Res. Public Health* **2017**, *14*, 714; doi:10.3390/ijerph14070714

Article

Treatment of Intrusive Suicidal Imagery Using Eye Movements

Jaël S. van Bentum [1,*], Marit Sijbrandij [1], Marcus J.H. Huibers [1], Annemiek Huisman [1], Arnoud Arntz [2], Emily A. Holmes [3] and Ad J.F.M. Kerkhof [1]

[1] Department of Clinical Psychology, Vrije Universiteit Amsterdam (VU), van der Boechorststraat 1, 1081 BT Amsterdam, The Netherlands; e.m.sijbrandij@vu.nl (M.S.); m.j.h.huibers@vu.nl (M.J.H.H.); a.huisman@vu.nl (A.H.); ajfm.kerkhof@vu.nl (A.J.F.M.K.)

[2] Department of Clinical Psychology, Universiteit van Amsterdam, Nieuwe Achtergracht 129 Amsterdam, The Netherlands; A.R.Arntz@uva.nl

[3] Department of Clinical Neuroscience, Karolinska Institutet, SE-171 77 Stockholm, Sweden; emily.holmes@ki.se

* Correspondence: j.s.van.bentum@vu.nl; Tel.: +31-020-598-6615

Abstract: Suicide and suicidal behavior are major public health concerns and affect 3-9% of the population worldwide. Despite growing evidence, there are still few effective interventions available to reduce suicide risk. In this article, we describe theoretical models of suicide ideation and behavior and propose to examine the possible effectiveness of a new and innovative preventive strategy. A model of suicidal intrusion (mental imagery related to suicide, also referred to as suicidal flash-forwards) is presented describing one of the assumed mechanisms in the etiology of suicide and the mechanism of therapeutic change. We provide a brief rationale for an Eye Movement Dual Task (EMDT) treatment for suicidal intrusions describing techniques that can be used to target these suicidal mental images and thoughts to reduce overall behavior. Based on the available empirical evidence for the mechanisms of suicidal intrusions, this approach appears to be a promising new treatment to prevent suicidal behavior as it potentially targets one of the linking pins between suicidal ideation and suicidal actions.

Keywords: suicide; suicidal mental imagery; flash-forwards; intrusions; preventive intervention; Eye movement dual task (EMDT)

1. Introduction

Suicidal ideation and behaviors are major public health problems and have been estimated to affect 3-9% of the population worldwide [1]. In the Netherlands, a total of 1871 suicides occurred in 2015, compared to 1353 suicides in 2007 [2]. This indicates that, despite the many efforts to prevent suicide, suicide rates are still rising. Several interventions have been developed to prevent suicide [3], but it is unclear which processes link suicidal plans to the act of suicide [4]. Recent studies provide a fresh perspective to suicide prevention. In the passage from having suicidal thoughts and actual suicidal behavior, suicidal patients may not only develop a cognitive narrative to reflect on suicide (rumination) but also form mental images how to complete suicide [5,6], adding to the emotional impact of suicidal cognitions. These mental images related to suicide e.g. imagining a suicidal act, or one's own funeral, have also been referred to as 'flash-forwards' to suicide [5,7-9].

Given that suicide-related images and thoughts are conceptually linked to the process of rumination (replaying one's problems and their causes over and over in one's head), suicidal mental imagery may play a pivotal causal role in the development of suicidality [10]. Extensive evidence shows a clear association between intrusions and rumination [11-14]. Rumination may intensify the impact of a negative life event by 'drawing repeated attention to problems and activating negatively biased thoughts in response to these problems' [15] (p. 209). Particularly, Ehlers and Clark [16] suggest that rumination may intensify negative emotions, which in turn create internal cues to

Peer-reviewed version available at Int. J. Environ. Res. Public Health 2017, 14, 714; doi:10.3390/ijerph14070714

trigger intrusions. If the psychological processes underlying both suicidal ideation and the decision to act on suicidal thoughts are understood, it could help develop specific interventions to target suicidal ideation when it first emerges and prevent the transition to a suicide attempt [4]. Imagery represents one form of thought that can be tackled in this context [17].

Suicidal behavior occurs most frequently during a depressive episode [18] and patients with depression have a 3.5-4.5 fold higher risk compared to individuals suffering from other psychiatric disorders [19]. An increasing number of studies have shown that patients diagnosed with unipolar depression [5,7] or bipolar disorder [8,9] report repetitive intrusive suicide-related images and thoughts. These suicidal images may be both distressing and comforting [5,20], and can be seen as a last visualized escape to protect oneself against future adversity [21,22]. Examples include imagining oneself during or right after committing suicide (taking an overdose, jumping off a bridge), or visualizing the reaction of family members. These intrusive suicidal images can be experienced as more and more adverse and inescapable, and in the end may become intolerable. Finally, the only way to escape this intrusive imagery is to commit suicide. Suicide is then seen as an escape to an unendurable misery and to prevent prolonged exposure to these images [22]. Although clinicians are familiar with suicidal imagery, it is not yet common practice to inquire about them, nor to treat these images as a focal point in the intervention [23].

Cognitive psychology suggests that imagining oneself in a potential future action affects the subsequent behavior [5,24,25]. This leads to the proposition that repetitive intrusive suicidal ideas and imagery may be a linking pin between suicidal ideation and suicidal behavior. Imagery may be a particularly useful target in this context since it is regarded as an as-if simulation of reality and to promote action [26]. Our central assumption is that the frequency and intrusiveness of suicidal imagery impacts the actual risk of suicide.

The intrusive nature of these suicidal images increases their discomfort and potential danger, i.e. that they spring to mind involuntarily. Intrusive suicidal ideas and images are predominantly experienced as unwelcome, burdensome, involuntary, and are difficult to manage or eliminate. Trauma research evidence shows that intrusive, traumatic images are causally related to distress, as they can be persistently re-experienced with the original emotions and sensations (i.e. trauma and flashbacks in Posttraumatic Stress Disorder; PTSD) [27]. In this article we aim to evaluate theoretical models of suicide ideation and behavior as well as assumed mechanisms in the etiology of suicide to clarify the concept of suicidal intrusions. Furthermore, we hypothesize that an intervention directly targeting these intrusive suicidal thoughts and images to reduce their frequency of occurrence may directly decrease the risk of suicidal behavior of an individual. Experimental studies have shown that vividness and emotionality of negative autobiographical memories is reduced when individuals retrieve the memory, and perform a dual task simultaneously that taxes the working memory, such as eye movements or counting backward [28,29]. This is also the presumed working mechanism of the evidence-based treatment Eye Movement Desensitization and Reprocessing (EMDR) for PTSD. Therefore, we propose an Eye Movement Dual Task (EMDT) intervention that taxes working memory while retrieving thoughts and images as an add-on intervention to usual care for suicidal patients.

2. Suicidal Intrusions

The following quote portrays the e a clinical example of a suicidal intrusion.

"Miss A. 37 years of age, continuously had thoughts and images about killing herself during the last 4 years. She had vivid images of herself jumping in front of a train, seeing her body lying disfiguredly alongside the tracks, thoughts and visions of her funeral, and the sadness of her parents. Immediately thereafter she had thoughts and images of herself slaying her wrists and bleeding to death, followed by vivid fantasies of herself hanging from a rope. She tried intensively to stop these images, but she could not stop it, and she could not sleep at all. She was exhausted and hated herself. She said that she actually did not want to kill herself, but because of the obsessive nature of her intrusions, she finally wanted to escape her consciousness and requested assisted suicide. She tried all medications and other treatments made available to her by the clinic where she was under mental health care treatment. She was then treated with Cognitive Behavioral Therapy (CBT) intervention

Peer-reviewed version available at Int. J. Environ. Res. Public Health 2017, 14, 714; doi:10.3390/ijerph14070714

aimed at obsessive rumination and repetitive imaginations (worry postponement and exposure) and which contributed significantly to her recovery. The total time of suicidal intrusive rumination was reduced from 20 hours a day to 45 minutes a day and Miss. A. withdrew her request for assisted suicide. More information about this real-life story can be found in Kerkhof and Van Luijn, Suicidepreventie in de praktijk [30] (pp. 104-107)".

There has been extensive research on intrusions. Berntsen [31] argues 'intrusions are experienced as involuntary and uncontrollable in that their appearance in consciousness is spontaneous rather than following a deliberate effort or search' [32] (p. 210). In the pre-suicidal process intrusive thinking and intrusive imagery are often reported. The pre-suicidal process is a period in which an individual gradually gravitates towards the act of suicide, and he or she can become preoccupied with emotional thoughts and images about killing themselves (i.e. suicidal imagery) [33]. To be able to comprehend suicidal intrusions, we need to evaluate the theoretical background of how the suicidal images come about in a suicidal person. According to Ringel [22] the pre-suicidal syndrome is seen as the endpoint of a specific neurotic development, and instead of neurotic images it leads to suicide. Initially, the person creates a tunnel vision, in which they let go of reality and focus on a fantasy world that becomes obsessive in nature. He or she loses sense of reality, and distance themselves from others. This fantasy world includes suicidal thoughts and images and pushes them to increasingly fixate on the end of that tunnel: suicide. The initial anger and aggression felt by the individual, perhaps due to negative life events, is no longer directed toward the outside world, but rather turned inwards. Aggression and impulsiveness have been shown to be risk factors for suicide [34,35]. Obsessive fantasies and imagination are focused on the belief that suicide is the only way to prevent worse things from happening. Examples of these fantasies include future-oriented (flash-forward) images or thoughts about jumping from a cliff or in front of a train, attending one's own funeral, reading one's own obituary, and so on [5,7,9]. These obsessive fantasies may initially start of as voluntary, controlled images created by the individual to escape from a negative situation and/or future, or to punish oneself or other people. However, the repeated engagement in them gradually changes the fantasy into automatic uncontrolled intrusions. It becomes impossible to control them and the individual feels pushed towards suicide. Recently empirical studies verified this obsessive imagination and it is now referred to as 'suicidal mental imagery' [6,36,37] or flash-forwards to suicide [5,7-9]. They include repetitive, intrusive, uncontrollable, vivid images that may occupy the suicidal mind with repetitive ideation, plans, and behavioral intentions. Suicidal individuals report these images as if 'they are watching a clear and vivid video of their own death by suicide' [6] (p. 867).

3. Escape Theory

Initially the individual may purposely engage in creating the images, as they are helpful in imagining a potential escape, punishment or serve as a revenge function. However, as the images gradually become involuntary and uncontrolled, they might become frightening and alarming. Their loss of control about suicide becomes upsetting and people start trying to avoid them. Thus, an important mechanism that increases suicidal intrusions is this attempt to avoid them [38,39]. The cognitive behavioral model of Salkovskis [40] suggests that unwanted thoughts develop into obsessions when they elicit suppression attempts, which, in turn result in a paradoxical increase in thought frequency. Abramowitz, Tolin and Street [38] found that longer suppression periods were related to larger initial enhancement effects, suggesting that efforts to suppress unwanted thoughts become less successful over time. In other words, the cognitive effort of stopping suicidal intrusions appears to have a counterproductive effect and inflates their frequency and intensity instead. This leads to feelings of uncontrollability related to suicidal ideations and images. The uncontrollability in turn may lead to the wish to stop consciousness altogether, prompting the last motivation for suicide: to escape from the unbearable, intrusive ideation and imagery. These assumptions are all closely tied into the Escape Theory proposed by Baumeister [39]. The Escape Theory is an integrative framework that provides a theoretical model to explain the process through which individuals develop suicidal ideation, 'with a causal chain characterizing suicide as the final step in

Peer-reviewed version available at Int. J. Environ. Res. Public Health 2017, 14, 714; doi:10.3390/ijerph14070714

self-destructive behavior [41] (p. 348). The theory states that suicide emerges as an escalation of the person's wish to escape from meaningful awareness of current life problems and their implications about the self. Suicide is viewed as an attempt to escape aversive self-awareness.

The Escape Theory can be categorized into a causal chain of six stages potentially leading to an ultimate suicide act [39]. First, stressful life-events fall severely short of standards and/or expectations. Second, these failures are attributed internally leading to high painful self-awareness. Third, the individual displays negative affect and experiences negative feelings due to this painful self-awareness. Fourth, trying to escape these feelings of negative affect and self-awareness, the individual enters a state of cognitive deconstruction. This helps to separate the self from meaningful self-awareness or emotions, and the individual now has a constricted temporal focus and solely immediate or proximal goals. Fifth, the cognitive deconstruction leads to the removal of inhibition, passivity, an absence of emotion and an increase in irrational thoughts. Like Ringel's pre-suicidal syndrome, the irrational thoughts appear in an obsessive manner, and may create a kind of vacuum by removing familiar beliefs and preventing meaningful thought about reality. Sixth, an increase in accessibility to suicidal ideation occurs, and drastic measures, like suicide, become acceptable. The Escape Theory suggests that as the fear of the intrusive, repetitive force of suicidal intrusions increases, the fear to act upon them decreases. Ultimately, the intrusions become more aversive and attractive to act upon. In order to escape the constant chaos in their head created by the unstoppable, vivid suicidal intrusions, suicide seems to be the best possible solution as it offers the individual a state of 'oblivion'.

Recent studies provide evidence for the Escape Theory as it was found that when individuals realize their failure to attain an important standard, they experience increased accessibility of suicidal thoughts [42]. Moreover, individuals with internal Locus of Control (how strongly people believe they have control over situations and experiences) showed greater implicit suicidal mind (i.e. suicidal ideation) with thoughts of failure priming than a control condition. This confirms the assumption of the Escape Theory that failure should lead to suicide only if it is internally attributed [41]. Attributing responsibility for failure to one's self strains the self and gives a strong desire to escape (cognitive dissociation). Suicide attempters had significantly stronger implicit associations between death and the self than other psychiatrically distressed individuals who did not make an attempt [43]. The preparation for the attempt at suicide may facilitate the escape, regardless of whether it will succeed. When preparing for suicide, one can finally cease to worry about the future, for one has effectively decided that there will be no future. Studies have shown that imagining a future event in general increases the likelihood that a person acts upon it [44]. Therefore, we assume that by reducing suicide-related images, we may also decrease the likelihood that a person would engage in suicidal behavior. Thus, suicide-related intrusive images can be crucial targets for suicide prevention.

4. Research evidence on intrusive ideas and images

The majority of the population in a non-clinical sample experiences intrusive thoughts (79-99%) and do not view them as problematic [45]. However, the appraisal of the uncontrollable thoughts is what creates the problematic experience in some individuals. The cognitive behavioral model [40] implies that when interpreted as being personally significant and meaningful the intrusive thought may become obsessive in nature. As mentioned prior, trying to suppress these unwanted thoughts may result in a paradoxical increase in thought frequency. While intrusions can possess a multitude of sensory qualities (visual, auditory, olfactory, touch, and movement), most literature is concerned with visual images [32]. Growing evidence supports the existence of intrusive suicidal ideas and images [5,7-9,37]. Moreover, intrusive mental images seem to be an important feature in multiple psychological disorders like PTSD [27,46], agoraphobia [47], social phobia [48], see Holmes and Mathews [49] for a review. Disorders differ in intrusions due to their associated theme, as the content of the intrusions matches the specific content of verbal thoughts related to each disorder [32].

Clinical studies [50,51] demonstrate correspondence between intrusive images of dreaded future outcomes (i.e. in OCD and anxiety disorders) and intrusive memories of past events (i.e.

Peer-reviewed version available at Int. J. Environ. Res. Public Health 2017, 14, 714; doi:10.3390/ijerph14070714

PTSD). Several cognitive theories try to explain the underlying role of memory for intrusive thoughts and traumatic events in PTSD [16,32,52-54]. According to the autobiographical memory model [55], the traumatic experiences consist of fragmented sensory details because they have been inadequately incorporated within the contextually organized autobiographical knowledge base. For example, patients with depressive symptoms tend to recall many 'over-general' memories, as a constant reminder of their failure [56]. The traumatic experience seems to be stored in the long-term memory with the same emotional intensity as when the event occurred. Interestingly, regular autobiographical memories tend to consist of detailed visual scenes explicitly linked to an original experience, while intrusive images tend to represent an imaginal extension of the original experience [57]. For example, an individual might experience a suicidal intrusion as the successful completion for a previous suicide attempt. The sensory impressions are experienced as if happening in the present, rather than being memories from the past, and the emotions are the same as those experienced at the time of the event [16].

Intrusiveness of the memories is assumed to the intensity rather than the valence of the memory [31]. According to the memory-based model, there is one memory system but the retrieval of memories differs for involuntary and voluntary memories [58-60]. While voluntary memories are retrieved using controlled narrative and schema-based searches, involuntary memories are retrieved by an uncontrolled associative spreading activation. This means that, a cue alone is sufficient to prompt retrieval of this particular involuntary memory [32]. It allows for less emotion regulation, leading to a more emotional reaction and mood change compared to voluntary memories [61]. In addition, a recent study suggest that depressogenic intrusions may 'reflect the effects of high levels of emotion on the entire memory system rather than any qualitative alteration in the way the system is operating' [32] (p. 226).

5. Treatment of intrusive images

Experimental research has indicated that imagery may elicit stronger emotional responses than do corresponding verbal cognitions [62,63], thus making them an important target in interventions. Moreover, intrusions tend to be a main target in disorders that are most typically associated with negative intrusions, such as anxiety disorders and PTSD. Very little clinical work or research to date has focused on how to treat suicidal mental imagery [64] and new initiatives are required.

A substantial amount of experimental studies have found that eye movements during recall of unpleasant autobiographical memories decreased vividness and/or negative emotions associated with these emotions compared to recall only [65-68]. Furthermore, analogue studies have shown that other taxing tasks, like drawing a complex figure [69], playing Tetris [70], and mental arithmetic [71] all reduce image vividness and/or emotionality. Gunter and Bodner [69] argue that the eye movement dual task has long-term effects because the nature of the memory trace remains unchanged but the meta-cognitive interpretations have been altered. Consequently, through eye movements (like in EMDR) and computer games like Tetris (which has recently translated into populations, e.g. Iyadurai, *et al.* [72], Horsch, *et al.* [73]), a considerable gain has been demonstrated with intrusive suicidal images.

One possible hypothesis to account for the effects of the dual task is provided by the working memory model. The working memory is a multicomponent system that carries out higher-order cognitive functions (i.e. problem solving [74]). It consists of the central executive and two 'buffer' subsystems – the phonological loop (PL), and the Visuospatial Sketchpad (VSSP) – in which the central executive can allocate information to be held online for later use [75]. The PL stores verbal and auditory information while the VSSP stores visuospatial information and the latter is suggested to hold memories during EMDR sessions [65,76]. Images of unpleasant memories are held in the VSSP and become less vivid when eye movements simultaneously use up processing resources in the VSSP. Controversy exists regarding what part of the working memory needs to be taxed. Engelhard & van den Hout [77] argue taxing the central executive is sufficient, while others suggest taxing the VSSP is most crucial for the effect [69]. Either way, there is an increased working memory

Peer-reviewed version available at Int. J. Environ. Res. Public Health 2017, 14, 714; doi:10.3390/ijerph14070714

load reducing the resources available. Thus, this working memory manipulation reduces the vividness of the memory and in turn decreases its emotionality.

One particular treatment uses the effects of dual task is the Eye Movement Desensitization and Reprocessing (EMDR) Therapy. It is an evidence-based dual-task treatment for trauma-related intrusions [78], that is recommended across guidelines worldwide [79]. The patient retrieves and holds an image of the worst moment of their trauma in mind along with any associated negative cognitions and emotions. Concurrently, the therapist introduces an external stimulation (this often involves tracking the therapist's finger moving from side to side, creating horizontal eye movements). The set of eye movements are repeated until the memory no longer evokes stress as measured on the Subjective Units of Distress Scale [80]. Patients are instructed to allow any images and thoughts to enter and leave awareness, observing them but not trying to influence the process. It is hypothesized that these images and thoughts are part of the association-chain and have an important (subconscious) link to the intrusive memory. There has been controversy surrounding EMDR about whether eye movements added to the treatment's effectiveness or that it was a mere exposure effect that caused it to be effective. However, a recent meta-analysis found a significant positive effect of the eye movement component [81].

EMDR Therapy for PTSD has recently been applied effectively, easily and safely in severe psychiatric disorders, such as individuals with comorbid psychosis [82]. Using an eye-movement dual task with suicidal patients did not increase their suicidal risk, and appears to be a safe option for treatment. Moreover, actively asking patients about their suicidality (i.e. through questionnaires, telephone calls, or interviews) did not increase their suicide risk. Similar results were found where displaying suicidal images did not increase the suicide risk of the participant [83]. Thus, specifically targeting patient's suicidal intrusions should not be associated with an increased risk of suicide. While EMDR Therapy has an additional explicit focus on reinstalling a positive cognition, the EMDT component solely focuses on reducing the vividness and emotional intensity of the intrusive mental image. Hence, the treatment protocol discussed in this article is interested in applying the effects of EMDT.

6. Treatment of intrusive suicidal images

Future-oriented images are located in the 'prospective memory' and can be stripped of their impact in the same way as flashbacks [68]. The working memory model implies that the past or future-oriented nature of vivid images is irrelevant to the effect of working memory taxing tasks such as eye-movements. Engelhard, van den Hout, Janssen and van der Beek [77] found that eye-movements indeed reduced vividness and emotionality of visual images about feared future events in a non-clinical sample. This suggests that EMDT could be a potential intervention focus to target future-oriented suicidal intrusions in suicidal individuals.

Based on the pre-suicidal syndrome and Escape Theory, an EMDT intervention could target the potential linking pin between suicidal ideation and suicidal behavior, namely the suicidal intrusions. Using suicidal intrusions as the target of the intervention may influence the underlying process of suicidal ideation. This process includes risk factors associated to suicide like hopelessness, desperation, entrapment, perceived burdensomeness, and wanting to escape the self. When the images become less emotionally charged, the desire to act upon suicidal thoughts decreases. As the uncontrollable, vivid, suicidal intrusions diminish, their desire to escape them decreases as well. There is an instant sense of relief, and the individual becomes able to shift their focus and attention to more positive non-suicide related thoughts.

In addition, targeting suicidal intrusions may also interfere with the individual's ruminative thought processes. Rumination may be triggered and used as a coping strategy to try and avoid the suicidal intrusions. This escape mechanism is no longer needed and in turn decreases the level of rumination in the patient. Results of Petit's study [84] show that suppression of suicidal thoughts may indeed be one of the mechanisms that contributes to the persistence of suicidal ideation. Approximately 450 cases of suicide each year are being treated for depression in the Dutch mental health care (extrapolated from Huisman, Kerkhof, & Robben [85]). If targeting suicidal intrusions, as

Peer-reviewed version available at Int. J. Environ. Res. Public Health 2017, 14, 714; doi:10.3390/ijerph14070714

an intervention method is deemed effective, perhaps a substantial proportion of these suicides can be prevented. Implementation of this intervention in health care clinical settings, may reach the appropriate target audience and aid in reducing the number of suicides each year.

7. Treatment Protocol

The treatment protocol of EMDT add-on treatment for suicidal intrusions (images and thoughts) focuses on taxing the working memory while retrieving suicidal images and thoughts. It consists of six sessions, each approximately 1 hour over the course of three weeks. The intervention is aimed primarily at reducing the intensity and frequency of suicidal imagery and secondary to prevent suicidal behavior. The EMDT protocol has been developed in co-creation with patients and mental health professionals involved in mental health care for depressed patients with suicidal ideation, currently in treatment for depression and/or suicidality. The patient will continue to receive care as usual (usually consisting of a combination of psychotherapy and/or medication).

7.1. Introduction

Prior to the dual task, the patient needs to understand the concept of suicidal intrusions and how to identify their associated intrusive images. The patient and therapist have discussed the negative, emotional experience and content of the targeted suicidal intrusion in great detail. Once both therapist and patient feel confident about the established target suicidal intrusion, an introduction about EMDT will be provided. The therapist locates him- or herself in the appropriate position, so that the patient can have their full focus on the finger of the therapist.

7.2. Focus (assessment)

During the assessment phase, the therapist tries to get the patient to be in the heavily emotionally charged state as they feel when experiencing the suicidal intrusions. This is essential, as the fear-network needs to be highly activated in order to generate any changes to the stimulus-aspects, meaning-aspects, and response-aspects associated to the memory representation of the intrusive suicidal image. The target image is selected and portrays the part of the suicidal intrusion that invokes maximum emotional tension.

7.3. Cognitive Domains

Similar to the EMDR procedure, there are five potential cognitive domains linked to the dysfunctional meaning of the suicidal intrusions. These are potential underlying concepts, which cause the suicidal thoughts and images to be uncontrollable and intrusive. First, *responsibility*, *shame*, and *guilt* are a cognitive domain in which the patient might blame themselves for certain (negative) life events. Second, *control* is an important cognitive domain as they feel powerless or helpless and suicide seems to be the only solution. Third, s*elf-worth* is a cognitive domain in which the patient experiences strong negative self-conceptions. Fourth, *safety* is a potentially interesting cognitive domain as they experience a constant state of danger, and suicide seems to be the best or only option. Fifth, *anger* and/or *revenge* feelings towards others are a potential cognitive domain.

7.4. Negative Cognition

The purpose of addressing the underlying maladaptive cognition is to figure out why this particular target image is intrusive and uncontrollable. The therapists ask the patient 'why' this specific image is so aversive (or positive) and what is says about the patient as a person. It is important to distinguish the emotional state from cognitions in this phase. For example, if the patient is feeling scared, their negative cognition could be: 'I'm a coward'. The distress experienced with this image is measured using a ten-point Subjective Units of Distress Scale (SUDS).

Peer-reviewed version available at Int. J. Environ. Res. Public Health 2017, 14, 714; doi:10.3390/ijerph14070714

7.5. Desensitization

It is emphasized that the focus of the patient does not have to stay on the initial target image the patient selected. Their mind is free to wander as it is hypothesized that any associative cognition that arises is important in the entire 'associations-chain' linked to their suicidal intrusion. The therapist does not initiate a conversation about the content of the associations that arise, but merely asks the patient to focus on the associations. The distress experienced with the target image is once again measured using the SUDS. Eye-movements are repeated until the score has diminished to 0.

7.6. Positive Closure

The patient is asked about what the most positive or worthwhile lesson or experience was during the session. The purpose of this positive closure is to have the patient leave with a powerful, positive feeling after the emotionally laden session.

7.7. Outcome Meausres

We expect the EMDT-add on treatment to have an effect on the presence of suicidal intrusions. In particular, we are looking at a potential decrease in the frequency, vividness, emotionality, and quality of these suicidal ideas and mental imagery. An individual's suicidal ideation, in turn, may also be reduced. Finally, to touch upon the potential underlying working mechanisms of the EMDT-add on intervention, outcome measures such as the executive functioning 'n-back task' and rumination are considered.

8. Conclusions

Repetitive intrusive suicidal ideas and mental imagery may potentially be a linking pin between suicidal ideation and suicidal behavior. The cognitive effort of trying to stop the unwanted, vivid suicidal intrusions appears to have a counterproductive effect as it inflates their frequency and intensity instead. Various experimental studies have found that eye movements during recall of the unpleasant images decreased their vividness and negative emotions. Other studies suggest that disrupting mental images in related ways reduces the frequency of their recurrence. Thus, an EMDT-ad on treatment targeting the suicidal intrusions may reduce their frequency and intensity. This may lead to an instant sense of relief, allowing the individual to focus on topics other than their suicide. We are currently setting up a randomized controlled trial (RCT) in which EMDT as an add-on intervention to usual care is tested against usual care alone in depressed patients with suicidal ideation and suicidal imagery.

Supplementary Materials: not applicable.

Acknowledgments: This research has received a grant from ZonMw and covers the costs to publish in open access.

Author Contributions: Jael van Bentum wrote the paper. Marit Sijbrandij, Marcus Huibers, Ad Kerkhof, Arnoud Arntz, Emily Holmes and Annemiek Huisman reviewed and contributed additional information to the paper.

Conflicts of Interest: The authors declare no conflict of interest. The founding sponsors had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, and in the decision to publish the results.

References

1. Nock, M.K.; Borges, G.; Bromet, E.J.; Cha, C.B.; Kessler, R.C.; Lee, S. Suicide and suicidal behavior. *Epidemiol Rev* **2008**, *30*, 133-154.

2. Overledenen; zelfdoding (inwoners), diverse kenmerken. Available online: Http://statline.Cbs.Nl/statweb/publication/?Vw=t&dm=slnl&pa=7022gza (accessed on 10-02-2017).
3. World Health Organization. *Preventing suicide: A global imperative*. WHO: Geneva, 2014.
4. O'Connor, R.C.; Nock, M.K. The psychology of suicidal behaviour. *The Lancet Psychiatry* **2014**, *1*, 73-85.
5. Holmes, E.A.; Crane, C.; Fennell, M.J.; Williams, J.M. Imagery about suicide in depression--"flash-forwards"? *J Behav Ther Exp Psychiatry* **2007**, *38*, 423-434.
6. Selby, E.A.; Anestis, M.D.; Joiner, T.E., Jr. Daydreaming about death: Violent daydreaming as a form of emotion dysregulation in suicidality. *Behavior Modification* **2007**, *31*, 867-879.
7. Crane, C.; Shah, D.; Barnhofer, T.; Holmes, E.A. Suicidal imagery in a previously depressed community sample. *Clin Psychol Psychother* **2012**, *19*, 57-69.
8. Ng, R.M.; Di Simplicio, M.; McManus, F.; Kennerley, H.; Holmes, E.A. 'Flash-forwards' and suicidal ideation: A prospective investigation of mental imagery, entrapment and defeat in a cohort from the hong kong mental morbidity survey. *Psychiatry Res* **2016**, *246*, 453-460.
9. Hales, S.A.; Deeprose, C.; Goodwin, G.M.; Holmes, E.A. Cognitions in bipolar affective disorder and unipolar depression: Imagining suicide. *Bipolar Disord* **2011**, *13*, 651-661.
10. Morrison, R.; O'Connor, R.C. A systematic review of the relationship between rumination and suicidality. *Suicide and Life-Threatening Behavior* **2008**, *38*, 523-538.
11. Birrer, E.; Michael, T.; Munsch, S. Intrusive images in ptsd and in traumatized and non-traumatized depressed patients: A cross-sectional clinical study. *Behaviour Research and Therapy* **2007**, *45*, 2053-2065.
12. Guastella, A.J.; Moulds, M.L. The impact of rumination on sleep quality following a stressful life event. *Personality and Individual Differences* **2007**, *42*, 1151-1162.
13. Lyubomirsky, S.; Tucker, K.L.; Caldwell, N.D. Why ruminators are poor problem solvers: Clues from the phenomenology of dysphoric rumination. *Journal of Personality and Social Psychology* **1999**, *77*, 1041-1060.
14. Smith, J.M.; Alloy, L.L.B.; Abramson, L.Y. Cognitive vulnerability to depression, rumination, hopelessness, and suicidal ideation: Multiple pathways to self-injurious thinking. *Suicide and Life-Threatening Behavior* **2006**, *36*, 443-454.
15. Smets, J.; Luyckx, K.; Wessel, I.; Raes, F. Depressed mood mediates the relationship between rumination and intrusions. *Australian Journal of Psychology* **2012**, *64*, 209-216.
16. Ehlers, A.; Clark, D.M. A cognitive model of posttraumatic stress disorder. *Behaviour Research and Therapy* **2000**, *38*, 319-345.
17. Holmes, E.A.; Blackwell, S.E.; Burnett Heyes, S.; Renner, F.; Raes, F. Mental imagery in depression: Phenomenology, potential mechanisms, and treatment implications. *Annu Rev Clin Psychol* **2016**, *12*, 249-280.
18. Mann, J.J.; Waternaux, C.; Haas, G.L.; Malone, K.M. Toward a clinical model of suicidal behavior in psychiatric patients. *Am J Psychiatry* **1999**, *156*, 181-189.
19. van Gastel, A.; Schotte, C.; Maes, M. The prediction of suicidal intent in depressed patients. *Acta Psychiatrica Scandinavica* **1997**, *96*, 254-259.
20. Crane, C.; Barnhofer, T.; Duggan, D.S.; Eames, C.; Hepburn, S.; Shah, D.; Williams, J.M. Comfort from suicidal cognition in recurrently depressed patients. *J Affect Disord* **2014**, *155*, 241-246.
21. Lester, D.; Wood, P.; Williams, C.; Haines, J. Motives for suicide - a study of australian suicide notes. *Crisis* **2004**, *25*, 33-34.
22. Ringel, E. The presuicidal syndrome. *Suicide and Life-Threatening Behavior* **1976**, *6*, 131-149.
23. Di Simplicio, M.; McInerney, J.E.; Goodwin, G.M.; Attenburrow, M.; Holmes, E.A. Revealing the mind's eye: Bringing (mental) images into psychiatry. *American Journal of Psychiatry* **2012**, *169*, 1245-1245.
24. Gregory, W.L.; Cialdini, R.B.; Carpenter, K.M. Self-relevant scenarios as mediators of likelihood estimates and compliance: Does imagining make it so? *Journal of Personality and Social Psychology* **1982**, *43*, 89-99.

25. Libby, L.K.; Shaeffer, E.M.; Eibach, R.P.; Slemmer, J.A. Picture yourself at the polls. *Psychological Science* **2007**, *18*, 199-203.
26. Ji, J.L.; Burnett Heyes, S.; Macleod, C.; Holmes, E.A. Emotional mental imagery as simulation of reality: Fear and beyond - tribute to peter lang. *Special 50th Anniversary Issue: Honoring the Past and Looking to the Future: Updates on Seminal Behavior* **2016**, *47*, 702-719.
27. Hackmann, A.; Holmes, E.A. Reflecting on imagery: A clinical perspective and overview of the special issue of memory on mental imagery and memory in psychopathology. *Memory* **2004**, *12*, 389-402.
28. Engelhard, I.M.; van den Hout, M.A.; Dek, E.C.; Giele, C.L.; van der Wielen, J.W.; Reijnen, M.J.; van Roij, B. Reducing vividness and emotional intensity of recurrent "flashforwards" by taxing working memory: An analogue study. *J Anxiety Disord* **2011**, *25*, 599-603.
29. van den Hout, M.A.; Eidhof, M.B.; Verboom, J.; Littel, M.; Engelhard, I.M. Blurring of emotional and non-emotional memories by taxing working memory during recall. *Cogn Emot* **2014**, *28*, 717-727.
30. Kerkhof, A.J.F.M.; van Luyn, J.B. *Suïcidepreventie in de praktijk*. 2010.
31. Berntsen, D. *Involuntary autobiographical memories: An introduction to the unhidden past.* Cambridge University Press: Cambridge, England, 2009.
32. Brewin, C.R.; Gregory, J.D.; Lipton, M.; Burgess, N. Intrusive images in psychological disorders: Characteristics, neural mechanisms, and treatment implications. *Psychol Rev* **2010**, *117*, 210-232.
33. Lindberg, E. Att välja döden: En socialpsykologisk studie av livs(o)vilja : A social psychological study of (un)willingness towards living. . Upsaliensis, A.U., Ed. Uppsala, 1998.
34. Dumais, A.; Lesage, A.D.; Rouleau, G.; Dumont, M.; Chawky, N.; Roy, M.; Mann, J.J.; Benkelfat, C.; Turecki, G. Risk factors for suicide completion in major depression: A case-control study of impulsive and aggressive behaviors in men. *Am J Psychiatry* **2005**, *162*, 2116-2124.
35. Giegling, I.; Olgiati, P.; Hartmann, A.M.; Calati, R.; Moller, H.J.; Rujescu, D.; Serretti, A. Personality and attempted suicide. Analysis of anger, aggression and impulsivity. *J Psychiatr Res* **2009**, *43*, 1262-1271.
36. Rudd, M.D.; Joiner, T.E., Jr.; Rajab, M.H. *Treating suicidal behavior: A time-limited approach*. Guilford: New York, 2001.
37. Di Simplicio, M.; Renner, F.; Blackwell, S.E.; Mitchell, H.; Stratford, H.J.; Watson, P.; Myers, N.; Nobre, A.C.; Lau-Zhu, A.; Holmes, E.A. An investigation of mental imagery in bipolar disorder: Exploring "the mind's eye". *Bipolar Disord* **2016**, *18*, 669-683.
38. Abramowitz, J.S.; Tolin, D.F.; Street, G.P. Paradoxical effects of thought suppression: A meta-analysis of controlled studies. *Clinical Psychology Review* **2001**, *21*, 683-703.
39. Baumeister, R.F. Suicide as escape from self. *Psychological Review* **1990**, *97*, 90-113.
40. Salkovskis, P.M. *Trends in cognitive and behavioural therapies*. Wiley: Chichester, 1996.
41. Tang, J.; Wu, S.; Miao, D. Experimental test of escape theory: Accessibility to implicit suicidal mind. *Suicide Life Threat Behav* **2013**, *43*, 347-355.
42. Chatard, A.; Selimbegovic, L. When self-destructive thoughts flash through the mind: Failure to meet standards affects the accessibility of suicid-related thoughts. *Journal of Personality and Social Psychology* **2011**, *100*, 587-605.
43. Nock, M.K.; Park, J.M.; Finn, C.T.; Deliberto, T.L.; Dour, H.J.; Banaji, M.R. Measuring the suicidal mind: Implicit cognition predicts suicidal behavior. *Psychological Science* **2010**, *21*, 511-517.
44. Johnson, J.; Gooding, P.; Tarrier, N. Suicide risk in schizophrenia: Explanatory models and clinical implications, the schematic appraisal model of suicide (sams). *Psychol Psychother* **2008**, *81*, 55-77.
45. Barrera, T.L.; Norton, P.J. The appraisal of intrusive thoughts in relation to obsessional-compulsive symptoms. *Cogn Behav Ther* **2011**, *40*, 98-110.
46. Holmes, E.A.; Grey, N.; Young, K.A. Intrusive images and "hotspots" of trauma memories in posttraumatic stress disorder: An exploratory investigation of emotions and cognitive themes. *J Behav Ther Exp Psychiatry* **2005**, *36*, 3-17.

47. Day, S.J.; Holmes, E.A.; Hackmann, A. Occurrence of imagery and its link with early memories in agoraphobia. *Memory* **2004**, *12*, 416-427.
48. Hackmann, A.; Clark, D.M.; McManus, F. Recurrent images and early memories in social phobia. *Behaviour Research and Therapy* **2000**, *38*, 601-610.
49. Holmes, E.A.; Mathews, A. Mental imagery in emotion and emotional disorders. *Clin Psychol Rev* **2010**, *30*, 349-362.
50. Gregory, J.D.; Brewin, C.R.; Mansell, W.; Donaldson, C. Intrusive memories and images in bipolar disorder. *Behav Res Ther* **2010**, *48*, 698-703.
51. Reynolds, M.; Brewin, C.R. Intrusive cognitions, coping strategies and emotional responses in depression, post-traumatic stress disorder, and a non-clinical population. *Behaviour Research and Therapy* **1998**, *36*, 135-147.
52. Foa, E.B.; Kozak, M.J. Emotional processing of fear: Exposure to correctiv information. *Psychol Bull* **1986**, *99*, 20-35.
53. Mowrer, O.H. On the dual nature of learning: A re-interpretation of 'conditioning' and 'problem-solving'. *Harv Educ Rev* **1947**, *17*, 102-148.
54. Rubin, D.C. A basic-systems approach to autobiographical memory. *Curr Dirr Psychol Sci* **2005**, *14*, 79-83.
55. Conway, M.A.; Pleydell-Pearce, C.W. The construction of autobiographical memories in the self-memory system. *Psychology Review* **2000**, *107*, 261-288.
56. Williams, J.M. Depression and the specificity of autobiographical memory. . In *Remembering our past: Studies in autobiographical memory*, Cambridge University Press: 1996; Vol. 244-267.
57. Patel, T.; Brewin, C.R.; Wheatley, J.; Wells, A.; Fisher, P.; Myers, S. Intrusive images and memories in major depression. *Behav Res Ther* **2007**, *45*, 2573-2580.
58. Berntsen, D. Involuntary autobiographical memories: Speculations, findings, and an attempt to integrate them. In *Involuntary memory*, Blackwell: Oxford, England, 2007; pp 20-49.
59. Berntsen, D.; Rubin, D.C. The centrality of event scale: A measure of integrating a trauma into one's identity and its relation to post-traumatic stress disorder symptoms. *Behaviour Research and Therapy* **2006**, *44*, 219-231.
60. Berntsen, D.; Rubin, D.C. Emotion and vantage point in autobiographical memory. *Cognition and Emotion* **2006**, *20*, 1193-1215.
61. Rubin, D.C.; Berntsen, D.; Bohni, M.K. A memory-based model of posttraumatic stress disorder: Evaluating basic assumptions underlying the ptsd diagnosis. *Psychological Review* **2008**, *115*, 985-1011.
62. Holmes, E.A.; Mathews, A. Mental imagery and emotion: A special relationship? *Emotion* **2005**, *5*, 489-497.
63. Holmes, E.A.; Mathews, A.; Mackintosh, B.; Dalgleish, T. The causal effect of mental imagery on emotion assessed using picture-word cues. *Emotion* **2008**, *8*, 395-409.
64. Holmes, E.A.; Butler, G. Cognitive therapy and suicidality in ptsd: And recent thoughts on flashbacks to trauma versus 'flashforwards to suicide'. In *A case book of cognitive therapy for traumatic stress reactions*, Grey, N., Ed. Routledge: Hove, 2009; pp 178-194.
65. Andrade, J.; Kavanagh, D.J.; Baddeley, A.D. Eye-movements and visual imagery: A working memory approach to the treatment of post-traumatic stress disorder. *British Journal of Clinical Psychology* **1997**, *36*, 209-223.
66. Engelhard, I.M.; van den Hout, M.A.; Smeets, M.A. Taxing working memory reduces vividness and emotional intensity of images about the queen's day tragedy. *J Behav Ther Exp Psychiatry* **2011**, *42*, 32-37.
67. Kemps, E.; Tiggemann, M. Reducing the vividness and emotional impact of distressing autobiographical memories: The importance of modality-specific interference. *Memory* **2007**, *15*, 412-422.
68. van den Hout, M.; Engelhard, I. How does emdr work? *Journal of Experimental Psychopathology* **2012**, *3*, 724-738.
69. Gunter, R.W.; Bodner, G.E. How eye movements affect unpleasant memories: Support for a working-memory account. *Behav Res Ther* **2008**, *46*, 913-931.

70. James, E.L.; Lau-Zhu, A.; Tickle, H.; Horsch, A.; Holmes, E.A. Playing the computer game tetris prior to viewing traumatic film material and subsequent intrusive memories: Examining proactive interference. *J Behav Ther Exp Psychiatry* **2016**, *53*, 25-33.
71. Kemps, E.; Tiggemann, M. Modality-specific imagery reduces cravings for food: An application of the elaborated intrusion theory of desire to food craving. *J Exp Psychol Appl* **2007**, *13*, 95-104.
72. Iyadurai, L.; Blackwell, S.B.; Meiser-Stedman, R.; Watson, P.C.; Bonsall, M.B.; Geddes, J.R.; Nobre, A.C.; Holmes, E.A. Preventing intrusive memories after trauma via a brief intervention involving tetris computer game play in the emergency department: A proof-of-concept randomized controlled trial. *Molecular Psychiatry* **2017**.
73. Horsch, A.; Vial, Y.; Favrod, C.; Harari, M.M.; Blackwell, S.E.; Watson, P.; Iyadurai, L.; Bonsall, M.B.; Holmes, E.A. Reducing intrusive traumatic memories after emergency caesarean section: A randomised controlled trial. *Behavior research and therapy* **in press**.
74. Engle, R.W. Working memory capacity as executive attention. *Current Directions in Psychological Science* **2002**, *11*, 19-23.
75. Leer, A.; Engelhard, I.M.; van den Hout, M.A. How eye movements in emdr work: Changes in memory vividness and emotionality. *J Behav Ther Exp Psychiatry* **2014**, *45*, 396-401.
76. Kavanagh, D.J.; Freese, S.; Andrade, J.; May, J. Effects of visuospatial tasks on desensitization to emotive memories. *British Journal of Clinical Psychology* **2001**, *40*, 267-280.
77. Engelhard, I.M.; van den Hout, M.A.; Janssen, W.C.; van der Beek, J. Eye movements reduce vividness and emotionality of "flashforwards". *Behav Res Ther* **2010**, *48*, 442-447.
78. Bisson, J.; Andrew, M. Psychological treatment of post-traumatic stress disorder (ptsd). *Cochrane Database of Systematic Reviews* **2007**.
79. World Health Organization. *Guidelines for the management of conditions specifically related to stress*. WHO: Geneva, 2013.
80. Shapiro, F. *Eye movement desensitization and reprocessing: Basic principles, protocols, and procedures*. Guilford Press: 1995.
81. Lee, C.W.; Cuijpers, P. A meta-analysis of the contribution of eye movements in processing emotional memories. *J Behav Ther Exp Psychiatry* **2013**, *44*, 231-239.
82. van den Berg, D.P.; de Bont, P.A.; van der Vleugel, B.M.; de Roos, C.; de Jongh, A.; Van Minnen, A.; van der Gaag, M. Prolonged exposure vs eye movement desensitization and reprocessing vs waiting list for posttraumatic stress disorder in patients with a psychotic disorder: A randomized clinical trial. *JAMA Psychiatry* **2015**, *72*, 259-267.
83. Huisman, A.; Kerkhof, A.J. The risk of including suicidal patients in rct studies into the effectiveness of pharmacotherapy and psychotherapy for adult psychiatric disorders and iatrogenic effects as a result of asking about suicide. Vrije Universiteit Amsterdam: 2017.
84. Petit, J.W. Thought suppression and suicidal ideation: Preliminary evidence in support of a robust association. *Depresision and Anxiety* **2009**, *26*, 758-763.
85. Huisman, A.; Kerkhof, A.J.; Robben, P.B. Suicides in users of mental health care services: Treatment characteristics and hindsight reflections. *Suicide and Life-Threatening Behavior* **2011**, *41*, 41-49.