

Creating False Memories: Who is Most at Risk?

Examining Personal and External Risk Factors

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Abstract

In the early 90's an epidemic arose of adults who falsely claimed to be sexually abused as a child by their parents. Most of the adults who accused their parents were in therapy at the time of the accusation for eating disorders, sexual inhibition or depression, disorders which could be a possible consequence of child sexual abuse (CSA). In the past it was argued that using 'recovered memory therapy' forgotten memories of CSA could be 'retrieved'. However, using recovered memory techniques as hypnosis or dream interpretation are now known to be dangerous, and could lead to the creation of false memories. Even though those techniques being nowadays more carefully used, it is argued that there are still cases in which false memories lead to false accusations, indicating there possibly are other factors which make individuals vulnerable of creating false memories. In the current thesis a systematic literature review was conducted to find personal and external factors which could lead to the creation of false memories. It appears that some individuals are more susceptible of creating false memories than others, especially young adults, women, or individuals who are anxious or depressed. Furthermore, external risk factors as cannabis use, borrowing autobiographical memories of others, high script knowledge, mindfulness meditation, or sleep deprivation can prone individuals to create false memories. This indicates that those who are mentioned or exposed to the external risk factors, are more susceptible of creating false memories.

Keywords: false memories, recovered memory therapy, susceptibility, personal risks, external risks

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In the early 90's an epidemic arose of adults who claimed to be sexually abused in their childhood by their parents (McHugh, Lief, Freyd, & Fetkewicz, 2004; Saraga & MacLeod, 1997). Most of the sexual abuse was alleged to have started under the age of two (Wakefield & Underwager, 1992), though scientifically proven it is impossible to have memories of sexual abuse before the age of three due to the complexity of such traumatic events (Nierop & Van Den Eshof, 2008). The adults who accused their parents were not coming of problem families, but rather from relatively functional families (De Rivera, 1997). Most of the siblings of the accusers did not believe the sexual abuse accusations were to be true (Wakefield & Underwager, 1992).

Sexual Abuse

Sexual abuse can be described in various ways (Health Council of the Netherlands, 2004). It is described by The United States Department of Justice (2015) on their website as: "coercing or attempting to coerce any sexual contact or behaviour without consent." The prosecutor of The Netherlands talks about sexual abuse when a sexual acts involves the abuse of power or the abuse of age differences (Openbaar Ministerie, n.d.). A more comprehensive definition is described by the American Psychological Association (APA) (2016) on their website as: "unwanted sexual activity, with perpetrators using force, making threats or taking advantage of victims not able to give consent." There is no question, being sexually abused has a devastating impact on the psychological, emotional, and psychical aspects on the lives of the victims (Rape, Abuse, & Incest National Network [RAINN], n.d.). It does not only create fear and anxiety, but has some severe long term consequences (APA, 2016). These could be: substance abuse, self-destructive behaviour, and an increased risk for creating mental problems as depression or the development of Post-Traumatic Stress Disorder (PTSD) (APA, 2016; Brown & Finkelhor, 1986; Mullen, Martin, Anderson, Romans, & Herbison, 1993).

Accusations of sexual abuse have two sides. The consequences of accusing

someone of sexual abuse, could have devastating effects on the reputation of the person being accused, and brings psychological and emotional damage with it (Contactgroep Onterechte Beschuldigingen, 2001; Contactgroep Onterechte Beschuldigingen, 2005). Sexual abuse accusations could have a massive, if not catastrophic, impact on the lives of the accuser, the accused, and their families (Kaplan & Manicavasager, 2001; McHugh et al., 2004). People quickly think 'where there is smoke, there is fire', so if someone claims to be sexual abused as a child, society thinks there must be some truth to it (Contactgroep Onterechte Beschuldigingen, n.d.). The sexual abuse accusations in the epidemic in the early 90's show that this is not always the case. Although the sexual abuse was described in much detail, the large majority of the accusations later turned out to be false (McHugh et al., 2004). The fact that more than two decades later there are still cases known whereby people get falsely accused and convicted of sexual abuse, indicate that it is rather difficult to make the distinction between true or false statements of sexual abuse (American College of Forensic Examiners, 2010; Friedman, 1997). When a sexual abuse case is brought to court, the accused will be looked upon with suspicion, which makes it harder to stay professional for the individuals who need to determine if the statement of sexual abuse is correct (Raitt & Zeedyk, 2003). Even therapists find it hard to believe that something like being sexually abused could have been made up by their patient (Lief & Fetkewicz, 1997).

False Accusations

The difficulty to distinguish true from false accusations of sexual abuse is also shown in scientific research. Over the years, different studies tried to establish the prevalence of false allegations of rape. These prevalence's differ from roughly 2% (Brownmiller, 1975; Katz & Mazur, 1979; Norton & Grant, 2008) to 40% (Rassin & Van Der Sleen, 2005) or 41% (Kanin, 1994). Some researchers even accept figures as high as 90% (Stewart, 1981) or 100% (Kanin 1985, in Kanin, 1994). A possible dark number and different methodological errors, like vague terminology and coding criteria, could prevent these studies to provide a real estimate of the prevalence of false allegations of rape (Rumney, 2006; Saunders, 2012). The importance of a definition of what can be viewed as a false accusation or allegation

could be one of the explanations of the variety in percentage (Rumney, 2006). Stein (1994) states that: “[t]he term false refers to the whole range of specious allegations, from the consciously fabricated to the delusion” (p. 2). Hedges (2002) states: “an allegation is considered false when it is not possible to establish a direct and clear causal link between actions (or inactions) of the accused and damage sustained by the accusers” (p. 494). Furthermore, police in some countries will classify an allegation of rape false, if for example the complainant lied about how the victim met the rapist, even though the person reports a genuine incident of non-consensual sex (Rumney, 2006; De Zutter, Horselenberg, & Van Koppen, 2016b). Wall and Tarczon (2013) defined false accusations as a false complaint whereby the alleged victim has given intentionally¹ or unintentionally an inaccurate version of the event. False accusations of sexual abuse could be the result of wrongly interpreting the behaviour of the ‘abuser’, indicating the accusation is unintentional (Nierop & Van Den Eshof, 2008; Wall & Tarczon, 2013). Intimate nursing acts performed on children, mentally disabled or elderly individuals could be interpreted as criminal acts when taken out of context (Nierop & Van Den Eshof, 2008). Also, parents could be interpreting signals from their child in the wrong way, reasoning he or she suddenly wets the bed again or makes sexual comments could be the result of childhood sexual abuse (CSA) (Gardner, 2001; Nierop & Van Den Eshof, 2008). Furthermore, a disturbed mental state as the result of a sexual hallucination could be the cause of unintentional false accusations (Balasubramaniam & Park, 2003). This way the accuser thinks she is sexually abused, while in reality this was a hallucination (De Zutter et al., 2016a).

False Memories

As mentioned above, false accusations could be the result of delusion or hallucination (Balasubramaniam & Park, 2003; Stein, 1994; De Zutter et al., 2016a). Accusations of sexual abuse could be false, simply because they are based on fantasy and therefore did not occur

¹ Intentional false accusations of sexual abuse could have different motives, it could be used e.g., as an alibi or as revenge, to get attention, sympathy or material gain, or as the result of regret (see Nierop & Van Den Eshof, 2008; Kanin, 1994; De Zutter, Horselenberg, & Van Koppen, 2016a for further explanation and information on intentional motives).

(Wall & Tarczon, 2013). Knowing the damage sexual abuse could have to a person is enormous, saying that these memories of sexual abuse are false could have the same damaging effects (Raitt & Zeedyk, 2003). Why would someone believe memories of such a traumatic childhood event, when it did not even happen? Although seeming unlikely, this was exactly the case in the early 90's epidemic, in which the false accusations were in most cases the result of false memories (Wakefield & Underwager, 1992). This is shown by the majority of adults who first believed they were sexually abused and later believed these memories were false² (McHugh et al., 2004; Mollon, 1996). The accusations these alleged abused adults made, were stated to be based 'repressed' and 'recovered' memories (Raitt & Zeedyk, 2003). This idea was at the time of the epidemic described by Loftus (1993), who stated that repression of traumatic memories occurred when: "[s]omething shocking happens, and the mind pushes it into some inaccessible corner of the unconscious. Later, the memory may emerge into consciousness" (p. 518). Repression can therefore act as a severe protection mechanism (Holdsworth, 1998). Although it is possible to repress a traumatic childhood event and later recall it, it implies that the memories were accurate and actually happened (Coons, 1997; Raitt & Zeedyk, 2003). But given this was not the case in the epidemic of the early 90's the term false memory is more fitting – than the term recovered memory – and should therefore be used instead (False Memory Syndrome Foundation [FMSF], 2013; Coons, 1997; Raitt & Zeedyk, 2003). Raitt and Zeedyk (2003) stated that: "the term 'false memory' implies that the memories are fabricated, either partially or entirely" (p. 4). Newman and Lindsay (2009) described false memory as: "a wide variety of memory errors ranging from misremembered word lists to erroneous reports of details in stories to false memories of dramatic life events" (p.2). The Health Council of the Netherlands (2004) adds that these false memories are autobiographical, and are seen as authentic by the individual.

As it turns out having false memories of an event is not something rare, most of the

² These results are known because of retrospective studies, based on self-reports (Health Council of the Netherlands, 2004; McHugh et al., 2004; Wakefield & Underwager, 1992).

childhood memories people have are in fact doubtful (McHugh et al., 2004; Newman & Lindsay, 2009; Pope, 1996). In some cases, it might not be certain whether or not a childhood event really happened in the way it was remembered by an individual, or if it has been completely made up (Newman & Lindsay, 2009; Pope, 1996). Retractions – the process in which individuals state their recovered memories are false – show that it is even possible for individuals to develop false memories of CSA (Loftus, 1993; Nierop & Van Den Eshof, 2008).

Early Mechanisms

It is striking that most adults, (86% in McHugh et al., 2004), were in therapy at the time of the accusations (McHugh et al., 2004; Wakefield & Underwager, 1992). The majority of the adults entered therapy for eating disorders, sexual inhibition or depression (De Rivera, 1997). These psychological problems could in some cases be associated with being sexually abused as a child (De Rivera, 1997), while these memories could sometimes be repressed (Kaplan & Manicavasagar, 2001). In time of the epidemic, CSA had become more and more recognized, and incest even had become a 'cultural obsession' (Saraga & MacLeod, 1997). The larger number of the therapists therefore believed those psychological problems were the result of repressed memories of CSA, despite the fact that the psychological problems could have many other causes (Health Council of the Netherlands, 2004; Nierop & Van Den Eshof, 2008; Wakefield & Underwager, 1992). These assumptions made the therapists biased towards sexual abuse as a cause, and made them lose their neutral stance (Coons, 1997; Nierop & Van Den Eshof, 2008; Wakefield & Underwager, 1992). This phenomenon can be explained by the confirmation bias: "[p]eople in general, therapists included, have a tendency to search for evidence that confirms their hunches rather than search for evidence that disconfirms" (Loftus, 1993, p. 530). The patients on the other hand, were entering the therapy without memories of sexual abuse, but wanted to understand the cause of their psychological problems (Health Council of the Netherlands, 2004; Loftus, 1993; McHugh et al., 2004; Perry & Gold, 1995). This made them vulnerable to the suggestion of the therapist (Leavitt, 1997; McHugh et al., 2004; Nierop & Van Den Eshof, 2008; Perry & Gold, 1995).

The False Memory Syndrome Foundation (FMSF)³ (as cited in Pope, 1996, p. 12) stated "that certain psychotherapeutic techniques, theories and practices have led many people to falsely believe they were sexually abused as children." These techniques are also referred to as 'recovered memory therapy' (Health Council of the Netherlands, 2004; Stocks, 1998). In this form of therapy, suggestive questioning is used in order for the memories to be 'retrieved' (Loftus, 1993; Nierop & van Den Eshof, 2008). Hence, all techniques stimulate the retrieval of memories, also stimulate the 'errors' that are inherent therein (Health Council of the Netherlands, 2004, p. 74). Using suggestions therefore makes it difficult to distinguish true from false memories of abuse (Loftus, 1993). It results in being unable to determine if the individuals 'remembered' these acts of CSA themselves, or if they were implanted by suggestion of the therapist (Nierop & Van Den Eshof, 2008). This is also referred to as source monitoring, in which suggestion makes it unclear from which source (their own experiences or the ideas of the therapies) the memories came from (Thayer & Lynn, 2008). Inadequate source monitoring and the inability to separate fact from fantasy makes the recovered memory therapies enlarge the likelihood of creating false memories (Thayer & Lynn, 2008).

Hypnosis. One of the techniques used by the therapists when CSA was expected was hypnosis (Goldstein, 1997; Feigon & De Rivera, 1998; Porter & Lane, 1996; Stocks, 1998; Wakefield & Underwager, 1992). Frederickson (1992) stated: "[h]ypnosis is a structured process of relaxation designed to produce a state of dissociation. This induced state of dissociation facilitates your ability to get in touch with unconscious parts of yourself, such as feelings, awareness, or memories" (p.149). Hypnosis provides a recollection of fact and fantasy, and will be contagious for the beliefs the therapist held (Perry & Gold, 1995). "[It] has a strong capacity for producing false memories or memories that are distorted by therapist suggestion (Kaplan & Manicavasagar, 2001, p. 347), especially when sensitive to

³ As the result of the epidemic in the early 90's the False Memory Syndrome Foundation (FMSF) was founded in 1992 in the United States by parents who claimed to be falsely accused by their children (FMSF, 2013; Raitt & Zeedyk, 2003).

this technique (Nierop & Van Den Eshof, 2008).

Age regression. Age regression exercises were often used in combination with hypnosis (Fredrickson, 1992; Goldstein, 1997). After the patient was brought in a hypnotic state, the therapist would guide the patient into a phase in their childhood where the abuse was suspected to have happened (Fredrickson, 1992). At this point, the patient believed and acted like he or she was a child again (Orne, 1951). The patient was then asked to talk about how he or she felt at that point in their life (Fredrickson, 1992). Most of the time, a memory fragment – not knowing if this memory fragment was real or not – was used as a starting point in therapy (Fredrickson, 1992).

Guiding techniques. Guided visualization and imagery techniques were also used to 'retrieve' the CSA memories (Goldstein, 1997; Kaplan & Manicavasagar, 2001; Porter & Lane, 1996; Sherman, 1996; Stocks, 1998). Guided imagery is "a form of psychodrama in which the client achieves a relaxed state and then pictures scenarios suggested by the therapist" (Stocks, 1998, p. 428). Therapists guided their patients "to expand on or explore images that have broken through the conscious mind, allowing related images of the abuse to surface" (as cited by Fredrickson, 1992, in Loftus, 1993, p. 527).

Dream interpretation. Another technique that was used is dream interpretation (Loftus, 1993; Porter & Lane, 1996; Stocks, 1998; Wakefield & Underwager, 1992). With dream interpretation the patients were not encouraged to tell a story (Loftus, 1993). However, when discussing CSA with the therapist, the patient could have dreams, or even have nightmares about CSA as the result of this conversation (Loftus, 1993). Different parts or clues in the dreams were interpreted by the therapist as unconscious or 'repressed' memories of CSA and were used as a starting point for therapy (Fredrickson, 1992).

Journaling. Furthermore, journaling was used to recover memories of CSA (Goldstein, 1997; Stocks, 1998). With journaling the patients' starting point was a central feeling, idea (Stocks, 1998) or sometimes "the felt sense that an abusive memory is trying to surface" (Fredrickson, 1992, p. 141). They were asked to write down the sensations, feelings, and thoughts that arose from those central feelings or ideas (Stocks, 1998). If the

patient did not know what happened to them, they were encouraged to write down what they did remember, and attempt in “nonevaluative stream-of-consciousness writing” (Stocks, 1998, p. 428).

Other mechanisms. Additionally, some therapists even used drugs which resulted in hallucinations, while there was already existing evidence this could result in fantasy stories (Goldstein, 1997; Kaplan & Manicavasagar, 2001). If these mentioned techniques did not help ‘recover’ the memories, patients were often sent to support, e.g., incest survivor groups, where in some cases peer pressure helped them ‘remember’ (Goldstein, 1997; Loftus, 1993; Stocks, 1998; Wakefield & Underwager, 1992).

Research Question

The mentioned therapeutic recovered memory techniques could be an explanation of how false memories are created and how this way patients could be influenced by their therapist (Goldstein, 1997; Health Council of the Netherlands, 2004; Pope, 1996; Porter & Lane, 1996; Saraga & MacLeod, 1997). However, this happened in a time when more than half of the therapists believed that retrieved memories were essentially true, and therefore used e.g., hypnoses and dream interpretation in the ‘recovery’ of memories (Health Council of the Netherlands, 2004). Knowledge of the possible dangers of these techniques when retrieving memories have provided for a change in the therapeutic climate, which resulted in these techniques being more carefully used (Health Council of the Netherlands, 2004; McHugh et al., 2004). This could be one of the possible reasons no new epidemic of false accusations has erupted. However, a dark number could affect the true number of false accusations (Health Council of the Netherlands, 2004). According to the *Werkgroep Fictieve Herinneringen* (Workgroup Fictive Memories⁴) the numbers of registered alleged victims has decreased in the last couple of years (Health Council of the Netherlands, 2004). This was also found by McHugh et al. (2004), who found the accusations declined after 1992.

⁴ This is a free translation by the author. The *Werkgroep Fictieve Herinneringen* is an organisation in the Netherlands (one of the sister bodies of the FMSF) which was founded in 1993 by parents who were falsely accused by their children (Health Council of the Netherlands, 2004).

However, there were still cases known up to the year 2000 (McHugh et al., 2004). Between 2003 and 2007 the *Landelijke Expertisegroep Bijzondere Zedenzaken (LEBZ)* (National Group of Experts on Special Sexual Offences⁵) has also conducted research on different retrieved memory cases and cases of memories before the age of three (Nierop & Van Den Eshof, 2008). The LEBZ is a multidisciplinary group of experts which are tasked by the prosecutor to review reports of sexual abuse in order to identify false accusations at an early stage (Nierop & Van Den Eshof, 2008). The LEBZ will make up a rapport of cases in which the accusations are based on ritual abuse, retrieved memories, and/or memories of abuse before the age of three (Nierop & Van Den Eshof, 2008). From the 141 cases handled by the LEBZ between 2003 and 2007, 22 cases regarded retrieved memories, and five cases regarded memories of abuse before the age of three. In most of the cases the LEBZ investigated (69%), they advised not to prosecute due to serious shortcomings (Nierop & Van Den Eshof, 2008). This indicates that even after the epidemic, there are still cases known where false memories have led to false accusations (Health Council of the Netherlands, 2004). This leads to the following research question that will be answered in this thesis: 'what are – besides usage of the early mechanisms like e.g., hypnosis, dream interpretation or guided imagery – possible personal and external risk factors leading to the creation of false memories?'

This systematic literature study will be used to start closing the gap between the false memories in the early 90's in which hypnosis and other methods have led to false accusations of CSA, and the latest knowledge of creating false memories. Closing this gap is needed because of the undoing agitation and aversion in society when exposed to cases of CSA (Health Council of the Netherlands, 2004). Despite the fact there are still cases known of false accusations as the result of false memories, it is still not clear what the exact percentage of these false accusations are. It is all the more important knowing how to keep this percentage as low as possible by knowing who could be most at risk for developing false

⁵ This is a free translation by the author.

memories (Health Council of the Netherlands, 2004).

Method

Search Strategy

All the research was conducted in May, June, and July 2016. Published literature was found using the databases PsycINFO, Psychological and Behavioural Sciences Collection, and Science Direct, which cover international studies that assessed false memories. Literature was found by using the term “fals* memo*”, with altering the terms “vulnerab*”, “creat*”, “suscept*”, “caus*”, or “personal*”. The search of literature was limited to free academic journals, published in English. Furthermore, the search was limited to empirical research to get insight in the methodologies of the studies (what kind of memory experiment was used), get insight in the used participant groups (e.g., their age, gender, being clinical diagnosed, etc.), and the results (e.g., differences or similarities in studies with the same methodology or participants). Commentaries or reviews were therefore excluded. Additionally, the reference lists of the included articles were reviewed to find additional literature. Table 1 gives an overview of the databases, search terms, and hits.

Table 1

Overview of Search Results

Search Terms	Database	Total of Hits	Hits ^a	Articles selected
fals* memo* AND vulnerab*	PsycINFO, Psychological and Behavioural Sciences Collection	91	30	3
fals* memo* AND creat*	PsycINFO, Psychological and Behavioural Sciences Collection, Science Direct	819	482	3
fals* memo* AND suscept*	PsycINFO and Psychological, Behavioural Sciences Collection	250	179	7
fals* memo* AND caus*	PsycINFO, Psychological and Behavioural Sciences Collection, Science Direct	190	96	2
fals* memo* AND personal*	PsycINFO and Psychological, Behavioural Sciences Collection	861	515	4

^a Number of articles after selecting for language and type of article.

Selection Criteria

Literature that was included in the current thesis ranged from 1998 to 2016. Date of publication was not used as an exclusion criterion, although a lot of literature regarding the creation of false memories was available before 1998. Hence, studies published before 1998 were almost all covering the early mechanisms (e.g., suggestion by the therapist, hypnosis, dream interpretation, etc.), and were therefore excluded from this systematic literature review. Next, all participant groups were included in this thesis. The exclusion of articles based on participants could result in an inadequate examination of who is most at risk in developing false memories. Therefore, no exclusion took place when an experiment was conducted only to e.g., women, children, or students. Literature was excluded when research was based on case studies, due to the possible inadequacy of generalizing the results to larger groups.

Selected Literature

The database searches resulted in a total of 2,211 hits. After the selection for academic journals, empirical studies, and literature in English, the searches resulted in 1,302 hits. Nine hundred and nine articles were excluded based on language and type of article. All research had a first selection based on title and abstract of the article. This resulted in the exclusion of 1,232 articles. Once an abstract was identified as relevant, a second selection based on the whole article took place before it was included into this thesis. From the 70 articles read entirely, 19 articles were included in the current thesis. Thirty-eight articles were excluded when false memory was not explicitly mentioned or investigated. For example, when the experiment measured false recognition or false recall (of words, etc.), but the authors did not explicitly refer to this as false memory in general or how the results should be interpreted outside the experimental condition. Thirteen articles were excluded when it appeared to measure a form of suggestion, whether or not explicitly mentioned by the authors. Once an article was included, it was excluded when found in another database. The extensive search of the literature lists of included articles for additional researches resulted in seven more articles. This resulted in a total of 26 articles that were included (see table 2 for

an overview of the included research). Figure 1 gives an overview of the number of articles regarding the selection criteria.

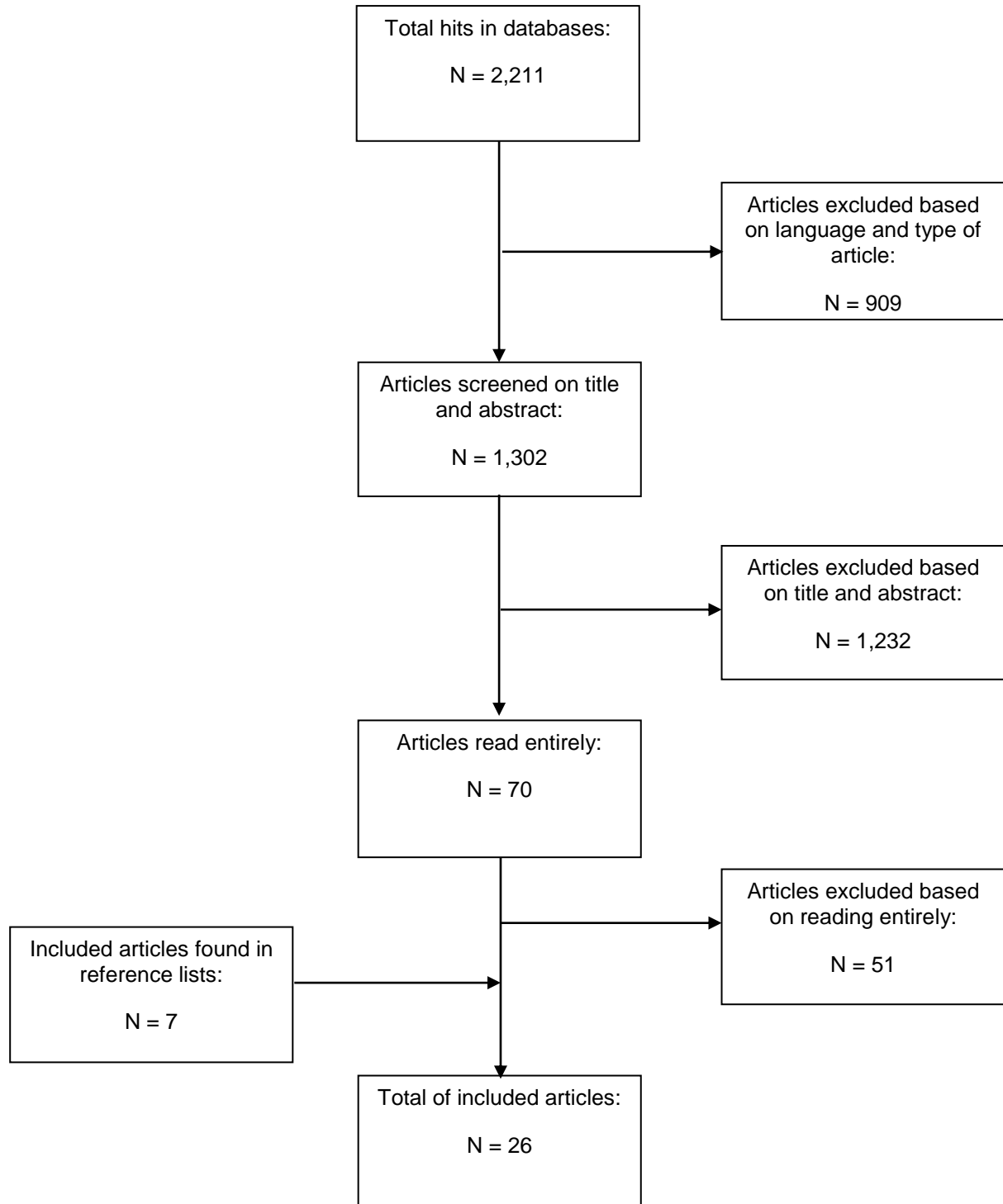


Figure 1. Article Selection

Participants and Used Methodologies in Included Research

In order to interpret the results, an overview will be given of the participants and used methodology in the included research (see also table 3 for this overview).

Participants.

Participant groups. Fifteen studies used students as participants (Ben-Artzi & Raveh, 2016; Brainerd, Stein, Rohenkohl, & Reyna, 2008; Brown, Croft, Caderao, Fields, & Marsh, 2015; Cody, Steinman, & Teachman, 2015; Dewhurst, Anderson, & Knott, 2012; Frenda, Patihis, Loftus, Lewis, & Fenn, 2014; Hyman & Billings Jr., 1998; Otgaar, Alberts, & Cuppens, 2012; Peiffer & Trull, 2000; Peters, Jellicic, Verbeek, & Merckelbach, 2007; Robers, 2002; Sanford & Fisk, 2009; Wilson, Mickes, Stolarz-Fantino, Evrard, & Fantino, 2015; Zhu et al., 2010; Zoladz et al., 2000). In three studies only women were tested (Berndt, Diekelmann Alexander, Pustal, & Kirschbaum, 2014; Pfeiffer & Trull, 2000; Zoellner, Foa, Brigidi, & Przeworski, 2000). Other participant groups were: children (Otgaar, Candel, Scoboria, & Meckelbach, 2010), youth and middle-aged adults (Meusel, MacQueens, Jaswal, & McKinnon, 2012), participants diagnosed with major depressive disorder (Joormal, Teachman, & Gotlib, 2009), borderline personality disorder (Schilling, Wingenfeld, Spitzer, Negal, & Moritz, 2013) or with PTSD (Jelinek, Hottenrott, Randjbar, Peters, & Moritz, 2009; Zoellner, Foa, Brigidi, & Przeworski, 2000), depressive-anxious participants (Toffalini, Mirandola, Drabik, Melinder, & Cornoldi, 2014), anxious participants (Toffalini, Mirandola, Coli, & Cornoldi, 2015) or heavy cannabis users (Riba et al., 2015).

Gender distribution. In most of the studies which tested both male and female participants, the majority of the participants were female (18 out of 22) (Ben-Artzi & Raveh, 2016; Brainerd et al., 2008; Brown et al., 2015; Cody et al., 2015; Frenda et al., 2014; Hyman & Billings Jr., 1998; Jelinek et al., 2009; Joormal et al., 2009; Meusel et al., 2012; Otgaar et al., 2012; Peters et al., 2007; Porter et al., 2000; Robers, 2002; Sanford & Fisk, 2009; Toffalini et al., 2014; Toffalini et al., 2015; Wilson et al., 2015; Zhu et al., 2000). Only two out of the 22 studies had a male participant majority (Otgaar et al., 2010; Schilling et al., 2013) In two other studies, gender was equally divided (Dewhurst et al., 2012; Zoladz et al., 2000).

Out of the 26 included studies, in one study gender (and age) of the participants was unknown (Riba et al., 2015).

Age. The mean in most of the studies was ranged between 18 and 29 years. However, the studies with clinical diagnosed participants the mean was higher, namely between 29 and 41 years.

Used methodology. A total of 17 studies used the Deese–Roediger–McDermott-paradigm (DRM-paradigm; Deese, 1959; Roediger & McDermott, 1995), or used the same methodology in order to study false memories formation as the DRM but did not name it as such (Ben-Artzi & Raveh, 2016; Berndt et al., 2014; Brainerd et al., 2008; Cody et al., 2015; Dewhurst et al., 2012; Jelinek et al., 2009; Joormal et al., 2009; Meusel et al., 2012; Otgaar et al., 2012; Peiffer & Trull, 2000; Peters et al., 2007; Riba et al., 2015; Sanford & Fisk, 2009; Schilling et al., 2013; Wilson et al., 2015; Zoellner et al., 2000; Zoladz et al., 2000). A list of positive, negative, or neutral words that are highly associated to a non-presented ‘critical lure’ word, was presented to the participant. These words are listed in backward associative strength, with the most strongly associated word presented first. An example of a neutral DRM paradigm wordlist is: *table, sit, legs, seat, couch, etc.* The critical lure in this example is *chair*. Examples of other neutral critical lures are *sleep, foot, mountain, slow*. In addition, negative critical lures are for example *evil, death, fear, hate, pain*. After the presentation of the list, participants had to recall or recognize as many words as possible.

Other methods of examining the formation of false memories were the studying of series of pictures, photographs, slides, or words (Robers, 2002; Toffalini et al., 2014; Toffalini et al., 2015; Zhu, 2010), which also had to be recalled or recognized. These techniques are close related to the DRM paradigm. In two studies parents were asked in advance about true and false childhood experiences of the participant (Otgaar, 2010; Porter, 2000). In the experiment, participants were interviewed and were asked about remembering those childhood experiences not knowing not all of the experiences were true. In one study participants themselves were asked about emotional experiences in their life, and how accurate their memory of it was (Hyman & Billings Jr., 1998). In one study questions were

asked about seeing a news events (were no know footage existed of) and how good they remembered seeing this (Frenda, 2014). Last, one study existed only of filling out a survey about borrowing personal stories of other people (Brown et al., 2015).

Of the 21 studies which used the DRM paradigm or in which e.g., lists of words or pictures were studied, 12 studies measured false memory with recognition (Ben-Artzi & Raveh, 2016; Berndt et al., 2014; Brainerd et a., 2008; Jelinek et al., 2009; Meusel et al., 2012; Riba et al., 2015; Schilling et al., 2013; Toffalini et al., 2014; Toffalini et al., 2015; Wilson et al., 2015; Zhu et al., 2010; Zoellner et al., 2000). After presenting the wordlists (or photographs etc., depending on the study), a short filler task was presented to clear the working memory. After that, participants were asked to recognize the previously presented words. In these studies the participants had to state if the presented word was 'old', (meaning it was presented during the learning phase), or 'new' (meaning it was not presented at the learning phase). In eight studies memory was measured using free recall of the presented wordlists or images (Cody et al., 2015; Dewhurst et al., 2012; Joormal et al., 2009; Otgaar et al., 2012; Peiffer & Trull, 2000; Peters et al., 2007; Robers, 2002; Sanford & Fisk, 2009). One study both used recognition and recall to measure false memories (Zoladz et al., 2014).

Results

"In even the simplest false memory experiment some people produce false memories and some do not" (Robers, 2002, p. 241). A reason for this could be that individual differences exist regarding the creation of false memories. Demographics, personality and cognitive risk factors, and external risk factors will be discussed.

Demographics

Age. Out of the 26 articles, one has examined the effect of age on the creation of false memories (Meusel et al., 2012). Results showed that younger individuals were more susceptible of creating false memories.

Meusel et al. (2012) compared youth (16-23 years old) with middle-aged adults (29-58 years old) and found that youth was more vulnerable for creating false memories. This

could be explained due to the development of certain brain networks that continue to develop until approximately the age of 25 (Meusel et al., 2012). This could result in youth and middle-aged adults differ in their response bias. The authors indicated that youth when not certain about a presented item have a greater tendency to falsely recognize that item.

Gender. Out of the 26 articles, one explicitly examined the effect of gender on the creation of false memories (Dewhurst et al., 2012). Another article provided additional support for those results (Brainerd et al., 2008). Results showed that especially women were more vulnerable for creating false memories than men as the result of negative valence and arousal (Dewhurst et al., 2012).

Dewhurst et al. (2012) found that provided with a negative wordlist, individuals – especially women – became more susceptible of creating false memories, than provided with a neutral wordlist. This could be explained by the fact that women had a less accurate memory for negative emotional information than men (Dewhurst et al., 2012). Additionally, women recalled more negative critical lures than men. The authors stated that women reflected on negative valenced⁶ wordlists more than men. It appeared that especially women were more susceptible for negative influences relating to false memory creation (Dewhurst et al., 2012). For example, women experienced a greater affective intensity than men (Dewhurst et al., 2012), this could explain the fact that women rated negative critical lures as more arousing. These results could additionally be explained by the research of Brainerd et al. (2008). They showed that remembering negative wordlists resulted in high levels of false memory. The authors stated that only negative valence had such an effect (Brainerd et al., 2008). Negative valence could reduce the ability to suppress errors, and could result in an increase of familiarity of critical lures, when asked to recognize words. Although it appeared in the study of Brainerd et al. (2008) that negative valence was the main factor in the creating of false memories, they did not look for gender differences. The authors indicated that when controlling for gender, arousal could also play a role in the creating of false memories in

⁶ Experiencing negative emotions, as anger or fear, have a negative valence.

women (Brainerd et al., 2008). Therefore, besides negative valence, arousal could also explain the differences between man and women in the creation of false memories.

Personality and Cognition

Negative affect. Two out of 26 articles examined the effect of depression on the creation of false memories (Jelinek et al., 2008; Joorman et al., 2009). Another article examined negative affect (Peiffer & Trull, 2000). Results showed that individuals with depression were more susceptible for creating false memories.

Peiffer and Trull (2000) found that young women were susceptible to create false memories when they had negative affect. This could indicate that those with negative effect had difficulties with concentration, due to not having emotional resources and therefore inaccurate recalled lures (Peiffer & Trull, 2000). However, it could indicate that mood is important in the creation of false memory. Jelinek et al. (2008) found a correlation between depression and false memories. Joormann et al. (2009) also found that individuals with a major depressive disorder (MDD) were more likely to falsely recall negative critical lures, than neutral or positive ones. For example, being depressive could make individuals more prone to mood-congruent material, which could explain individuals with MDD to be more susceptible to false memories when negative material was presented (Joormann et al., 2009).

PTSD. Out of the 26 articles, two examined the creation of false memories in traumatized individuals⁷ (Jelinek et al., 2008; Zoellner et al., 2000). The results showed that individuals with PTSD created more false memories, but these results not always were significant.

Even though Jelinek et al. (2008) found a correlation between depression and false memories, this correlation was not significant when looking at traumatized participants. In spite of these results, they did found that PTSD participants created more false memories than non PTSD participants, except these results were not significant. Though, Zoellner et al.

⁷ Traumatized victims were individuals with or without PTSD.

(2000) concluded that traumatized participants created more false memories, especially when critical lures were recalled. Particularly participants with PTSD falsely recalled more critical lures. On the other hand, Zoellner et al. (2000) found when recognizing words, both the traumatized groups with or without PTSD falsely recognized more critical lures. Then again, these results were not significant.

Dissociation. Three articles examined dissociation or topics related to dissociation (Hyman & Billings, 1998; Porter et al., 2000; Schilling et al., 2013). Dissociation can be described as “[t]he lack of the normal integration of thoughts, feelings, and experiences into the stream of consciousness and memory” (as cited by Bernstein & Putnam, 1986, in Eisen & Lynn, 2001; p. 50). Results indicate a connection between dissociation and false memories.

Hyman and Billings (1998) found scores on the Dissociation Experiences Scale (DES) and false memories creation were related. The DES was used to “measure the frequency of interruptions of the normal integration of consciousness, memory, and identity” (as cited by Bernstein & Putnam, 1986, in Hyman & Billings, 1998, p. 5). In other words, it was used to measure the “tendency towards dissociation” (Porter et al., 2000, p. 508). However, the experiment by Hyman and Billings was conducted using a technique very close to the imaginary technique used in the early 90’s. This indicates the correlation between false memories and dissociation could be the result of suggestive questioning. Though, Porter et al. (2000) also found that individuals who experienced memory distortions scored higher on the DES. This indicated there is possibly a connection between dissociation and the creation of false memories.

Related with dissociative experiences are borderline patients (Schilling et al., 2013). This would suggest that borderline patients would be more prone to false memories. However, Schilling et al. (2013) did not find this result. Though, this result could be questionable due to a small sample of participants.

Anxiety. Out of the 26 articles, four articles examined different anxious individuals and their susceptibility to false memory creation (Cody et al., 2015; Roberts, 2002; Toffalini,

2013; Toffalini, 2014). Overall, the results showed that individuals who are anxious were more susceptible for creating false memories.

Toffalini et al. (2013) found that individuals with a depressive-anxious personality trait were more prone to false memories when the presented events were negative. Nevertheless, Roberts (2002) did not find that state anxiety had an effect on the production of false memory. However, this could be the result of the study not being sensitive enough to detect an anxious state (Roberts, 2002). Furthermore, Toffalini et al. (2014) found that highly anxious young adults created more false memories when presented with negative events. This is supported by research of Cody et al. (2015), who found that individuals with social anxiety disorder are more susceptible to memory distortions when anticipating social stress. Additionally, those false memories could maintain over time, if continuously exposed to social stress.

Stress. Out of the 26 articles, two articles examined stress in the relation with the creation of false memories (Roberts, 2002; Zoladz et al., 2014). Results showed that stress, when presented for a short period of time could result in more accurate memories.

Roberts (2002) found that individuals who experienced more vivid imagery were more susceptible to false memories if they were stressed. Meaning participants falsely recalled more pictures than those who experienced less vivid imagery. Zoladz et al. (2014) showed the timing of a stressor was crucial for creating false memories. They found that brief stress namely reduced false memories, especially when recalling memories (instead of recognizing). Next to that, Zoladz et al. (2014) found that only in women, stress resulted in recognition and recall of true events. This means that acute stress, if presented for a short period of time, could reduce the susceptibility for creating false memories (Zoladz et al., 2014). These results could also explain why people with social anxiety disorder would continue to maintain having false memories.

Perfectionistic concerns. One of the 26 articles examined perfectionistic concerns and how this is related to false memories (Ben-Artzi & Raveh, 2016). "Perfectionistic concerns refers to the tendency to be worried and over-preoccupied with making mistakes

and with feelings of discrepancy between one's standards and performance" (Ben-Artzi & Raveh, 2016, p. 132). Another article provided additional information (Peter et al., 2007). Results showed that having perfectionistic concerns could make individuals more susceptible of creating false memories.

Ben-Artzi and Raveh (2016) found that having perfectionistic concerns was correlated with false memories, and a higher confidence that these memories were true. This could be explained as a result of the capacity of the working memory. Due to the fact that worrying consumes the working memory, leaving less working capacity left for other tasks. "The term working memory refers to a brain system that provides temporary storage and manipulation of the information necessary for such complex cognitive tasks as language comprehension, learning, and reasoning" (Baddeley, 1992, p. 556). The role of the working memory was also found to be important in the research of Peter et al. (2007). They found that poor simple span working memory was related with susceptibility to false memory.

Cognitive abilities. Two articles examined the effect of cognitive abilities on the creation of false memories (Otgaar et al., 2012; Zhu et al., 2010). Results showed that individuals with low cognitive abilities are more susceptible of creating false memories.

According to Zhu et al. (2010) individuals with low cognitive abilities were more likely to create false memories. As the result of low cognitive abilities and no worries about this, individuals will have difficulties with separating true from false memories because they are less able to clearly remember things (Zhu et al., 2010). This is in line with research from Otgaar et al. (2012). They found that depleted cognitive resources could make individuals susceptible to the creation of false memories, especially when self-control was reduced. "Ego depletion refers to a state of reduced self-control due to engaged acts of self-control" (Otgaar et al., 2012, p. 1674). Intriguingly, results showed that participants remained more accurate for negative word lists than for neutral ones. Indicating that negative material is more resistant to depleted cognitive resources.

Extraversion. Out of the 26 articles, two examined extraversion and its effect of false memories (Porter et al., 2000; Sanford & Fisk, 2009). The results were inconclusive, due to

opposite results.

Sanford and Fisk (2009) found that individuals with extravert personalities recalled more critical lures, indicating that extraverts were more susceptible of creating false memories. However, these findings were not supported by other research. Porter et al. (2000) namely showed that lower extraversion scores were related to susceptibility to false memories. They indicated that those who were susceptible of creating false memories were more introvert. This could be explained by the fact that introverts could be less susceptible for creating false memories due to “the heightened arousal and consequent narrowing of attentional focus among introverts may inhibit the process of spreading activation” (Sanford & Fisk, 2009; p. 975). Differences in results could be explained by the time of the conducted research, as the result of extraverts’ and introverts’ arousal levels peak at different times during the day (Sanford & Fisk, 2009).

External Risks

Besides different internal, personal aspects which could make someone susceptible to creating false memories, there are some external risk factors which could make someone more vulnerable of creating false memories.

Cannabis. One article examined heavy cannabis users and found that these individuals were more susceptible of creating false memories (Riba et al., 2015). Chronic cannabis use could lead to structural alterations in different brain areas, e.g., in the hippocampus: “a key area in the memory processing network” (Riba et al., 2015, p. 772). These structural changes in the brain could be long lasting, since some areas of the brain continue reducing even after several months of abstinence of cannabis usage (Riba et al., 2015). Riba et al. (2015) concluded that cannabis users, even when abstinent show an increased susceptibility to false memories than non-users.

Borrowing personal experiences. Out of the 26 articles, one examined the effect of borrowing personal memories from someone else (Brwon et al., 2015). Using an autobiographical experience (or details) from someone else and telling as if it is someone’s own experience eventually could lead to believing this experience really happened to them.

This was shown in research from Brown et al. (2015). When borrowing personal experiences from someone else, individuals are imagining how the event happened, until believing they experienced it themselves (Brown et al., 2015). Knowing that the early mechanisms, like imaginary techniques, produced false memories, could therefore explain that borrowing personal experiences from someone else would lead to the creation of false memories.

Script knowledge. One article examined the effect of script knowledge on the creation of false memories (Otgaar et al., 2010). Results showed that having high script knowledge leads to more false memories in children.

Otgaar et al. (2010) showed that children were more susceptible for creating false memory when they had knowledge of an event, than for events of which their knowledge was limited. The authors explained having high knowledge for event as: the fingers of the children being caught in a mousetrap, and explained low script knowledge as: receiving a rectal enema (Otgaar et al., 2010). The results indicated that children will reject false events when they had low script knowledge, due to this event being extremely memorable compared to a high script knowledge event (Otgaar et al., 2010).

Mindfulness. One article examined the effect of mindfulness meditation on the creation of false memories (Wilson, 2015). Results showed that individuals who participated in mindfulness meditation were more susceptible of creating false memories.

One of the therapeutic techniques that is used in therapy sessions nowadays, is mindfulness. In mindfulness mediation, individuals are encouraged to experience judgement-free thoughts and feelings, with the attention focused on the present moment (Wilson et al., 2015). Wilson et al. (2015) found that individuals who participated in mindfulness meditation created more false memories than individuals who did not. This result could be explained due to the resembles with an early mechanism – hypnosis – in which likewise thoughts and feelings were encouraged and this way reality monitoring may be impaired.

Sleep deprivation. Out of the 26 articles, two articles examined the effect of sleep deprivation on the creation of false memories. (Berndt et al., 2014; Frenda et al., 2014). Results showed that sleep deprivation could make individuals more susceptible of creation

false memories.

Berndt et al. (2014) conducted a study with pregnant women (during pregnancy and after childbirth). They found that pregnant women displayed more sleep fragmentation and had a higher susceptibility to creating false memories than non-pregnant women. One of the explanations that pregnant women created more false memories could be the influence of hormones (e.g., cortisol, progesterone) on the memory (Berndt et al., 2014). However, in their study it is not clear if there is a connection with sleep deprivation and susceptibility to false memories. Though, Frenda et al. (2014) did find that sleep deprivation increased the risk of developing false memories. A possible explanation provided by the authors, could be that sleep deprivation influenced the encoding process of an event, resulting in making memory this way more vulnerable. However, how sleep deprivation affects false memories will also depend on how the experiment was conducted (Frenda et al., 2014).

Discussion

As an outcome of the early 90's epidemic, the focus of the creation of false memories lied mainly in the therapeutic sphere. In the current study, a systematic literature review was conducted, to bring the personal and external risk factors at light in who is most susceptible of creating false memories.

Looking at demographics, results in the current thesis showed that young adults were more susceptible of creating false memories than middle aged adults. This difference could be explained due to ongoing brain development of young adults (Meusel et al., 2012). However, another study showed when only looking at middle-aged adults and older, false memory did appear to increase with age (Dennis, Bowman, & Peterson, 2014). Furthermore, Dennis, Kim, and Caberza (2008) showed that older adults (with a mean age of 68) also showed more false memories, due to e.g., decrease in hippocampus activity. Close to those results, results in the current thesis showed that the usage of cannabis also changes brain networks (e.g., the hippocampus). Even when abstinent, heavy cannabis use can result in the creation of false memories. These studies combined could indicate individuals are more susceptible for the creation of false memories when important brain networks change.

Other demographic results showed that compared to men, especially women had more negative valence and had more arousal. This could possibly explain the fact that women were more susceptible to create false memories. Furthermore, in the current study it was shown that young women were more susceptible for creating false memories when they had negative affect, indicating the importance of mood. The importance of mood was also shown due to the fact that individuals with depression, anxiety, or perfectionistic concerns, were more susceptible for creating false memories, especially when presented with negative material. Being depressed (or anxious), could be the result of negative material being kept in the working memory, with the possibility to rehearse the negative material (Joorman, 2010). This way, when presented with a negative critical lure it looks familiar to the depressed/anxious individual, and will falsely recall the critical lure as if they had seen it before (Joorman et al., 2009). Also with perfectionistic concerns, the working memory is too occupied with worrying, and leaving less capacity to remember correctly. Research of Ganley and Vasilyeva (2014) also showed the importance of occupying the working memory with worrying. They found that women with greater anxiety during a math test, asked too much of their working memory, which resulted in a poor performance on the test. This is in line with the results found in the current thesis, that poor simple span working memory was related to being susceptible in the creation of false memories. Furthermore, being susceptible for the creation of false memories could as well be the result of having low cognitive abilities. On the other hand, results in the current thesis showed that (healthy) individuals with depleted cognitive resources, created less false memories when negative material was presented. This indicated that when there is less focus on negative material, memory is more accurate than when extremely focused on negative material (which consumes the working memory) as it is with individuals with depression.

Stress is closely related to depression and anxiety (American Psychological Association, n.d.). Individuals who are stressed appeared to be more susceptible of creating false memories, except when a stressor was presented for a short period of time. This would indicate that individuals with PTSD, who experience severe chronic distress (American

Psychiatric Association, 2013) would be more susceptible of creating false memories as well. Bremner, Shobe, and Kihlstrom (2000) found that abused women with PTSD showed poorer memory than non-abused women. However, no clear significant correlation between PTSD and false memory was found in the current study. However, PTSD appeared to be correlated with dissociation, since dissociation can serve as a mediator between PTSD and increased false memories (Jelinek et al., 2008). Borderline is as well associated with dissociative symptoms (Schilling et al., 2013), indicating individuals with borderline could be susceptible of creating false memories. However, results in the current thesis showed that borderline patients were not susceptible of creating false memories. The results combined indicated that individuals with dissociative symptoms could be more susceptible for creating false memories. These results are supported by other research, which shows that dissociative experiences have associations with false childhood memories (Qin, Ogle, & Goodman, 2008). However, it appears to be less likely to create false memories when being diagnosed with other psychological problems (which are associated with dissociation).

Another result in the current thesis showed that having high script knowledge makes people more susceptible of creating false memories. It could be speculated that script knowledge could explain why borrowing autobiographical memories of others were also shown to be a risk factor in the creation of false memories. In these cases, individuals told the stories of others more than once, believing this to be their own stories. The same process is going on with having high script knowledge, in which creating false memories of an event depend on the plausibility and memorability of that event (Ghetti & Alexander, 2004; Otgaar et al., 2010). These results are in line with other research. Garcia-Bajos, Migueles, and Anderson (2009) found in an eyewitness study that highly typical actions were resistant for forgetting, due to higher script knowledge.

Furthermore, results in the current thesis showed that mindfulness meditation will lead to the creating of false memories. Mindfulness meditation is a technique that nowadays can be used in therapy. Individuals are encouraged to experience any though that comes to

mind. It could be speculated that this technique is close to hypnosis, which could explain why individuals are creating more false memories after participating in mindfulness meditation.

Last, sleep deprivation was shown to make individuals more susceptible of creating false memories. The importance of sleep in the memory process was also shown in the study of Landmann et al. (2014). They found that sleep disruptions could contribute to a disturbed memory reorganization. Total sleep deprivation could result in memory loss (e.g., Smith, 1993; Smith, 1995). When sleeping, individuals pass a cycle of five phases of sleep: stages 1, 2, 3, and 4, and REM (Rapid Eye Movement) sleep (American Sleep Association, 2007; Dotto, 1996). Sleep deprivation can result in not completing the stages, e.g., resulting in other stages of sleep to increase or wake up (Tilley & Empson, 1978). Those results indicate that when not completing all stages of sleep, false memories could arise.

Looking back at the research question of this thesis: 'what are – besides usage of the early mechanisms like e.g., hypnosis, dream interpretation or guided imagery – possible personal and external risk factors leading to the creation of false memories?', the results showed that false memories appear to arise in both individuals with a psychological disorder, as in healthy individuals. It appears that some individuals are more susceptible of creating false memories than others, especially young adults, women, or individuals who are anxious, depressed, or have perfectionistic concerns. Furthermore, external risk factors as cannabis use, borrowing autobiographical memories of others, high script knowledge, mindfulness meditation, or sleep deprivation can prone individuals to create false memories.

There are several limitations to this thesis. First, only free articles written in English that were online available were included, which could result in missing some important articles. Second, most of the false memory experiments that were conducted either asked participants to recognize or recall material, which possibly could produce different results. When recognizing, participants only have to think if they studied the presented material before or not, while with recall they are asked to remember as much as they can. It could be speculated that, when individuals were asked to recognize, there is a higher chance they will say they did recognize the presented word or picture. This way individuals would have a

higher chance of creating false memories. On the other hand, recall would make the creation of false memories harder, because the individuals had to use their own memory capacity. Furthermore, other methodological differences could have an effect on the results, e.g., as was shown with extroverts and introverts. These results indicated possibly the importance of the time the experiment was conducted. However, since only two studies with inconclusive results were included in this thesis, no harsh conclusion can be drawn on the effect of the methodology of these studies. Third, the large majority of the participants of the included studies were students. Since the results showed that youth were more susceptible of creating false memories, it is possible that this could interfere with the false memory experiment. Indicating that, those who are younger are already more susceptible, which possibly could easier lead to a significant result. This large majority of students as participants could question the external validity. Fourth, results showed that it is possible in a laboratory setting to create false memories. This makes it questionable if the false memories of wordlists and photographs are the same as autobiographical false memories. Also, it is questionable if the results in the current thesis are valid outside the controlled setting in which the experiment was conducted. However, the importance lies not in ecologically validating the found results, but knowing who is more prone in developing false memories, and to better understand which risks there are. Results found in an experimental setting showed that those individuals are more susceptible.

Further research should continue to focus on the different personal and external risk factors which could lead to false memories. In addition, it is important to replicate different studies due to contradictory or inconsistent results. Furthermore, further research should keep in mind the possible jeopardy when only students are used as participants. It is important to focus on different participant groups, which probably better reflect society. Last, it is recommended for further research that both the recognize and recall memory form is examined in order to make a more correct assessment of who is most at risk of creation false memories.

Since the early 90's epidemic, a lot of research is conducted in order to examine different risk factors that could lead to the creation of false memories. Even though a lot more is known now than roughly 20 years ago, as long as there are cases known in which false memories lead to false accusations, more research should be conducted to examine who is most at risk of creating false memories. Besides the knowledge of the dangers in using recovered memory techniques, the current thesis gives additional insights in personal and external risk factors leading to false memories

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Table 2

Summary of Included Empirical Research

Authors	Year of Publication	Title	N	Relevant Findings
Ben-Artzi and Raveh	2016	Perfectionism and false memories: A signal detection analysis.	97	Results showed that individuals with perfectionistic concerns were associated with higher levels of false memories. On the other hand, results showed that individuals with perfectionistic strivings were associated with more accurate memories.
Berndt, Diekelmann, Alexander, Pustal, and Kirschbaum	2014	Sleep fragmentation and false memories during pregnancy and motherhood.	236	Results showed that pregnant women suffered from sleep fragmentation and had a higher susceptibility to false memories. However, according to these results, it was not clear if the sleep fragmentation was correlation with the susceptibility to false memories.
Brainerd, Stein, Rohenkohl, and Reyna	2008	How does negative emotions cause false memories?	313	Results showed that valence created false memories, especially for negative materials. False memories were lowest for positive material.
Brown, Croft, Cadera, Fields, and Marsh	2015	Borrowing personal memories.	447	Results showed that the majority of the individuals were uncertain if an autobiographical memory belonged to them or to someone else.
Cody, Steinman, and Teachman	2015	True and false memories in social anxiety disorder: Effects of speech anticipation and social content.	77	Results showed that for individuals with social anxiety disorder non-social false memories were reported more frequently when they were anticipating a speech.
Dewhurst, Anderson, and Knott	2012	A gender difference in the false recall of negative words: Women DRM more than man.	100	Results showed that women falsely recalled more negative lures than men. However, there were no gender difference in the false recall of neutral lures.
Frenda, Patihis, Loftus, Lewis, and	2014	Sleep deprivation and false memories.	297	Results showed that sleep deprivation make an individual more susceptible of creating false

Fenn				66	memories.
Hyman and Billings Jr.	1998	Individual differences and the creation of false childhood memories.		66	Results showed that individuals who scored high on the Creative Imagination Scale and Dissociative Experiences Scale created more false memories.
Jelinek, Hottenrott, Randjbar, Peters, and Moritz	2009	Visual false memories in Post-Traumatic Stress Disorder (PTSD).		76	Results showed that individuals with depression were more susceptible for creating false memories.
Joormal, Teachman, and Gotlib	2009	Sadder and less accurate? False memory for negative material in depression.		52	Results showed that when presented with lists of words, individuals with major depressive disorder recalled fewer words but were more likely to falsely recall negative lures.
Meusel, MacQueens, Jaswal, and McKinnon	2012	Youth are more vulnerable to false memories than middle-aged adults due to liberal response bias.		40	Results showed that youth recalled more false lures than middle-aged adults. This increased susceptibility to the creating of false memories resulted from a more liberal response bias in the youth.
Otgaar, Alberts, and Cuppens	2012	Ego depletion results in an increase in spontaneous false memories.		80	Results showed that depleted cognition made individuals more susceptible of creating false memories.
Otgaar, Candel, Scoboria, and Meckelbach	2010	Script knowledge enhances the development of children's false memories.		120	Results showed that children who are having high script knowledge develop more false memories than children with low script knowledge.
Peiffer and Trull	2000	Predictions of suggestibility and false memory production in you adult women.		60	Results showed that individuals with negative affect were more susceptible of creating fals memories.
Peters, Jelacic, Verbeek, and Merckelbach	2007	Poor working memory predicts false memory.		60	Results showed that poor simple span working memory was related to higher levels of false recognition. Furthermore, results showed that poor working memory was associated with individuals being more susceptible to the recollection of critical lures.

Porter, Birt, Yuille, and Lehman	2000	Negotiating false memories: Interviewer and rememberer characteristics relate to memory distortion.	75	Results showed that susceptibility to memory distortion was associated with lower scores on extraversion. Those individuals also scored higher on the Dissociate Scale.
Riba, Valle, Sampedro, Rodríguez-Pujadas, Martínez-Horta, Kulisevsky, and Rodríguez-Fornells	2015	Telling true from false: Cannabis users show increased susceptibility to false memories.	30	Results showed that cannabis users have an increased susceptibility to false memories, even when drug free. Those results suggested a long-lasting effect on the memory and cognitive control mechanisms involved in reality monitoring.
Robers	2002	Vulnerability to false memory: The effects of stress, imagery, trait anxiety, and depression.	60	Results showed that individuals who experienced more vivid imagery were more susceptible to creating false memories when they were stressed.
Sanford and Fisk	2009	How does the extraversion personality trait influence false recall with the Deese-Roediger-McDermott (DRM) paradigm?	79	Results showed that extraverts falsely recalled more critical lures.
Schilling, Wingenfeld, Spitzer, Negal, and Moritz	2013	False memories and memory confidence in borderline patients.	42	Results showed that borderline patients showed no increased susceptibility for distorted memories.
Toffalini, Mirandola Coli, and Cornoldi	2015	High trait anxiety increased inferential false memories for negative (but not) positive emotional events.	68	Results showed that high-anxious individuals were more susceptible of creating false memories.
Toffalini, Mirandola, Drabik, Melinder, and Cornoldi	2014	Emotional negative events do not protect against false memories in young adults with depressive-anxious personality traits.	60	Results showed that depressed-anxious individuals were created more false memories when presented with negative material.
Wilson, Mickes, Stolarz-Fantino, Evrard, and Fantino	2015	Increased false memory susceptibility after mindfulness meditation.	293	Results showed that individuals who participated in mindfulness meditation created more false memories.

Zhu, Chen, Loftus, Lin, He, Chen, Li, Moyzis, Lessard, and Dong	2010	Individual differences in false memory from misinformation: Personality characteristics and their interactions with cognitive abilities.	436	Results showed that individuals with low cognitive abilities were more susceptible for creating false memories.
Zoellner, Foa, Brigidi, and Przeworski	2000	Are trauma victims susceptible to false memories.	42	Results showed that traumatized participants recalled more critical lures than non-traumatized participants.
Zoladz, Peters, Kalchik, Hoffman, Aufdenkampe, Woelke, Wolters, and Talbot	2014	Brief, pre-learning stress reduced false memory production and enhances true memory selectively in females.	60	Results showed that the timing of a stressor is important in the creating of false memories. False memories were decreased when a stressor was presented for a brief period of time.

Table 3

Overview of Participants and Used Methodology

Study	Participants	Mean Age Participants	Percentage of Female Participants ^a	Methodology	Form of Memory
Ben-Artzi and Raveh (2016)	Students	26.5	73	DRM	Recognition
Berndt, Diekelmann, Alexander, Pustal, and Kirschbaum (2014)	Pregnant women	26.9	100	DRM	Recognition
Brainerd, Stein, Rohenkohl, and Reyna (2008)	Students	25.0	65	DRM	Recognition
Brown, Croft, Caderao, Fields, and Marsh (2015)	Students	19.7	75	Survey	-
Cody, Steinman, and Teachman (2015)	Students	19.7	69	DRM	Recall
Dewhurst, Anderson, and Knott (2012)	Students	- ^c	50	DRM	Recall
Frenda, Patihis, Loftus, Lewis, and Fenn (2014)	Students	19.2	68	Interview based on news-event	Recall ^b
Hyman and Billings Jr. (1998)	Students	-	56	Interview with participants	Recall ^b
Jelinek, Hottenrott,	Traumatized group	39.2	61	DRM	Recognition

Randjbar, Peters, and Moritz (2009)	with/without PTSD					
Joormal, Teachman, and Gotlib (2009)	Major depressive disordered group	31.9	63	DRM	Recall	
Meusel, MacQueens, Jaswal, and McKinnon (2012)	Youth (aged 16-23), middle-aged adults (aged 29-58)	19.7 and 44.8	63	DRM	Recognition	
Otgaar, Alberts, and Cuppens (2012)	Students	21.7	70	DRM	Recall	
Otgaar, Candel, Scoboria, and Meckelbach (2010)	Children (aged 7-8 and aged 11-12)	7.4 and 11.3	43	Interview with parents and participants	Recall ^b	
Peiffer and Trull (2000)	Students	18.5	100	DRM	Recall	
Peters, Jelacic, Verbeek, and Merckelbach (2007)	Students	19.6	72	DRM	Recall	
Porter, Birt, Yuille, and Lehman (2000)	Participants	19.2	81	Interview with parents and participants	Recall ^b	
Riba, Valle, Sampedro, Rodríguez-Pujadas, Martínez-Horta, Kulisevsky, and Rodríguez-Fornells (2015)	Heavy cannabis users	-	-	DRM	Recognition	
Robers (2002)	Students	27.2	77	Studying series of pictures and words	Recall	

Sanford and Fisk (2009)	Students	23.2	68	DRM	Recall
Schilling, Wingenfeld, Spitzer, Negal, and Moritz (2013)	Borderline patients	32.2	31	DRM	Recognition
Toffalini, Mirandola Coli, and Cornoldi (2015)	Anxious group	19.4	57	Studying series of coloured pictures	Recognition
Toffalini, Mirandola, Drabik, Melinder, and Cornoldi (2014)	Depressive-anxious group	18.3	73	Studying series of coloured photographs	Recognition
Wilson, Mickes, Stolarz-Fantino, Evrard, and Fantino (2015)	Students	20.7	73	DRM	Recognition
Zhu, Chen, Loftus, Lin, He, Chen, Li, Moyzis, Lessard, and Dong (2010)	Students	19.8	57	Studying series of coloured slides	Recognition
Zoellner, Foa, Brigidi, and Przeworski (2000)	Traumatized group with/without PTSD	32.6	100	DRM	Recognition
Zoladz, Peters, Kalchik, Hoffman, Aufdenkampe, Woelke, Wolters, and Talbot (2000)	Students	19.2	50	DRM	Recognition and recall

Note: DRM = Deese–Roediger–McDermott-paradigm, PTSD = Post-Traumatic Stress Disorder.

^a Percentages are rounded. ^b This was not explicitly mentioned in the article, but an interpretation by the author of this thesis. ^c Mean age unknown, participants age ranged between 18-25.