Simulation of multiple personalities: A review of research comparing diagnosed and simulated dissociative identity disorder

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HIGHLIGHTS

- Twenty studies compared people diagnosed with DID to individuals simulating DID.
- Aspects of symptoms, identities, and cognitive processes differed between groups.
- Interidentity transfer of information occurred at similar rates in both groups.
- Several methodological improvements are needed in simulation research.

ARTICLE INFO

ABSTRACT

Dissociative Identity Disorder (DID) has long been surrounded by controversy due to disagreement about its etiology and the validity of its associated phenomena. Researchers have conducted studies comparing people diagnosed with DID and people simulating DID in order to better understand the disorder. The current research presents a systematic review of this DID simulation research. The literature consists of 20 studies and contains several replicated findings. Replicated differences between the groups include symptom presentation, identity presentation, and cognitive processing deficits. Replicated similarities between the groups include interidentity transfer of information as shown by measures of recall, recognition, and priming. Despite some consistent findings, this research literature is hindered by methodological flaws that reduce experimental validity.

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Contents

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1. Introduction

Dissociative Identity Disorder (DID) maintains a unique place in the field of psychopathology; it elicits an unprecedented mixture of acceptance and rejection in the scientific community. Beginning with acceptance, DID is an officially recognized diagnosis in the *Diagnostic and Statistical Manual of Mental Disorders*, *Fifth Edition* (DSM; American Psychiatric Association, 2013) and the *International Classification of Diseases* (ICD-10; World Health Organization, 1992). In addition, the scientific study of DID produces a modest but steady stream of publications documenting cases of the disorder in countries throughout the world (Boysen & VanBergen, 2013). On the other hand, some have dismissed the idea of multiple personalities as an incredible "folly" (Piper & Merskey, 2004), and others have argued that interest in dissociative disorders was a scientific fad that peaked in the 1990s and then quickly faded (Paris, 2012; Pope, Barry, Bodkin, & Hudson, 2006). One of the longest-standing controversies about DID, however, is if it represents a socially-enacted role or a special case of posttraumatic dissociation (Spanos, 1994; Spanos, Weekes, & Bertrand, 1985). Can DID be exhibited after normal social learning processes or is it somehow unique? One method of exploring this issue would be to compare people with diagnoses of DID to individuals who are intentionally faking the symptoms of DID. Differences between these groups would provide evidence for DID's unique nature, and similarities would suggest a less-than-exceptional nature. The results could also have implications for the understanding of DID's etiology, diagnosis, and basic features. The purpose of this review was to examine all existing research comparing individuals diagnosed with DID to individuals simulating DID in order to indentify reliable similarities and differences between the groups.

1.1. Disagreements about DID and dissociation

Etiology is at the center of disagreement about DID. The posttraumatic explanation posits that DID is a reaction to intense trauma, typically occurring in childhood (Gleaves, 1996; Putnam, 1989). The model proposes that dissociation functions as a defense mechanism in the face of inescapable psychological distress, and DID occurs when this tendency to dissociate becomes too pervasive. Evidence for the posttraumatic model comes from several different sources. A primary source of evidence is the high proportion of people with dissociative disorders who report childhood abuse or trauma (Foote, Smolin, Kaplan, Legatt, & Lipschitz, 2006; Lewis, Yeager, Swica, Pincus, & Lewis, 1997; Sar et al., 2007). In fact, studies have documented the trauma–dissociation relation across several cultures (Tamar-Gurol, Sar, Karadag, Evren, & Karagoz, 2008; Xiao et al., 2006). Furthermore, there is evidence that sexual abuse is uniquely tied to dissociation among children (Kisiel & Lyons, 2001). Such evidence is cogent, but it is also correlational and frequently based on retrospective self-reports, which leaves the posttraumatic model open to criticism.

Skepticism about DID is multifaceted, but the central concern among critics is that social factors, rather than trauma, may be the predominant cause of the disorder. Several trends point to DID's origins as a social phenomena (Lilienfeld et al., 1999; Piper & Merskey, 2004; Spanos, 1994). Due to media depictions in the latter half of the 20th century,

the concept of having multiple personalities became part of the cultural landscape in Western countries; at the same time, the prevalence of the disorder dramatically increased. As cases became more frequent, so did some of the more incredible aspects of the DID phenomena. For example, the reported number of alternative identities increased and so did the scope of abuse allegations. Criticism has often focused on the treatment of DID as a potential iatrogenic factor. Some clinicians appear to diagnose DID disproportionately more than others, and the typical presentation of DID is unusual in that the core symptoms tend to emerge only after treatment has started. The DSM states that "only a small minority [of patients] present to clinical attention with observable alteration of identities" (American Psychiatric Association, 2013, p. 292). In fact, documentation of DID cases that have emerged outside of treatment appears to be particularly challenging (Boysen, 2011; Boysen & VanBergen, 2013). Direct support for the power of social influence comes from experimental laboratory studies indicating that social cues can lead individuals to enact some of the basic phenomena of DID such as amnesia and the adoption of an alternative identity (Spanos, 1994; Spanos, Weekes, & Bertrand, 1985). Taken together, these pieces of evidence have led to the proposal of a sociocognitive model stating that DID is a social role enacted due to the influence of culturally-determined rules for expressing multiple selves (Spanos, 1994). Thus, DID symptoms are learned in much the same way as any other social behavior.

Considering the divergent etiological models, a primary subject of disagreement is if DID's signs and symptoms are somehow special and unique. Skeptics argue that the exhibition of multiple personalities consists of acting out a known social role and is brought forth through nonpathological forms of social influence (Lilienfeld et al., 1999; Spanos, 1994); this is not to say that the psychopathology of DID is not real. Rather, skeptics argue that DID does not need to be explained as a specialized defense mechanism used in reaction to trauma. Although some trauma-focused theorists agree that social factors can be integrated into their models (Sar & Ozturk, 2007), a central assertion of the trauma model is that enactment of a social role in the absence of trauma can only resemble DID on a superficial level (Gleaves, 1996). For example, research showing that undergraduate students can be influenced into exhibiting symptoms of DID in the laboratory (e.g., Spanos, Weekes, & Bertrand, 1985) does not directly show that their behavior is analogous to people diagnosed with DID (Gleaves, 1996). Unlike many of the conflicts between supporters of the sociocognitive and trauma models, there is empirical evidence that can offer clarification in this case. Studies comparing individuals diagnosed with DID and individuals attempting to simulate DID have existed in the literature for almost as long as it has been an official diagnosis in the DSM (e.g., Coons, Milstein, & Marley, 1982). Comparing people diagnosed with DID to people simulating DID can directly demonstrate the ways in which having a diagnosis and enacting a role are similar or dissimilar.

The DID simulation literature can also inform the somewhat analogous debate about the general concept of dissociation. Proponents of the trauma model of dissociation believe that it is a biologically-based reaction to threat that includes experiences such as loss of conscious control over behavior and amnesia, which are typical not only of DID but also of many other posttraumatic stress reactions (Dalenberg et al., 2012). Skeptics argue that special, trauma-based explanations

are not needed and that dissociation is actually associated with increased, but unexceptional, cognitive processing failures such as forgetting and inattention (Giesbrecht, Lynn, Lilienfeld, & Merckelbach, 2008). Because DID is the hallmark dissociative disorder, the results of DID simulation research should provide evidence related to the assertion that dissociation phenomena can only be explained as unique, biologically-based reactions to trauma.

1.2. Evidence provided by simulation studies

A frequent criticism of DID simulation research is that it is incapable of providing conclusive evidence for one etiological theory over another (Merckelbach, Devilly, & Rassin, 2002). After all, the same behavior might emerge for completely separate, unrelated causes. Thus, it is important to consider how the results of simulation studies should logically be interpreted. Research on hypnosis provides some useful guidance for interpretation. Hypnosis simulation research has a long history (Orne, 1959), and it has had a substantial impact on the understanding of hypnotic phenomena (Kirsch & Lynn, 1998). Theorists assumed for a long time that behaviors associated with hypnosis were unique and impossible to intentionally simulate (Orne, 1971). However, researchers began performing studies in which the experimenter was blind to whether participants were actually hypnotized or acting as if they were hypnotized (e.g., Green, Page, Handley, & Rasekhy, 2005; Kirsch & Lynn, 1998; Naish, 2005; Orne, 1971). What they discovered, to the surprise of many, was that simulated responses and hypnotic responses were largely indistinguishable.

The results of hypnosis simulation studies provided important theoretical information. Behaviors that emerged only in the hypnosis group could be assumed to represent unique consequences to being hypnotized. In contrast, failure to find differences between hypnotized and simulating individuals demonstrated that hypnosis is not required to produce the behaviors in question, and normal social processes cannot be eliminated as an explanation for hypnotized behavior (Orne, 1971). For example, if people who are hypnotized and simulating hypnosis both experience a reduction in pain sensitivity, social demands cannot be eliminated as the cause of analgesic effects associated with hypnosis. If pain reduction occurs in hypnosis but not hypnosis simulation, social demands are unlikely to fully explain the differences between groups, which may be attributable to unique characteristics of hypnosis.

Building off of the lessons of hypnosis-simulation research, what can and cannot be learned from the simulation of DID? Beginning with similarities between individuals diagnosed with DID and individuals simulating DID, they show that the phenomena of DID cannot be considered unique. Similarities show that characteristics considered central to DID, such as exhibiting multiple personalities and amnesia, can be produced through normal learning and social influence. In laboratory experiments, social influences may include such factors as instructions, behaviors of the experimenters, and the experimental setting itself. It is important to note, however, that similarities do not provide direct evidence for the etiology of DID because the same behavior may result from different causes. Even though direct proof for one model cannot be offered from simulation research, evidence that DID phenomena can be created through social influence is theoretically important due the centrality of that proposition in the sociocognitive model (Spanos, 1994).

The interpretation of differences between simulators and people diagnosed with DID is also important to consider. Differences between simulators and people diagnosed with DID provide evidence that DID phenomena is not fully explained by the social influence exerted on simulators. However, simulators are likely to differ from people diagnosed with DID in many ways; thus, confounds due to sample selection prevents simulation research from conclusively showing that differences are a result of diagnosis rather than other differences between the groups. Nonetheless, evidence against the ability of

simulators to meaningful enactment DID is theoretically important because it directly contradicts the sociocognitive model and indirectly supports the trauma model's contention that DID is a unique phenomena.

There are several other pieces of important information that might be obtained from simulation research. It is possible that information about other etiological factors may emerge. The most obvious example would be if brain functioning in people diagnosed with DID differed systematically from simulators; this might provide corroborative evidence for areas of the brain previously identified as related to DID (e.g., Reinders et al., 2006; Sar, Unal, Kiziltan, Kundakci, & Ozturk, 2001; Vermetten, Schmahl, Lindner, Loewenstein, & Bremner, 2006). Some researchers have identified neurological correlates of switching personalities in DID (Reinders et al., 2003); however, without a simulating control group it is impossible to determine if neurological effects are unique to DID or if they occur in any group enacting the role of having multiple selves. Simulation studies might also offer perspective on the validity of the DID diagnostic criteria. According to the DSM, the core features of DID are amnesia and the existence of different identity states (American Psychiatric Association, 2013). However, other symptoms are quite common but are, nonetheless, absent from the DSM criteria (Dell, 2006). For example, somatoform, derealization, and hallucinatory symptoms appear to be as common as the classic memory and identity symptoms. Evidence that these symptoms differentiate simulated from diagnosed cases of DID would provide an argument for revision of the diagnostic criteria. Similarly, the research may provide guidance for differential diagnosis. Some individuals mimic DID symptoms because they are malingering or because they are exhibiting a factitious disorder. In fact, factitious DID may be as prevalent as nonfactitious DID (Friedl & Draijer, 2000). Given the evidence for frequent imitation of DID (Draijer & Boon, 1999; Reinders, 2008), identifying key points in differential diagnosis is particularly important. Overall, there is much to learn about DID from a systematic review of the simulation literature.

Reviewing the DID simulation literature also provides an opportunity to evaluate the methodological rigor used by researchers in the field. Confidence in the validity of research results must be moderated by the quality of the methods used, and there are several key methodological controls that are important to simulation research (Orne, 1971). Perhaps the most important control is to engage in blinding procedures so that the experimenter is unaware of participants' diagnostic group. In terms of simulator preparation, researchers should provide strong motivation for them to simulate effectively and emphasize the importance of convincing the experimenter that they are actually diagnosed with DID. During and after the simulation, researchers should engage in manipulation checks to ensure that simulators are following instructions and adequately performing their tasks. Other necessary controls are related to more general methodological quality. Considering the fact that participants in DID simulation research are likely to come from very different populations, matching of groups on demographic characteristics would help reduce the potential influence of selection confounds. DID is a complex phenomena; as such, people simulating DID must be trained on how to perform its associated behaviors and must be given adequate opportunity to practice. Finally, adequate sample sizes are needed to ensure the validity of statistical conclusions.

1.3. The current research

The current research consisted of a review of all published studies comparing individuals diagnosed with DID to individuals intentionally simulating DID. Of primary interest were the similarities and differences that emerged between the two groups. Similarities provide evidence that social influence cannot be ruled out as a factor in DID phenomena, and differences provide evidence that DID is a unique phenomena not easily explained by social influence. However, there are a number of potential confounds that would diminish the meaningfulness of the study's results. As such, the methodological quality of DID simulation

research must be evaluated before considering the results of the studies. Considering these issues, there were three primary research questions for the review. One, what are the methodological controls used in DID simulation research? Two, are there variables that reliably differentiate between diagnosed and simulated DID? Three, are there variables that reliably fail to differentiate between diagnosed and simulated DID? Answers to these questions may inform diagnostic practices as well as theories about the etiology of DID.

2. Method

Researchers searched the MEDLINE and PsycINFO databases for this review. Search limiters included peer-reviewed journal articles published in English. Search terms included dissociative identity disorder, multiple personality, and dissociative disorder combined with act, simulation, fake, role play, enactment, mimic, imitation, factitious, malinger, and feign. Researchers also examined the references of identified articles in order to locate studies that did not emerge using the database searches. Inclusion criteria for the review were that the study contain at least one participant diagnosed with DID and at least one participant simulating the phenomena of DID in some way for the purposes of the study (e.g., alternate identities, amnesia). Other dissociative disorders, high scores on dissociation measures, or dissociation in general did not meet the DID inclusion criterion. Also, there are a few studies comparing people diagnosed with DID and people who have been identified as intentionally faking DID in clinical settings (Coons & Milstein, 1994; Kluft, 1987). However, we chose to only include laboratory studies in this review due to their increased experimental control and conceptual similarity. In addition, individuals who have been caught faking DID have, by definition, failed in their attempt to simulation the disorder, which makes them a poor comparison group. These methods led to the identification of 20 DID simulation studies (see Table 1).

3. Results

The review consists of two major sections: study methods and study results. The first section reviews methodological controls utilized in DID research. Examination of the research methods will help to provide a frame of reference from which to evaluate research results in the second part of the review. Subsequent sections include reviews of the reliable differences and similarities that emerge between simulators and people diagnosed with DID.

3.1. Methodological controls

3.1.1. Control group matching

A high quality comparison group is an essential methodological control in DID simulation studies. The quality of a control group can be evaluated by size and demographic similarity to the DID group (see Table 1). In terms of sample size, the average number of people diagnosed with DID per study was 14 ($SD = 8$), and the average number of simulators was 20 ($SD = 14$). The average sample size in simulation studies is somewhat lower than the pool of all recent research utilizing people diagnosed with DID, which has mean sample size of 17 (Boysen & VanBergen, 2013). Overall, the sample sizes in DID simulation research are small, but the DID and control groups are similar in size. In terms of the comparability of these samples, there were systematic differences in the recruitment of participants. Researchers recruited DID samples from treatment settings. Of the studies specifying details about control groups recruitment, the samples included volunteers recruited from the general community ($n = 5$), health professionals recruited from the hospitals at which studies were taking place ($n = 5$), volunteers recruited among the student population ($n = 4$), actors recruited for their extensive experience ($n = 2$), and mixed sources ($n = 1$). Thus, the origin of groups was not directly comparable in the majority of

studies and simulators always consisted of healthy controls. Most studies ($n = 12$) included some sort of matching of the samples. However, matching was not extensive; the majority of studies only matched for age ($n = 9$), sex ($n = 10$), and education ($n = 8$). Nine studies matched on at least two of these demographic factors.

3.1.2. Control group training

DID is a complex phenomenon, and effective simulation of the disorder requires training. All simulators followed general instructions to mimic DID; two exceptions were one group asked to simulate amnesia by concealing knowledge (Brand, McNary, Loewenstein, Kolos, & Barr, 2006) and one group of actors instructed to role play specific patient identities (Hopper et al., 2002). Specific wording of instructions or training scripts was not available in the articles (presumably due to space constraints). The level of training offered to assist in effectively mimicking DID varied considerably. Of the 17 studies outlining a training method, 15 included exposure to educational information about DID in written or video format (see Table 1). Eight of these studies included both readings and videos in the training. Educational materials mostly consisted of general readings or documentaries about DID, but three studies used the book or movie version of *Sybil* (Brand et al., 2006; Miller, 1989; Miller et al., 1991).

Training in 12 studies included opportunity to practice DID simulation (see Table 1). A common training procedure was to encourage control group members to fabricate details about their alternate identities that corresponded to 17 specific attributes (Huntjens, Peters, et al., 2005; Huntjens, Peters, Woertman, Van der Hart, & Postma, 2007; Huntjens et al., 2002; Huntjens, Postma, Peters, Woertman, & Van der Hart, 2003; Huntjens, Postma, Woertman, Van der Hart, & Peters, 2005; Putnam, Zahn, & Post, 1990; Reinders, Willemsen, Vos, Den Boer, & Nijenhuis, 2012). Among the studies specifying the duration of time allowed for practice, the modal amount was one week (Huntjens, Peters, et al., 2005; Huntjens et al., 2007, 2003; Huntjens, Postma, et al., 2005; Huntjens, Verschuere, & McNally, 2012), but times ranged from one day (Silberman, Putnam, Weingartner, Braun, & Post, 1985) to two weeks (at minimum; Reinders et al., 2012). Although the modal duration was one week, researchers did not provide details on the actual hours spent on practice or the number of individual practice sessions, which are, perhaps, more valid measures of training quality.

3.1.3. Manipulation checks

Although the term manipulation check typically refers to the procedures for determining if an independent variable had its intended effect in experimental research, the concept can be applied in the current context to refer to control group members' ability to effectively simulate DID. Some basic standard of performance must be set for the quality of simulation. Otherwise, simulation studies are inherently biased toward finding differences between people diagnosed with DID and simulators. Ten studies included methods that could be broadly construed as manipulation checks. Reinders' et al. (2012) study included the most extensive system of checks; it included checks on simulators' compliance with practice instructions, assessment of the quality of their development of identities, and self-evaluations of their actual performance during the study. Miller et al. (1991) conducted a simple but elegant manipulation check by having examiners, who were blind to participants' group membership, rate how much they believed the person they examined had DID. The most common check was testing simulators' knowledge about their identities (Huntjens, Peters, et al., 2005; Huntjens et al., 2006, 2007, 2002, 2003; Huntjens, Postma, et al., 2005) or about DID in general (Brand et al., 2006). Finally, Huntjens et al. (2012) and Kong, Allen, and Glisky (2008) conducted post-study interviews of simulators to assess their effectiveness. Overall, manipulation checks were minimal, and only one study included an evaluation of the simulation as it was actually occurring (Miller et al., 1991).

Table 1
Study method and results for studies comparing people with DID to people simulating DID.

Study	DID/Control *N*	Control source and matching	Task and training	Blinding	Manipulation checks	Comparisons between DID and simulator groups
Allen & Movius, 2000	4/60	College students No matching	Simulate amnesia None	No	No	Recognition: forced choice test (DID less recognition)[a] Response latency for responses (DID slower)[a] Electroencephalogram (EEG) P3 amplitude (no statistical comparisons)
Brand et al., 2006	20/43	College students No matching	Simulate DID Watch or read *Sybil*, complete Abnormal Psychology course, readings	No	Yes, scores above 70% on test of DID knowledge	Structured interview of Reported Symptoms total score and 13 subscales (DID scores lower)[a]
Coons et al., 1982	2/1	Therapist of DID patient No matching	Simulate DID Therapist attempted to mimic patient personalities	No	No	EEG amplitude (no direct comparisons made, significant EEG differences existed within subjects)
Eich et al., 1997	7/9	Mental health professionals with knowledge of DID No matching	Simulate DID None	No	No	Perceptual priming (no direct comparison, but DID showed significant priming and control did not)[a]
Hermans et al., 2006	7/10	Students Sex	Simulate DID such that one personality had memories of trauma and the other did not Readings	No	No	Emotional Stroop task (DID more efficient in trauma identity)[a]
Hopper et al., 2002	5/5	Professional actors Sex, age	Role play identities Given summaries of each identity	No	No	EEG coherence (Direct comparisons between DID patients and controls were not reported, but DID patients showed differences between identities and simulators did not)[a]
Huntjens et al., 2002	26/25	Not specified Sex, age, education	Simulate DID Watched documentary, readings, created identity details, practiced for 1 week	No	Yes, researcher examined 17-item survey about alter identity	Perceptual priming: proportion correct (DID lower)[a] Perceptual priming: reaction time Conceptual priming: proportion correct Conceptual priming: reaction time (DID slower)[a] Word stem completion: proportion correct (DID lower)[a] Word stem completion: reaction time (DID slower)[a]
Huntjens et al., 2003	21/25	University staff and community members Sex, age, education	Simulate DID Watched documentary, readings, created identity details, practiced for 1 week	No	Yes, researcher examined 17-item survey about alter identity	Recall: overall memory (DID lower)[a] Recall: number of intrusions from alternate personality Recognition: hit rate Recognition: sensitivity Recognition: response bias (DID had more bias)[a] Memory list discrimination: hit rate Memory list discrimination: response bias "Remember" responses to list items "Know" responses to list items
Huntjens, Postma, et al., 2005	27/25	Not reported Age, education	Simulate DID Watched documentary, readings, created identity details, practiced for 1 week	No	Yes, researcher examined 17-item survey about alter identity	Procedural memory: reaction time to a series-learning task (DID slower)[a] Procedural memory: percent of correct responses to a series-learning task Awareness of series pattern (no test but percentages were the same)
Huntjens, Peters, et al., 2005	19/25	Community volunteers Sex, age, education	Simulate DID Watched documentary, readings, created identity details, practiced for 1 week	No	Yes, researcher examined 17-item survey about alter identity	Cued recall Affective ratings for words Evaluative conditioning Affective priming: errors (DID had more errors)[a] Affective priming: reaction times (DID slower)[a]

Table 1 (continued)

Study	DID/Control N	Control source and matching	Task and training	Blinding	Manipulation checks	Comparisons between DID and simulator groups
Huntjens et al., 2006	19/25	Community members Age, education	Simulate DID Watched documentary, readings, created identity details, practiced for 1 week	No	Yes, researcher examined 17-item survey about alter identity	Wechsler Memory Scale-R Logical Memory: immediate test (DID lower)[a] Wechsler Memory Scale-R Logical Memory: delayed test Wechsler Memory Scale-R Visual Reproduction: immediate test Wechsler Memory Scale-R Visual Reproduction: delayed test Recognition memory: proportion correct Plausibility of answers (DID more plausible)[a]
Huntjens et al., 2007	19/25	Community volunteers Sex, age, education	Simulate DID Watched documentary, readings, created identity details, practiced for 1 week	No	Yes, researcher examined 17-item survey about alter identity	Recall of words (DID lower)[a] Memory intrusions from separate identity Recognition: word list differentiation sensitivity (DID less sensitive)[a] Recognition: response bias to old and new words Sensitivity increases in assigning words to the correct list (DID increased more)[a] Response bias in assigning words to lists (DID with less bias)[a] "Remember" responses to list items "Know" responses to list items
Huntjens et al., 2012	9/23	Actors with an average of 14 years of experience Sex, age, education, biographical facts	Simulate DID such that one personality had memories of childhood abuse and the other did not Watched documentary, readings, created identity details, practiced for 1 week	No	Yes, researcher excluded one simulator said during debriefing that she had not understood the instructions — no further details provided on the procedure	Reaction times to words related to current or other identity
Kong et al., 2008	7/34	Community members Sex, age, education	Simulated DID Given information about DID, spent time creating identities, and provided information about the identities	No	Yes, interviewed simulators about compliance with instructions and simulation ability	Implicit word identification task Logical memory forced-choice recognition test (no direct statistical comparisons but 28% of DID patients and 35% of controls performed significantly worse than chance, a sign of malingering)
Miller, 1989	9/9	Nursing and secretarial staff at mental hospital No matching	Simulate DID Watch Sybil, watch video of DID patient	Yes, examining ophthalmologist	No	Variability between identities in visual acuity with correction, visual acuity without correction, visual field, manifest refraction cylinder, and Maddox Wing Muscle Balance Test, (DID more for all tests)[a] Variability between identities in manifest refraction sphere and manifest refraction axis Number of clinically significant changes between personalities (DID more)[a]
Miller et al., 1991	20/20	Nursing, psychological, and secretarial staff at mental hospital Sex	Simulate DID Watch Sybil, watch video of DID patient	Yes, examining ophthalmologist	Yes, ophthalmologist rated group membership	Variability between identities in visual acuity with correction and visual fields (DID more for all tests)[a] Variability between identities in visual acuity without correction, refraction, keratometry, and Jaeger visual acuity Number of clinically significant changes between personalities (DID more)[a] Clinically significant differences between identities in visual acuity with correction, visual acuity without correction, sphere of manifest refraction, axis of manifest refraction, keratometry, visual fields, and eye muscle balance (DID more for all tests)[a]

Table 1 (continued)

Study	DID/Control N	Control source and matching	Task and training	Blinding	Manipulation checks	Comparisons between DID and simulator groups
Putnam et al., 1990	9/5	Not reported No matching	Simulate DID Specified 17 attributes about their identity, encouraged to rehearse alter indentify	No	No	Clinically significant differences between identities in Jaeger visual acuity, cylinder of the manifest refraction, slit lamp, fundoscopy, pupils, and pupil size Reaction time variability (DID more variable)[a] Skin conductance Heart rate Respiration Number of orientation responses Spontaneous fluctuations in response Habituation [The authors report analyzing 196 variables but do not report all results.]
Reinders et al., 2012	11/18	Community members Sex	Simulate DID Readings, given instructions on simulating neutral and trauma-focused identities, recalled real emotional incidents from past, practiced for at least 2 weeks	No	Yes, checked to see if instructions were followed during practice period, checked to see if emotional incident met requirements, evaluated ability to simulate, self-evaluation of performance	Subjective sensory rating[a] Subjective emotional rating[a] Heart rate frequency[a] Systolic blood pressure[a] Diastolic blood pressure[a] Heart rate variability[a] [Comparisons occurred between two diagnostic groups, two levels of fantasy proneness among the control groups, and two memory scripts. Significant interactions occurred for all measures, but the authors do not report specific post hoc test results. Visual inspection of Figures indicates that the general pattern of results across the variables was for trauma-focused DID identities to be more reactive to a trauma-focused memory script than all other individuals and conditions.] Positron emission tomography (PET)[a] [The authors report results for 185 tests of various brain areas but leave out commonalities discovered in their whole brain analysis. Among the areas the authors claim to be "specific to DID" in their analyses are the angular gyrus, caudate nucleus, cerebellum, cerebral tonsil, cingulate gyrus, cingulate sulcus, cuneus, frontal gyrus, fusiform gyrus, Insula, Intra-parietal sulcus, lateral globus pallidus, lingaul gyrus, medial frontal gyrus, nucleus dentatus, occipital gyrus, occipotemporal sulcus, orbitofrontal cortex, parahippocapal gyrus, parietal lobule, perietal operculum, postcentral gyrus, precentral gyrus, precuneus, putamen, rectal gyrus, substania nigra, and temporal gyrus.]
Silberman et al., 1985	9/10	College students No matching	Simulate DID Create identity details 1 day prior	No	No	Recall (DID recalled fewer words between identities, but the authors caution that the difference was confounded by extra word exposure)[a] Recognition Recall compartmentalization between personalities Recognition compartmentalization between personalities Change in recall between

Table 1 (continued)

Study	DID/Control N	Control source and matching	Task and training	Blinding	Manipulation checks	Comparisons between DID and simulator groups
						dissociative and nondissociative conditions
						Change in recognition between dissociative and nondissociative conditions (DID showed increases in compartmentalization of information)[a]
						Correlation between compartmentalization in dissociative and nondissociative conditions (no direct comparison but DID showed significant correlations and control did not)[a]
Welburn et al., 2003	12/10	Mental health nurses No matching	Simulate DID Read one page summary of DID symptoms	Yes, interviewers	No	Structured Clinical Interview for Dissociative Disorders (DID higher)[a] Somatoform Dissociation Questionnaire-5 Dissociative Experiences Scale Minnesota Multiphasic Personality Inventory-2 Hypnotic eye roll sign (DID higher)[a] Schneiderian First Rank Symptoms scale Millon Multiaxial Clinicial Inventory-III

Note. Reported N represents the final number of participants used in analyses. Comments in parentheses indicate the nature of differences between the DID. Comments in brackets outline additional contextual information about the studies.

[a] Significant difference between people diagnosed with DID and people simulating DID.

3.1.4. Blinding

One of the most basic research controls is blinding researchers to the experimental condition of participants. Similarly, it is generally important to keep participants blind to a study's hypothesis. Despite the importance of blinding, only three studies mentioned blinding of participants or researchers (Miller, 1989; Miller et al., 1991; Welburn et al., 2003). In all three cases an examiner or interviewer was unaware of participants' group membership.

3.2. Differences between diagnosed and simulated DID

The next section of the review outlines replicated differences between people diagnosed with DID and simulators. Results within the section are further broken down, as needed, into subcategories based on if they were replicated by independent researchers or the same researcher. The section also includes a brief discussion of effect sizes for the differences.

3.2.1. Cognitive processing deficits

The most widely replicated difference between people diagnosed with DID and simulators is the deficit in cognitive processing shown by the former group in terms of memory and reaction times. Two independent research groups have shown that people diagnosed with DID have lower recognition of previously seen material than simulators regardless of which identity was exposed to the material (Allen & Movius, 2000; Huntjens et al., 2002). Measures of recognition included forced choice and word stem completion tests. The memory deficit is not attributable to interidentity amnesia, which, as will be outlined below, is similar across people diagnosed with DID and simulators. It is important to note that some studies have not replicated the memory deficit (Huntjens et al., 2006, 2003; Silberman et al., 1985). There were no obvious methodological differences to explain the failure to replicate. Also, although the Huntjens' et al. (2006, 2003) studies did not replicate a deficit in recognition memory, they did find a deficit in recall memory, which will be discussed below.

Independent replication also shows that people diagnosed with DID, compared to simulators, have significantly slower reaction times (Allen & Movius, 2000; Huntjens et al., 2002; Huntjens, Postma, et al., 2005). This effect seems generalizable because each of the three studies measured reaction times to different stimuli as part of a different task. Reaction time measures include "yes" or "no" responses to words (Allen & Movius, 2000), completion of word stems (Huntjens et al., 2002), and prediction of the next event in a patterned series (Huntjens, Postma, et al., 2005). However, the finding does not always replicate (Huntjens et al., 2002, 2012). One of the replication failures occurred for reaction times to previously seen pictures in a study that found reaction time differences for previously seen words (Huntjens et al., 2002); low statistical power may explain the failure to replicate because the group difference had a medium effect size and nearly reached the conventional cutoff for significant results ($p = .065$). The other replication failure involved reaction times to autobiographically meaningful information rather than the autobiographically neutral material used in other studies; both simulators and people diagnosed with DID were slower to respond to words associated with an alternate identity than to identity-neutral words, which is an example of interidentity transfer of information outlined in greater detail below (Huntjens et al., 2012).

A final cognitive deficit involves reduced memory on measures of recall. One research group has demonstrated that DID patients have lower recall scores than simulators regardless of which identity was exposed to the material (Huntjens et al., 2006, 2007, 2003). However, the effect does not occur on all tests of recall (Huntjens, Peters, et al., 2005; Huntjens et al., 2006; Silberman et al., 1985). Failure to replicate in one study might be explained by the fact that its procedure utilized cued recall rather than the free recall used in other studies (Huntjens, Peters, et al., 2005), and the interpretation of one of the other failed replications is difficult because, as the authors point out, there was a confound in that the DID group received extra exposure to the memory stimuli (Silberman et al., 1985).

3.2.2. Symptom reporting

Surprisingly few studies have examined simulators' ability to mimic DID on diagnostic measures; however, there is independent replication of significant differences in the reporting of symptoms. One study showed that the Structured Clinical Interview for DSM-IV Dissociative Disorders yielded higher symptom severity scores for people diagnosed with DID than for simulators (Welburn et al., 2003). Another study demonstrated higher scores for simulators on four out of 14 scales of the Structured Interview of Reported Symptoms, a measure of faking psychiatric symptoms (Brand et al., 2006). Although both studies documented differences in symptom reporting, the effects were in opposite directions, the constructs being measured were different, and both studies included other measures or subscales that showed no differences between the groups.

3.2.3. Trauma-focused vs. non trauma-focused identity performance

One potential criticism of DID simulation research is that the alternate identities created by simulators do not reflect the common differences between the identities of people diagnosed with DID. For example, one identity might have no trauma-related experiences whereas another identity is focused on past trauma. Two research groups have documented differences between such identities that could not be accurately simulated. In one study, identities with and without trauma memories completed an emotional Stroop task, which is a measure of information processing efficiency (Hermans, Nijenhuis, Van Honk, Huntjens, & Van der Hart, 2006). Significant differences emerged between people diagnosed with DID and simulators, but only for identities that had no memory of trauma. Identities without trauma memories tended to be more efficient in processing emotional material in people diagnosed with DID relative to simulators, but identities with trauma memory did not show a statistically significant difference between groups. One other study showed DID-specific differences between trauma-focused and neutral identities using a large number of physiological and brain activation measures (Reinders et al., 2012). Despite broad conceptual similarities, these studies contained considerable differences in their procedures and measures, and not all studies find significant differences between identities with and without trauma memories. Huntjens et al. (2012) found that biographical memory transferred at similar rates between trauma-focused and non trauma-focused identities for both people diagnosed with DID and simulators.

3.2.4. Eyesight variability

One researcher has conducted two studies on eyesight differences between identities (Miller, 1989; Miller et al., 1991). The studies included eye exams conducted by an optometrist who did not have knowledge of individuals' group membership; each identity received a separate eye exam, and variability between identities was the main dependent measure. In both studies, people diagnosed with DID showed greater variability between identities than simulators in terms of visual acuity, visual field, and the total number of clinically significant differences between identities. The ophthomological measures varied in their objectivity and vulnerability to self-report bias, but significant differences emerged for measures with both higher and lower objectivities (Miller et al., 1991). However, it is essential to note that these effects have not been independently replicated, and the lead author of the studies abandoned the research after reaching the conclusion that the effects were not reliable (Scott D. Miller personal communication, March 16, 2013).

3.2.5. Effect sizes

Although the purpose of the current review is not to offer a meta-analysis, effect sizes provide some perspective on the differences that emerged in the research. Some studies did not include enough information to calculate effect sizes, but the available data were remarkably consistent. Calculation of Cohen's d for replicated differences ($n = 26$) showed that effect sizes were almost all large. In fact, the average effect size was 1.02 ($SD = 0.54$). The only replicated differences with effect sizes below 0.50 were for recognition memory (Allen & Movius, 2000), recall (Huntjens et al., 2006), and reaction time (Huntjens et al., 2002). Effect sizes for nonreplicated differences ($n = 7$) were large as well ($M = 0.81$, $SD = 0.44$). Given the small sample sizes used in the studies, the large effect sizes are not surprising. With 20 or fewer participants per group, the studies may have lacked statistical power to detect smaller differences.

3.3. Similarities between diagnosed and simulated DID

The final section of the review outlines replicated similarities between people diagnosed with DID and simulators. There are inherent difficulties in interpreting null statistical findings (Keppel, 1991). Failures to find significant group differences can be a result of poor statistical or methodological practices. However, in order to increase the potential that the similarities are meaningful, the focus of this review is on replicated findings.

3.3.1. Interidentity transfer of information

The most prominent finding in the DID simulation literature is that the self-reported amnesia between identities is incomplete. In contrast to subjective reports of memory compartmentalization, there is transfer of information between identities. Five independent research groups have documented interidentity transfer of information, and they have done so using a wide variety of explicit and implicit measures. Starting with explicit measures – ones that include conscious, intentional cognition such as free recall or cued recall – both people diagnosed with DID and simulators recall information presented to one identity when they are responding as a separate, purportedly amnesic, identity (Huntjens et al., 2007, 2003; Kong et al., 2008; Silberman et al., 1985). The same effect holds true for recognition memory (Allen & Movius, 2000; Huntjens et al., 2006, 2007, 2003; Silberman et al., 1985). Typically, the procedure for these memory studies includes presenting a large amount of separate but similar information (e.g., word lists) to the identities and then determining how much material from one identity is accidentally recalled or recognized by the other identity.

Implicit measures also show interidentity transfer of information for both people diagnosed with DID and simulators. The defining feature of implicit measures is that they do not require conscious, intentional processing of information. For example, priming is the process whereby exposure to a stimulus facilitates responses to a later stimulus in some way. In a typical priming study, exposure to a negative word (e.g., abuse) allows faster recognition of subsequent negative words than if a positive word (e.g., love) had been seen. Four studies conducted by two independent research groups have shown that priming between purportedly amnesic identities occurs in both people diagnosed with DID and simulators. Types of priming investigated have included recognition of line drawings seen by an alternate identity (Eich, Macaulay, Loewenstein, & Dihle, 1997; Huntjens et al., 2002), responses to words seen by a alternate identity (Huntjens et al., 2002), and responses to words that had been conditioned to have an emotional connotation for an alternate identity (Huntjens, Peters, et al., 2005). In term of implicit measures not related to priming, two independent research groups have shown that reaction times are slower for words related to an alternate identity than for neutral words, an indication of transferred knowledge about the alternate identity (Allen & Movius, 2000; Huntjens et al., 2012). The implicit transfer of information occurred at similar rates for people diagnosed with DID and simulators. Once again, it is worth reemphasizing that the explicit and implicit transfer of information occurs at similar rates for people diagnosed with DID and simulators.

3.3.2. Specific cognitive effects

Within the broader concept of interidentity transfer of information, there are three specific cognitive effects that researchers have

independently replicated and found to be similar among people diagnosed with DID and simulators. Thus, these results overlap with those in the previous section, but it is important to point out which specific forms of transfer have been replicated. Three separate research groups have documented similar transfer of information between identities for measures of recall (Huntjens et al., 2007, 2003; Kong et al., 2008; Silberman et al., 1985). Similarly, three research groups have documented transfer of information between identities for measures of recognition (Allen & Movius, 2000; Huntjens et al., 2006, 2007, 2003; Silberman et al., 1985). Two research groups each have demonstrated slowed reaction times to information concerning an alternate identity (Allen & Movius, 2000; Huntjens et al., 2012) and perceptual priming between identities (Eich et al., 1997; Huntjens et al., 2002). Perceptual priming included exposing one identity to line drawings and then testing the alternate identity's ability to recognize incomplete versions of the same drawings. Despite the fact that both studies documented the existence of priming, it is important to note that the pattern of results differed between studies; Eich et al. (1997) found that people diagnosed with DID had stronger priming, and Huntjens et al. (2002) found that they had weaker priming.

4. Discussion

The purpose of the current review was to answer three questions concerning research on the simulation of DID. (1) What are the methodological controls used in DID simulation research? Most researchers engage in some form of control group matching and training. In contrast, blinding of researchers and direct checks on simulation quality are rarely utilized. (2) Are there variables that reliably differentiate between diagnosed and simulated DID? If replication is set as the standard for reliability, there are several reliable differences between people diagnosed with DID and simulators. Consistent with the idea that DID is different from socially influenced mimicry, simulators and people diagnosed with DID show significant differences on some clinical measures. Another reliable difference is that people with DID show cognitive deficits in memory and reaction time that are generalized and not specific to interidentity amnesia. There is also evidence that people diagnosed with DID show differences between trauma-focused and trauma-neutral identities that are not shown by simulators. Overall, the effect sizes of these differences were large. (3) Are there variables that reliably fail to differentiate between diagnosed and simulated DID? Despite the fact that amnesia is the most commonly reported symptom of DID (Spiegel et al., 2011), people with DID and simulators demonstrated similar levels of interidentity recall, recognition, and priming. The pattern of results among both groups clearly indicates that information is transferred between identities despite reports of amnesia.

The results of this study can inform the ongoing debate about the validity of dissociative disorders and their associated etiological theories. Taken together, the results provide more support for sociocognitive/skeptical models than the trauma model. Only one replicated finding provided direct support for the trauma model and that was the difference in cognitive processes among trauma-focused and non trauma-focused identities. In contrast, interidentity transfer of information, despite self-reports of amnesia, was replicated numerous times by independent researchers using a variety of methods; this finding supports the adoption of skeptical stance toward the accuracy of self-reported memory experiences among people diagnosed with DID. The fact that, in terms of key symptoms of the disorder, people taught to simulate DID are largely indistinguishable from people actually diagnosed with DID shows that social influence cannot be eliminated as a possible etiological factor. Furthermore, the failure to find objective evidence of amnesia among people diagnosed with DID is consistent with the sociocognitive assertion that people with DID are playing a social role rather than exhibiting a special dissociative state that results in a split of consciousness.

The results also inform the broader debate about the nature of dissociation. In an article proposing a skeptical alternative to the trauma model of dissociation, Giesbrecht et al. (2008) concluded that dissociation, despite being associated to some subtle cognitive deficits, is a product of normal failures of cognition such as forgetting and inattention. They characterized the mental processes of people with dissociative disorders as "unremarkable," and the dearth of differences emerging in the DID simulation literature must be considered supporting evidence for their contention (Giesbrecht et al., 2008, p. 632). Just as Giesbrecht and colleagues would predict, people diagnosed with DID appear to process information less efficiently than people simulating DID, but the differences are not indicative of any specialized, dissociative memory capacity for isolating information within one identity. However, because people diagnosed with DID represent only a fraction of people who dissociate (Dalenberg et al., 2012), the current review's results may not generalize to all disorders that include dissociation.

4.1. DID and simulator group differences

Arguably, the most important potential difference between people diagnosed with DID and simulators is in their basic symptom presentation. The average clinician has only limited resources with which to accurately diagnose patients, and the ability to discern genuine from intentionally faked DID using only diagnostic measures would be highly valuable. Some evidence emerged for reliable differences between people diagnosed with DID and simulators. Control group simulators received significantly lower scores on the standard diagnostic tool for DID (Welburn et al., 2003) and significantly higher scores on a measure of faking psychiatric symptoms (Brand et al., 2006). However, it is important to note that significant differences emerged on a minority of the latter measure's subscales and that the study's authors characterized simulators as "successful at feigning without being detected" (p. 78). Although these measures did differentiate between average scores of people diagnosed with DID and simulators with relatively little experience feigning DID, the fact that the samples were different on basic measures of symptomology leads to questions about the quality of the simulation, which is a point discussed in greater detail below.

One assumption about alter identities in DID is that they have different functions than the primary identity. Differences in function between trauma-aware and trauma-unaware identities is a subtle feature of DID and may be difficult to fake. Indeed, the current review indicates that test performance of trauma-aware and trauma-unaware personalities function somewhat differently among simulators and people with DID (Hermans et al., 2006; Reinders et al., 2012). However, the methods used in the pertinent studies did not overlap, and not all studies find such identity differences (Huntjens et al., 2012). Thus, this difference must be considered tentative until further research is conducted, but it represents a potentially fruitful new area of DID simulation research.

The hypnosis simulation literature provides an interesting perspective on cases where simulators appear more distressed or dysfunctional than people diagnosed with DID (Brand et al., 2006; Hermans et al., 2006). Hypnosis simulators sometimes fake too well such that their behavior exemplifies the ideal hypnotic subject more so than individuals who are actually hypnotized (e.g., Spanos, James, & de Groot, 1990). For example, simulators may report more complete amnesia than people who are actually under hypnosis. Although the similarity in results is intriguing, interpretations must be tentative considering that people diagnosed with DID exhibited many signs of cognitive deficits not shown by simulators.

Evidence for deficits in recognition, recall, and reaction times emerged across several studies, and the finding is consistent with previous reviews of the cognitive processes associated with dissociation (Dorahy, 2001; Giesbrecht et al., 2008). There are many possible etiological explanations for cognitive differences between people with DID and healthy controls. Given the similar effects with PTSD

(Vasterling et al., 2002), it could be that deficits are an aftereffect of the trauma that is so frequently reported among people with DID. An intriguing possibility, also from the study of PTSD, is that the cognitive deficits may not be caused by the trauma; rather, they could represent a preexisting vulnerability to experiencing trauma-based disorders (Gilbertson et al., 2006). As such, the cognitive deficits may have existed before the DID. Recent research has tied dissociation with disturbances in sleep (Koffel & Watson, 2009; van der Kloet, Merckelbach, Merckelbach, Giesbrecht, & Lynn, 2012). Disruptions in normal sleep patterns could explain both the dissociation and the types of memory disturbances that characterize DID, or all three factors could share a common cause that is yet to be discovered.

The cognitive deficits associated with DID could also be unrelated to etiology. Cognitive deficits are seen among people with anxiety disorders, mood disorders, and schizophrenia (e.g., Austin, Mitchell, & Goodwin, 2001; Castaneda, Tuulio-Henriksson, Marttunen, Suvisaari, & Lönnqvist, 2008; Heinrichs & Zakzanis, 1998); this suggests that the deficits could be an effect of psychopathology in general rather than any one specific disorder. DID is also known to be a disorder with high comorbidity (Rodewald, Wilhelm-Gößling, Emrich, Reddemann, & Gast, 2011), and this means that cognitive deficits may be explained by the disorders that co-occur with DID rather than DID itself. Although the current review cannot shed light on the origins of cognitive deficits related to DID, it is a topic worthy of further attention, especially due to its potential etiological significance.

An often-reported feature of DID is the existence of distinct differences between identities' biological characteristics. Several studies in the current review included physiological measures, but the results often failed to include clear statistical comparisons (Allen & Movius, 2000; Coons et al., 1982; Hopper et al., 2002; Putnam et al., 1990) or were not replicated (Reinders et al., 2012). However, two studies conducted by Miller (Miller, 1989; Miller et al., 1991) showed that people diagnosed with DID had greater variation in eyesight between identities than did simulators. Although some of the differences involved subjective, self-reported measures of eyesight, others were more objective and physical in nature. However, these effects were not independently replicated, and vision research appears to have ended after these publications. Miller stated that the main reason for the absence of follow-up research was that the "fad" of multiple personality disorder passed (personal communication, March 16, 2013). In addition, Miller stated that variations were not stable within personalities and "much of what we were seeing was a co-construction between helper and client" (personal communication, March 16, 2013). The experiences of one researcher should be generalized only with extreme caution, but this candid statement from a former DID researcher illustrates much about the potential for social influence on dissociative phenomena.

Overall, the relative dearth of evidence for objective differences between DID and simulated DID is surprising. Given claims for the uniqueness of multiple personalities and the divergent interpretations of DID symptoms that are induced in the laboratory using normal, social processes (Gleaves, 1996; Spanos, 1994), the topic would seem to be of high importance to the understanding of DID. However, a valid criticism of DID simulation research is its inability to provide convincing evidence for one etiological theory over another (Merckelbach et al., 2002). An often-used analogy is that the ability to fake a broken leg says nothing about the reality of broken legs or their causes. However, showing that both people with a broken leg and those faking a broken leg can, despite their claims to the contrary, walk without assistance is meaningful, and, as outlined below, evidence of just this type exists in the DID simulation literature.

4.2. DID and simulator group similarities

Documentation of similarities between people diagnosed with DID and simulators has been one of the primary outcomes of DID research,

and this is problematic from an interpretive standpoint. Basic statistical theory states that the null hypothesis (i.e., no difference between groups) can only be disconfirmed, not confirmed (Keppel, 1991). Null results are especially difficult to interpret in the current research given the small sample sizes. Larger samples may have resulted in the detection of more small- or medium-sized differences. Nonetheless, researchers have provided strong evidence for similarity by administering validated cognitive tests, demonstrating that the tests show the expected effects, and replicating the results. Despite statistical pitfalls, similarities between groups are theoretically important. Simulators' behavior is only explained by social influence; thus, similarities between their behavior and the behavior of people diagnosed with DID illustrate that social influence cannot be eliminated as a potential causal explanation (Orne, 1971). In laboratory settings, social influence might include explicit instructions, interactions with the experimenters, and the research setting. In addition, similarities provide perspective on the objective accuracy of self-reported symptoms such as amnesia.

Among all of the similarities that emerged in this review, the most important was the failure of interidentity amnesia among people diagnosed with DID and simulators. Interidentity transfer of information was, in fact, the most reliable finding in the entire review. It was supported by multiple independent replications using implicit and explicit measures and multiple tests within those categories; thus, the finding cannot be dismissed as an artifact of any one researcher or methodology. An important subfinding within the interidentity transfer results is the evidence for systematic avoidance of information presented to one identity by a purportedly amnesic second identity. Some simulators and people diagnosed with DID showed evidence of scores below chance on tests of recognition of material seen by an alternate identity (Huntjens et al., 2006; Kong et al., 2008); this is a classic sign of malingering (Merten & Merckelbach, 2013). Accurate diagnoses is necessary to determine appropriate treatment, and combining data from cases of legitimate and malingering DID harms the validity of research results. Thus, both clinicians and researchers should take care to identify cases of intentionally feigned DID so that the individuals can be effectively treated or eliminated from research samples.

There is little agreement about how the memories of people diagnosed with DID can or should function (Merckelbach et al., 2002), but Spiegel et al. (2011) offered this broad summary: "Memory is available, but it is not accessible" (p. 835). In other words, memories are still stored neurologically even though the person with DID cannot call them to mind. However, the large amount of objective evidence for interidentity transfer of information shows that people with DID can actually access memories despite subjectively feeling like they cannot. Thus, the current review suggests an amendment to Spiegel and colleagues' summary: "Memory is available, but it is not *subjectively* accessible."

What is to be made of this failure to find objective evidence of amnesia among people with DID? To take an extreme position, failure to substantiate reports of amnesia constitutes evidence that one of the defining features of DID is not strictly accurate and could be construed as evidence against the validity of the diagnosis. By way of analogy, imagine if people with sexual arousal disorder were actually found to exhibit genital arousal to sexual stimuli. Just such a difference between self-reported arousal and objective measurement of arousal lead to the deletion of Female Sexual Arousal Disorder as a stand-alone diagnosis in the DSM-5 (American Psychiatric Association, 2013; Graham, 2010) On the other hand, misinterpretation is a hallmark of mental disorders. In Panic Disorder, symptoms are perceived as signs of imminent danger; in hypochondriasis, minor physical abnormalities are believed to be evidence of illness; in Schizophrenia, internal thoughts are perceived as external; in Body Dysmorphic Disorder, normal aspects of the body are viewed as seriously flawed; in DID, belief that one has amnesia is perceived as amnesia (Giesbrecht et al., 2008). To take a less extreme position, the absence of full amnesia among people diagnosed with

DID is completely consistent with what is known about cognitive psychology, the differences between organic and functional amnesia, and the modern view of alters as metaphorical rather than literal aspects of the person's mind (Merckelbach et al., 2002; Spiegel et al., 2011; Staniloiu & Markowitsch, 2012). Complete amnesia would only exist if the brains of people diagnosed with DID were damaged or if they truly had separate minds, and neither of these characterizations are accurate. Even supporters of the trauma model recognize that personalities in DID are not truly separate and distinct (Dalenberg et al., 2012).

4.3. Research methodology

The differences and similarities that emerged in this review must be couched in the context of the methodological rigor used in producing them, and there are several ways research methods in the DID simulation literature might be improved. One improvement would be to increase the standards for equivalence between DID and simulation groups. Researchers recruited people with DID and simulators from unrelated populations and matched them on basic demographic characteristics, if at all. Such practices are entirely appropriate if the researchers' hypotheses concern the ability of healthy subjects to mimic DID, but the use of healthy controls as a sample of convenience could be improved upon. One possible methodological improvement would be to recruit simulators from treatment populations similar to those used to recruit people diagnosed with DID. Matching could also occur based on general distress or impairment. Not even the most ardent skeptics argue that DID is created among individuals who are otherwise completely healthy. In addition, people diagnosed with DID have high comorbidity rates (Rodewald et al., 2011), and a control group sampled from a healthy community population is likely to be different from people diagnosed with DID in many fundamental ways not accounted for by researchers' attempts to match basic demographics. The deficits in cognitive processing identified in the current review support this contention. Cognitive deficits are common among people with anxiety and mood disorders (e.g., Austin et al., 2001; Castaneda et al., 2008; Vasterling et al., 2002), and recruiting simulators from treatment populations with these diagnoses could better ensure that differences found in simulation studies are not simply a product of population differences unrelated to the specific diagnosis of DID. Although there are many other possible characteristics on which to match subjects, one more that deserves special mention is fantasy proneness. Matching on this trait could be particularly important because of the evidence that it is a key cognitive process in dissociation (Giesbrecht et al., 2008).

Another methodological improvement would be to engage in rigorous evaluations of simulators' motivation and ability to mimic the signs and symptoms of DID. Hypnosis simulation research provides an exemplar for these procedures. Standard practice in the hypnosis literature dictates that simulators should be well motivated and that researchers should assess simulators' abilities to simulate (Orne, 1971). To illustrate the methodological rigor of hypnosis research with just one example, Spanos, de Groot, Tiller, Weekes, and Bertrand (1985) instructed simulators to behave throughout the whole experiment as if they were an excellent hypnotic subject. The researchers told participants that their task was to fool the hypnotist who would not know if they had been told to simulate hypnosis or actually become hypnotized. To ensure motivation the researchers also told simulators that the hypnotist would stop the study if their faking was detected. At the end of the study, simulators provided detailed feedback on their experiences during the experiment using a questionnaire and in-depth interview (Experimental Analysis Technique; Sheehan, McConkey, & Cross, 1978). This example clearly illustrates the great lengths hypnosis researchers go to ensure valid simulations.

In contrast to hypnosis simulation research, few studies in the DID simulation literature systematically assessed simulators' actual effort and ability to feign DID. The level of motivation among DID simulators is largely unknown. One study offered the best simulator a cash prize to increase motivation (Brand et al., 2006), but the motivation of simulators in other studies to engage in quality simulation is unknown. In terms of assessment of actual performance, many studies measured factual knowledge about created identities, but creating a biography for an identity is not the same as successfully enacting that identity. The interviewing of participants to assess their experience, effort, and consistency with instructions during the study is rare in this literature (see Reinders et al., 2012 for an exception). Given the lack of data on simulators' motivation and performance, an alternative explanation for the differences that emerged in this review is that simulators simply lacked appropriate motivation or skills.

A higher standard for simulation is needed. Consider research on the effective discrimination of real from simulated DID using diagnostic tools (Brand et al., 2006). Success is defined in this research area when diagnostic tools discriminate between real and simulated DID, but the problem posed by this approach is that people who are detected as feigners have inherently been ineffective in their simulation. What is the minimum quality of faking that is acceptable? Using hypnosis research as an example again, the standard for performance in simulators is to actually fool the hypnotist into believing that they have been hypnotized (Orne, 1971). Perhaps an effective, albeit extreme, manipulation check would be the ability of simulators to receive a clinical diagnosis of DID. Such a suggestion comes with many practical difficulties – increased sample sizes, more simulator training, and extensive clinical interviewing – but the resultant methodological rigor would substantially increase the validity of simulation results, which currently suffer from an almost total absence of manipulation checks.

A potential difficulty with a manipulation check consisting of clinical diagnosis is that researchers would have to remain blind to participants' group membership; however, blinding is one of the methodological improvements most needed in this research area. There is a long and rich history demonstrating the power of expectations – among both experimenters and participants – to influence research results (Orne, 1962; Schulz & Grimes, 2002). DID simulation research is no less vulnerable to these validity concerns. Nonetheless, only three studies in this literature included blinding of researchers to diagnostic group (Miller, 1989; Miller et al., 1991; Welburn et al., 2003). A methodological improvement would be to keep all researchers who interact with participants during data collection blind to diagnostic group. Some might react to this suggestion by insisting that such a procedure would never work because of simulators' inability to fool the experimenters. However, this concern goes against what is known from the current review and hypnosis research. Hypnosis experimenters believed that they could not be fooled by people simulating hypnosis — at least they did until they were consistently fooled (Orne, 1971). Keeping researchers blind to experimental group would also allow for an interesting new analysis: comparison of the people researchers believe are diagnosed DID to the people they believe are simulating DID. In addition to keeping experimenters blind to diagnostic group, participants should be blind to the specific hypotheses of the research in order to prevent them from, intentionally or unintentionally, adjusting their responses based on the expected results.

Some additional methodological observations are worth noting. The DID samples contained only individuals who could switch personalities on demand. Although this is a methodological necessity for this research, exclusive use of participants with that characteristic could lead to problems in generalizing the results to individuals who are unaware of alternate identities and cannot switch on demand. Researchers performed a huge number of statistical comparisons – we

would estimate the number at around 1000 in these 20 studies – on a host of measures to yield a relatively small number of differences. A potential problem is the tendency to conduct a large number of statistical comparisons without specific a priori predictions. For example, Putnam et al. (1990) analyzed 196 variables per participant in their study with no guiding hypotheses. Differences found in exploratory research can be valid and important, but researchers should exert appropriate caution when interpreting a small number of significant differences that result from a large number of tests. The sample sizes of some studies may also be leading to statistical error. Mean sample size per group in this literature was below 20 participants, and this may be insufficient for some statistical tests. In terms of Type 2 error, such small sample sizes may hide real differences due to low power. The fact that effect sizes of differences were almost universally large lends suggests that DID simulation studies are systematically underpowered.

Small samples may also lead to Type 1 error by exacerbating the effects of random or extreme scores. Twenty participants per group is the accepted minimum sample size for avoiding false positives in statistical results (Simmons, Nelson, & Simonsohn, 2011), but 75% of the studies in this literature analyzed DID samples with fewer than 20 people. Obtaining large sample sizes is an endemic problem in DID research (Boysen, 2011; Boysen & VanBergen, 2013), but it would be poor science to ignore statistical standards simply due to the difficulty of obtaining samples in this research area. The within subject designs used by many DID simulation researchers increases statistical power, but the fact remains that some researchers conduct a large number of tests on a small number of people. For example, Reinders et al. (2012) utilized samples of 11 people diagnosed with DID and 18 simulating controls; they further broke down the control group based high and low fantasy proneness. These methods resulted in statistical comparisons being conducted on groups with ns of 11, 5, and 8. Using these small samples, Reinders et al. (2012) report statistical results for over 200 specific comparisons between simulators and people diagnosed DID. However, they compared neural activation between groups across the whole brain and explicitly stated that areas of common activation were left out of the article. Thus, the reported results are likely to be a gross underestimate of the total number of statistical comparisons conducted by the researchers. Although the researchers can be commended for their use of a priori predictions, the small sample sizes, large number of statistical tests, and selective reporting of results are troubling both in this particular study and in the broader research area.

4.4. Limitations

Several limitations of this review are worth noting. The most important limitation is the exclusion of research not published in English. DID research occurs in many countries, and there are likely to be findings published in non-English journals that we did not review. Another potential problem is the lack of a comparison group for the results. Research on the simulation of mental disorders appears to be unique to DID, and this makes it impossible to know if some of the trends that emerged are also unique. For example, we cannot determine if the matching and blinding that occurs in DID research is more or less rigorous than is typical. Similarly, we do not know if simulation of other disorders would also lead to few group differences and contradiction of self-reported symptoms. Finally, research in this review was dominated by the many studies of Huntjens and colleagues from the Netherlands. Although their research meets the highest standards of cognitive experimentation, the fact that their studies represent one third of the total DID simulation research output means that they had an especially large influence on the results of this review.

5. Conclusion

Some have dismissed research of DID simulation by healthy controls as a logical dead end in terms of its ability to solve theoretical disputes (Gleaves, 1996), but this review suggests that simulation has a great deal to offer. The extant differences between DID and simulators offer means for improving the quality of differential diagnosis and understanding basic phenomena associated with the disorder. Differences showed that DID may not be as simple as enacting social role. In contrast, overlap among DID and simulators illustrated how self-reports may not be a reliable indication of actual abilities and symptoms — if patients and clinicians can be fooled by the subjective experience of amnesia, what else could be an illusion? Despite some meaningful results, conclusions from this research are hampered by methodological flaws. Future researchers should consider (a) remaining blind to diagnostic group, (b) matching simulation and DID groups more comprehensively, (c) increasing the standards for effective simulation, and (d) increasing statistical power. With methodological improvements such as these, continued research on the simulation of DID is likely to produce further theoretically meaningful results.

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