APPENDIX S1

SUPPLEMENTARY MATERIALS

DID is trauma based:
Further evidence supporting the Trauma Model of DID

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Introduction
Merckelbach, Lynn and Lilienfeld (2016)’s commentary about our study, “Is it trauma or fantasy-based? Comparing dissociative identity disorder, post-traumatic stress disorders, simulators, and controls” (1) states that we have misrepresented the Fantasy Model, also known as the socio-cognitive model (SCM) of dissociative identity disorder (DID) and that our statistical analyses are underpowered. They seem to suggest that we might even have selected and influenced subjects to produce more favorable results and that we do not offer convincing support for the Trauma Model of DID. We address their challenges and present the additional analyses that they suggested – these new analyses also support the Trauma Model of DID and strongly challenge their model.

Statistical Power

Bonferroni-correction
In the first paragraph Merckelbach, Lynn and Lilienfeld (2016) express the concern that we are diminishing our statistical results by applying Bonferroni-corrections. We agree that applying stringent statistical multiple comparisons corrections to prevent false positive findings can lead to being too stringent and consequently can lead to an underestimation of support found for the Trauma Model. However, as it is common practise to correct for multiple testing we applied Bonferroni-correction to our statistical results. If we would not have been this conservative, the SCM theorists could have dismissed our results as false positive findings.

Fantasy proneness
Merckelbach et al. (2016) calculated an effect size for our finding that DID patients were not higher on fantasy proneness than posttraumatic stress disorder (PTSD) patients, a finding which strongly challenges the SCM. By attempting to mask the small effect size (Cohen’s $d = .39$) between the DID and PTSD groups by stating that it was “closer to medium” (paragraph four), Merckelbach et al. (2016) are trying to bypass the more likely interpretation that this small effect is due the lack of high fantasy proneness among DID individuals.

It is important to note that the SCM’s measure of fantasy proneness, that is, the Creative Experiences Questionnaire (CEQ\(^a\)) (2), includes some dissociative items. The authors of the CEQ themselves noted the item overlap between the CEQ and a commonly used measure of dissociation, the Dissociative Experiences Scale (DES\(^a\)) (3): “Two CEQ items (i.e., ‘I often confuse fantasies with real memories’ and ‘I sometimes feel that I have an out of body experience’) clearly overlap with some DES items (e.g., ‘not sure whether one has done something or only thought about it’ and ‘feeling as though one’s body is not one’s own,’ respectively ” (2) (p. 989). It is therefore hardly surprising that highly dissociative individuals obtain somewhat elevated scores on the CEQ, a scale that includes dissociative items (see also: (4)).

\(^a\) Instruments’ Abbreviations: CEQ = Creative Experiences Questionnaire; DES = Dissociative Experiences Scale; SDQ-20 = Somatoform Dissociation Questionnaire; TEC = Traumatic Experiences Checklist; STAI-T = State-Trait
Furthermore, SCM proponents have stated that traumatized children use fantasy to escape the emotional and physical pain of child abuse (see for details: 5). Consistent with this, fantasy proneness is associated with childhood abuse (5). However, the DID group did not score significantly higher than the PTSD group, despite both groups likely using some fantasy to survive childhood abuse.

Predictors of dissociative symptoms
Merckelbach et al. (2016) requested that we collapse the two clinical groups (DID and PTSD) and test “whether trauma self-reports are better (independent) predictors of dissociative symptoms than are fantasy proneness. Finding such a pattern would have provided evidence for the Trauma Model (paragraph four).” We performed bivariate Pearson’s correlations and in line with methods applied in the original publication we corrected for the number of questionnaires, in this case 3, which results in applying a statistical significance threshold of $p < 0.0167$. The new results showed a pattern providing further evidence for the Trauma Model (see Table 1). The TEC-total significantly correlated with all dissociation measures (DES, SDQ-20, CDS-total, CDS-frequency, and CDS-duration). All the TEC subscales (emotional neglect and abuse, physical abuse, and sexual harassment and abuse) correlated significantly with the SDQ-20 and the CDS-frequency. The TEC subscales physical abuse, sexual harassment and sexual abuse correlated significantly with all dissociative measures. In contrast, the fantasy proneness measure (CEQ) only correlated significantly with the SDQ-20.

Misinterpretation of SCM of DID versus Misrepresentation of Trauma Model of DID

Misinterpretation of SCM of DID: Simulator design
In our study we encouraged actors to emotionally engage in the roles of having DID as much as possible. They received descriptions of these roles, watched a video of DID patients shifting among different dissociative states, and rehearsed these roles often. Our simulation protocol was based in detail on Huntjens et al. (6–10) and similar to the one previously used (11), for which we consulted Giesbrecht and Merckelbach about the CEQ cut-off for the healthy simulating controls (12).

As recommended by authors who described the design that would be necessary to test for genuine vs. simulated DID (13) and as noted in our Supplementary Material (1) for the original article, we provided several crucial methodological controls: 1) we provided strong motivation during simulation preparation so that simulators were motivated to effectively simulate DID; 2) we checked that simulators: 2a) followed instructions during the training phase, 2b) adequately performed their tasks during and after the simulation; and 3) we carefully matched groups on demographic characteristics. Two of authors who currently challenge our simulation design lauded one of our studies using an almost identical simulation-based design (11) as “most interesting” (14) (p. 120). Yet in contrast to their earlier praise of the simulation protocol used in Huntjens et al. (6–10) (acknowledged in the original publication: “The authors would also like to thank R.J.C. Huntjens for providing material for personality state simulation protocol”), and Spanos’ reliance on simulation, Merckelbach et al. (2016) posit that using simulation misrepresents the SCM. These inconsistencies across publications and SCM theorists lead one to wonder what, if any, design and data the SCM theorists would find compelling.
Misrepresentation of Trauma Model of DID

Merckelbach et al. (2016) argue that few differences have been found between persons diagnosed with DID and healthy individuals simulating DID on measures of memory and inter-identity transfer of information, which thereby supposedly provides support for the SCM. They do not seem to recognize that dissociative amnesia is a functional symptom: sensorimotor dissociative symptoms, such as the subjective inability to walk, are not similar to a physical paralysis. However, the Trauma Model does not claim that dissociative states are totally separate or totally amnestic for all activities and memories of the other dissociative states. To the contrary, the Trauma Model explicitly states that dissociative states can share experiences and memories, and that they can and often do influence each other (15). Thus, Merckelbach et al.’s (2016) conclusion is based on a misrepresentation of the Trauma Model.

Further, they overlook the Trauma Model studies that have found evidence for the priori theoretically-driven neurobiological differences in DID patients with emotionally over-modulated dissociative self-states versus trauma-based emotionally under-modulated dissociative states on supraliminal presented traumatic memories (11,16,17), subliminally presented angry and neutral facial expressions (18), and resting state activation (19). They also ignore that low and high-fantasy prone individuals, and normal controls could not replicate the neurobiological patterns found in under- and over-modulated states among DID patients (11,16). Furthermore, neuroanatomical findings of our group support the Trauma Model as well (20,21). For example, we showed that childhood trauma correlates with abnormal hippocampal morphology in both PTSD and DID, which is in line with results obtained from individuals from the general community showing a relationship between childhood maltreatment and small hippocampal subfield volumes (22).

DID Patients Are Not Suggestible or Prone to False Memories

Merckelbach et al. (2016) agree that, contrary to SCM hypotheses, our data show that DID individuals are not more suggestible or more prone to creating false memories than DID simulators, individuals with PTSD, or healthy controls. That is, they concur with us that our study challenges two of the central tenets of their theory. However, they suggested we had tipped off our DID group that the goal of the study was to assess for false memories, thereby influencing them to be less suggestible and less prone to creating false memories. As specified in the main reply, this is not the case. Pre-experimental information explained the procedures of investigating the neural correlates of autobiographical memory processing in the human brain using functional magnetic resonance imaging, which was the main component of the study (paper in preparation; personal communication in Dutch and available on request). We explained that we would ask participants to complete a number of interviews and questionnaires as well. However, we did not provide details on which interviews and questionnaires we would use or why. We only specified the time it would take to complete them. Furthermore, in the acknowledgements of the original paper, we thank “H.L.G.J. Merckelbach, T. Giesbrecht, and L.H.C. Raymaekers for advice on the selection of questionnaires.” More specifically, we were very careful to adhere to advice of SCM proponents while designing our study. To this end, members of Reinders’ research group personally visited Merckelbach’s group on the first of February
Inclusion of questionnaires was discussed and meeting notes were circulated in the following week for approval. During 2008 (medical ethics application) and 2009 (inclusion of first participant) we continued to seek confirmation on which questionnaires to include and how to formulate instructions. Ultimately, on the 15th of July 2009 the specific instructions for the DRM task were approved by Professor Merckelbach in an email to H. Hofstetter with a copy to Dr Reinders (personal communication in Dutch).

Our finding that DID patients are not highly fantasy prone is consistent with other studies. For example, in Nijenhuis and Reinders (2012) (4) the score for fantasy proneness for the 42 DID patients was $M = 9.8$ ($SD = 5.3$) which is essentially the same as found by Huntjens et al. (2006) (7), $M = 9.9$ ($SD = 4.4$). These scores are comparable to those of female high school students, university students, and university employees (2), and lower than in borderline personality disorder ($M = 11.8$, $SD = 5.1$) (23). Our findings that DID patients are not highly suggestible is also consistent with a review of the literature conducted by Dalenberg et al. (2012) who concluded, “It is surprising to see average weighted effect sizes between dissociation and suggestibility that are so small (1%–3% of variance accounted for) across categories” (p. 565).

The SIMS: An Indicator of Malingering among DID and PTSD Patients?
Merckelbach advised us in the personal and email communication as specified above to use the Structured Inventory of Malingered Symptomatology (SIMS) to assess malingering. The SIMS (Smith & Burger, 1997) was developed to screen for malingering. Forensic defendants may pretend to be amnesic for alleged crimes to avoid criminal responsibility. For this reason, the SIMS contains 15 items addressing amnesia. But amnesia is a core symptom required to diagnose DID, hence patients with DID will endorse these symptoms.

Merckelbach et al. (2016) opine that the DID group’s high scores on the SIMS supports the SCM. The SIMS subscales assessing depression and amnesia were high among the trauma groups, which is not surprising, given these symptoms are well-documented among traumatized and dissociative samples (24–28). The SIMS has never been validated with trauma populations. Our results strongly challenge its validity with traumatized and dissociative individuals.

Nevertheless, we adhere to Merckelbach et al.’s (2016) suggestion to perform two types of analyses to overcome the uncertainty of respondents over-reporting on the Structured Inventory of Malingered Symptomatology (SIMS): 1) exclude participants from the analyses who exceed the cut-point of the SIMS, and 2) to treat SIMS scores as covariates. In line with methods applied in the original publication we corrected for the number of questionnaires utilizing a statistical significance threshold of $p < 0.0056$ for the new analyses.

1) Exclude participants with SIMS cut-off score of $\geq 16$

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To further address concerns of possible malingering, a SIMS cut-off score of ≥16 was utilized and only participants who scored 15 or below were used, based on suggestions by Merckelbach and Smith (29). This was to verify whether our results would hold after removing participants who may have been malingering. Using the SIMS cut-off score, the total sample size for these analyses was N = 36, including DID-G N = 3 (out of 17), DID-S N = 13 (out of 16), PTSD N = 8 (out of 16), and HC N = 12 (out of 16). These data did not meet parametric assumptions, so Kruskal-Wallis H tests were used. We found significant group differences for all dissociation measures but not for anxiety (see Table 2). Post-hoc tests revealed that the DID-G still showed higher dissociation (DES, SDQ, and CDS total and subscales), compared to DID-S and HC groups. DID-G scores on dissociation measures did not differ significantly from the PTSD group. This suggests that both trauma groups show high dissociation, supporting the Trauma Model.

Kruskal-Wallis H tests for trauma exposure were conducted for participants below the SIMS cut-off (N = 36). For total trauma exposure as well as each childhood maltreatment subscale (TEC emotional neglect, emotional abuse, physical abuse, and sexual abuse) with one exception (sexual harassment), group differences were found between the DID-G, DID-S, PTSD, and HC groups. Post-hoc tests showed that the DID-G group scored significantly higher on total trauma exposure compared with the DID-S and HC groups. As with dissociation, post-hoc tests showed the DID-G group did not differ from the PTSD group on trauma exposure. The DID and PTSD groups having similarly high levels of trauma exposure supports the Trauma Model.

Follow-up analyses with the Kruskal-Wallis H-tests for the SIMS with participants below the SIMS cut-off (N = 36) revealed significant group differences on the SIMS total measure as well as the SIMS psychosis subscale. Group differences were not found to be significant in the SCM’s measure of fantasy proneness (CEQ), neurological symptoms on the SIMS, affective symptoms on the SIMS, low intelligence on the SIMS, amnesia on the SIMS, or on the ISES scales. Post-hoc tests on group differences in the SIMS total revealed that DID-G participants scored significantly higher than DID-S, and HC groups, but not the PTSD group. On the SIMS psychosis subscale, PTSD participants scored significantly higher than HC participants (p < .006). These results are generally supportive of the Trauma Model.

2) Treat SIMS scores as covariates
To further explore whether the DID group’s scores were indicative of malingering versus trauma exposure or genuine psychopathology, we conducted a MANCOVA covarying the SIMS total score to assess whether our original findings are upheld after statistically controlling for potential malingering, as suggested by Merckelbach et al. (2016). This MANCOVA demonstrated significant group differences on dissociation (DES, SDQ-20, CDS-total, CDS-frequency, CDS-duration) and anxiety (see Table 3). Post-hoc pairwise comparisons revealed the DID patients scored significantly higher on all dissociation measures compared to the simulators, PTSD, and HC groups, but they were not higher than any group on anxiety. A MANCOVA covarying SIMS total score also demonstrated group differences in trauma exposure (TEC total and subscales), as well as problems with attachment (all subscales of the PBI except maternal overprotection). Post-hoc pairwise comparisons revealed that the DID-G group had significantly higher scores for trauma

PTSD = posttraumatic stress disorder; DID-G = genuine dissociative identity disorder; DID-S = simulated dissociative identity disorder; HC = healthy control
exposure (TEC total and TEC subscale measures), and problematic attachment with fathers (lower paternal care and higher paternal overprotection subscales of the PBI), compared to all three groups. The DID-G group also had significantly lower scores for attachment to mothers (lower maternal care subscale of the PBI) compared to the DID-S and HC groups, but not the PTSD group. Our results indicate that the DID patients had higher dissociation and trauma exposure as well greater attachment insecurity with mothers and fathers after controlling for potential malingering. All of these analyses support the Trauma Model.

A MANCOVA controlling for SIMS scores further demonstrated significant group differences on the ISES general subscale, and the neurologic, low intelligence, and psychosis subscales of the SIMS. There were no group differences for fantasy proneness, the ISES-lucid dreaming subscale, or the affective and amnesia subscales of the SIMS. Post-hoc pairwise comparisons revealed that the DID-G group reported more sleeping problems (ISES-general subscale) and had higher SIMS-low intelligence subscale scores than HC participants. DID-G participants scored higher on the SIMS-neurologic and psychosis subscales compared to PTSD participants. Post-hoc pairwise group differences were not found to be significant between the DID-G and the DID-S group on sleep problems, or the SIMS neurologic, psychosis or low intelligence subscales. The DID-G group did not differ significantly from the PTSD group on the low intelligence SIMS subscale nor sleep problems. Lastly, the DID-G group did not differ significantly from the HC group on the neurologic nor psychosis subscales of the SIMS. Consistent with our findings, research demonstrates that DID patients have high levels of psychotic symptoms due to hearing voices of dissociative states (30) and high level of seemingly neurological yet actually sensorimotor dissociative symptoms (31, 32). The lack of group differences on fantasy proneness and SIMS scales that are not elevated on characteristics associated with trauma-related phenomena supports the Trauma Model of DID.

Discussion
We have shown that individuals with DID do not create more false memories than do actors imitating DID, individuals with PTSD, or healthy controls. Individuals with DID are not more fantasy prone than individuals with PTSD and mentally healthy individuals who were invited, instructed and motivated to imitate DID. Contrary to Merckelbach et al. ’s (2016) statements, we did not misrepresent the SCM of DID, nor did we tip off our participants about the hypotheses of our study. We proved that the SCM/Fantasy Model does not hold up against scientific investigation with well-diagnosed DID patients. Furthermore, our analyses of the SIMS data showed it has questionable validity in the study of DID. The findings from our original study (1), combined with the additional analyses we present here, do not support the SCM/Fantasy Model of dissociation. To the contrary, our study, including the additional analyses requested by the Fantasy Model theorists, consistently provides further evidence supporting the Trauma Model of DID.
References


