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BRIEF REPORT

Transfer of Episodic Self-Referential Memory Across Amnesic Identities in Dissociative Identity Disorder Using the Autobiographical Implicit Association Test

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Individuals with dissociative identity disorder (DID) often report having no access to autobiographical experiences encoded by other identities. This research used the autobiographical Implicit Association Test (aIAT) to determine whether there was transfer of episodic self-referential memory events across amnesic identities. Nineteen DID individuals, 16 DID simulators, and 41 comparison participants (divided into amnesic and nonamnesic groups) engaged with an audio vignette of embarrassing scenarios to produce the experience of episodic self-referential events. Results showed transfer of episodic self-referential memory using the aIAT across identities that reported no conscious awareness of encoded content in DID. These aIAT results in DID patients were similar to the nonamnesic comparison group and the simulator group, and differed from the amnestic comparison group. These results are in line with previous literature showing transfer of memories, but extends this work to episodic self-referential memory.

General Scientific Summary

Dissociative Identity Disorder (DID) is characterized by reported interidentity amnesia (i.e., gaps in the recall of personal events experienced in another personality state). Although previous studies indicated evidence of transfer of information between identities for semantic personal information, episodic memory (i.e., the recollection of past personal experiences that occurred at a particular time and place) had not previously been assessed. The results of the current study indicate that although patients subjectively report episodic memory loss, objective testing indicates that memory functioning in patients is intact and comparable to memory functioning of healthy comparisons.

Dissociative Identity Disorder (DID) is captured by a person experiencing marked disruptions in his or her identity and sense of agency characterized by two or more distinct personality states (American Psychiatric Association, 2013). It is not uncommon for adults with DID to present dissociative identities purporting to hold information about traumatic experiences from the past, or that appear normal save for a lack of affect and the experience of amnesia for previous, particularly traumatic events (Kluft, 2007). Each identity has a unique sense of self, having its own first person perspective on itself, other identities, other people, and the world (American Psychiatric Association, 2013).

Discussion continues about the etiological factors for DID. Yet a combination of factors, including chronic physical, emotional, or sexual abuse perpetrated by a caregiving figure, major attachment disruption, genetic determinants (e.g., hypnotizability), and socio-cognitive and cultural factors, are argued to facilitate its development (e.g., Dorahy et al., 2014; Lynn, Lilienfeld, Merckelbach, Giesbrecht, & Van der Kloet, 2012).

Two fundamental types of identities can be distinguished based on their function in the person's life: Those that appear avoidant of painful internal experiences (avoidant identities) and those that appear fixated on them (trauma identities; Boon, Steele, & Van der Hart, 2011). Interidentity amnesia for traumatic events has been reasoned to allow an identity to preserve its sense of self and daily functioning in the face of abuse and neglect (Kluft, 2007). Although an avoidant identity may claim to not have memories for traumatic past events (Lewis, Yeager, Swica, Pincus, & Lewis, 1997), trauma identities report key information regarding these experiences. Interidentity amnesia has been studied for events holding both traumatic and neutral emotional content (stored in the episodic memory system) as well as for common facts (e.g., general semantic or autobiographical knowledge) stored separate from a person's experience, in the semantic memory system. More recently, these studies have not found evidence for objective memory retrieval deficits across identities that report amnesia (e.g., Huntjens, Peters, Woertman, Van der Hart, & Postma, 2007; Kong, Allen, & Glisky, 2008). This lack of retrieval deficit was found in both explicit and implicit retrieval tasks (for an extended discussion see Huntjens, Postma, Peters, Woertman, & Van der Hart, 2003). Yet research regarding episodic autobiographical memory transfer in DID is lacking. Although therapists have routinely noted a lack of shared episodic autobiographical memories between identities (Bryant, 1995), the extent and nature of this reported amnesia has not been well assessed experimentally.

Autobiographical memories hold a large amount of person-specific information associated with knowledge about who a person is and the events that have occurred in their life (Conway & Pleydell-Pearce, 2000). One of the few studies assessing autobiographical memory transfer in DID required participants to answer semantic autobiographical memory questions (e.g., favorite food) about themselves in avoidant and traumatic identities (Huntjens, Verschuere, & McNally, 2012). Although the DID group reported amnesia for the answers provided by the other identities and reported a belief that they were unable to access memories from amnesic identities, transfer of autobiographical memory was evident using the Concealed Information Test.

The current study took a step toward examining episodic autobiographical information by assessing episodic self-referential information across identities in DID patients reporting amnesia in a controlled setting. Self-referential encoding processes information "as strongly related to one's own experience" (Northoff et al., 2006, p. 441; e.g., I had this experience), and is retrieved more accurately than information not self-referentially encoded (Symons & Johnson, 1997). The autobiographical Implicit Association Test (aIAT) was utilized for this study. The aIAT uses reaction time (RT) data to assess which of two autobiographical or self-referential statements (e.g., I was drunk vs. I was sober) is true (Verschuere, Prati, & De Houwer, 2009). It does so by examining the ease of pairing the statements with the labels true and false. When pairing a statement with true (and pairing its counterpart with false) is faster than pairing that statement with false (and pairing its counterpart with true), the statement is more likely to be correct than its counterpart. Meta-analytic research supports its validity, with Cohen's $d = 0.82$ [0.54; 1.11], in naïve (i.e., non-faking) participants, implying that RTs allow for assessing which of the two statements presented in the aIAT is most likely true (Suchotzki, Verschuere, Van Bockstaele, Ben-Shakhar, & Crombez, 2017).

In the current study, we aim to determine whether memory transfer across reported amnesic DID identities was evident for episodic self-referential information using the aIAT. Two vignettes detailing embarrassing scenarios were used. Four samples were assessed. DID participants heard a different vignette in each identity. To address the suggestion that DID may be a disorder of simulation and as such simulator groups should be utilized for comparison purposes (Boysen & VanBergen, 2014), we also included a DID simulator sample consisting of professional and amateur actors instructed to simulate interidentity amnesia. The same procedure was used for the DID and DID simulator samples. One additional nonclinical nonamnesic comparison sample heard both vignettes, and acted as a true control group, while another heard only one vignette to act as a true amnesia group. In line with previous research showing that interidentity amnesia in DID may be more a perceived deficit than an objective retrieval impairment, it was hypothesized that the vignette material of both identities would be as easily paired with the "true" category in the aIAT (i.e., no objective amnesia).

Method

The vignettes and all data can be found at https://osf.io/c6g7d/.

Participants

Nineteen DID participants were recruited from a hospital program in Australia specializing in trauma and dissociative disorders and from referrals via clinicians. For inclusion and exclusion criteria see online supplemental materials.

All 19 DID participants were female. Participants were told the study would research memory in different identities of people with DID. Participants self-selected the two identities (one trauma-focused, one avoidant) and received a $20 shopping voucher for taking part in the study. Seven DID participants were removed for failing to complete the task ($n = 1$), being unable to switch between identities ($n = 3$), or experiencing test interference from a third identity ($n = 3$). The final DID sample contained 12 participants.

Forty-one comparison participants took part in the study. These were undergraduate psychology students ($n = 15$) and members of

the general population of New Zealand and Australia ($n = 26$) recruited via group e-mail, notice board flyer, or word of mouth. Comparison participants reported no memory or attentional deficits and were randomly assigned to an amnesic group ($n = 21$) or a nonamnesic group ($n = 20$). Participants in the amnesic group received the memory stimuli given to the first identity (Identity A) in the DID group (see Stimuli), and participants in the nonamnesic group received the memory stimuli given to both DID identities. Comparison participants were not aware the study was researching DID and were informed it assessed how old and new memories were influenced by a person's cognitive functioning. They received $20 in shopping vouchers for participating in the research, or course credit.

Sixteen DID simulator participants took part in the study. These were professional and amateur actors from a university theater and film department in New Zealand and various theater companies via word of mouth and snowball sampling. Table 1 shows the demographics details for each group.

Stimuli

Vignettes. Vignettes were adapted for the study based on previous research that used stories to elicit emotion in a laboratory context in clinical and nonclinical participants (Dorahy et al., 2017). The vignettes were 14 sentences long. Two vignettes contained embarrassing emotional content (i.e., a bank teller pointing out mucus on your face while others mock; being berated in a supermarket for hitting a child with your trolley). We used vignettes with embarrassing content to introduce emotional stimuli while avoiding a task too taxing to complete, especially for the DID participants. One embarrassment vignette was administered to each identity (i.e., bank or supermarket).[1]

aIAT. The aIAT measured episodic self-referential memory for the content presented in the vignettes: "I had mucus on my face in the bank" (Bank vignette) versus "I hit a child with my trolley in the supermarket" (Supermarket vignette). It does so by examining the ease of pairing the statements with the labels true and false. When pairing the bank statement with true (and the supermarket statement with false), RTs are faster than pairing the bank statement with false (and supermarket statement with true), indicating the bank statement is more likely to be true for the participant than the supermarket statement. Examples of the stimuli and procedure are presented in Table 2. The task was presented using Inquisit Software, which recorded RTs with millisecond accuracy (De Clercq, Crombez, Buysse, & Roeyers, 2003). Participants are instructed to accurately categorize the sentences. In Block 1, participants are presented only with the true and false sentences. The labels *TRUE* and *FALSE* are depicted in the left and right (respectively) corners of the screen. Participants are instructed to categorize true sentences as *TRUE* (by pressing the E key) and false sentences as *FALSE* (by pressing the I key). In Block 2, participants are presented only with the vignette attributes, and participants classify the sentences as belonging either to the bank vignette (*I HAD MUCUS ON MY FACE IN THE BANK*) or to the supermarket vignette (*I HIT A CHILD WITH MY TROLLY IN THE SUPERMARKET*). Assignment of response buttons to vignettes was counterbalanced across participants. Block 3 practices for Block 4, and consists of a combined block in which participants have to classify both true versus false sentences and sentences

from both vignettes (i.e., with labels referring to both classifications appearing in the corners of the screen). Participants are instructed to categorize the sentences as they did in Blocks 1–2. In Block 5, participants are again only presented with vignette sentences, but the order of the vignette attributes is reversed to what it was in Block 2 (e.g., when bank label was left and supermarket right in Block 2; Block 5 has bank label right and supermarket left). The latter order is then also used in the last two combined blocks, with Block 6 practicing for Block 7 (e.g., bank and false; supermarket and true).

Procedure

The study was part of a larger experiment on memory transfer in DID approved by the relevant IRBs. Participants in the simulator group were instructed how to simulate DID via various means. Participants were shown a video outlining DID, which provided information to aid simulation (see online supplemental materials). A DID Information Sheet was also provided for education and consisted of three pages of information outlining DID and answering frequently asked questions (e.g., is it obvious when a person switches identities, what are the symptoms of DID?). *DSM–5* criteria for the disorder were also included. A description of activities required to develop and practice their created identity can be found in the online supplemental materials. Simulators were instructed to simulate amnesia between their identities throughout the study.

Written and informed consent was gained from all participants before participation. All participants were tested individually by the first author. Participants were randomly assigned into vignette conditions (bank or supermarket). DID and simulator participants were assigned the bank vignettes in one identity and supermarket vignettes in the other identity. Presentation order and DID/simulator identity was counterbalanced over all participants. Amnesic comparisons were randomly assigned one vignette. Nonamnesic comparisons were assigned both pairs of vignettes, and the presentation order was counterbalanced across participants.

Participants were instructed to become as absorbed in the vignette as possible and remember any details they could. During the vignette presentation participants were required to say aloud the sentence they had just heard via headphones, changing it from the personal pronoun "you" (e.g., *you went to the bank*) to "I" (e.g., *I went to the bank*) to heighten its self-referential quality. After each vignette had finished, participants rated the level of embarrassment experienced on a scale from 0 (not at all) to 100 (completely) and were asked to recall as many details of the story as possible in two minutes.

After switching to the other identity (Identity B), DID and simulator participants were asked if they remembered anything about what had just happened in the study to assess for subjective interidentity amnesia (all responded having no awareness). The second vignette was given to this identity (or to participants in the nonamnesic comparison group), and they followed the same procedure as Identity A. Comparison participants were also asked what they remembered after completing the vignette (amnesic) or after each set of the vignettes (nonamnesic).

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[1] Neutral vignettes were also presented but were not assessed by the aIAT, which focused on emotional events.

Table 1
Participant Demographic Data Across Groups

Demographic variables	DID (n = 12)	Simulator (n = 16)	Amnesic control (n = 21)	Nonamnesic control (n = 20)
Age M (SD)	39.17 (11.74)	31.38 (15.16)	39.10 (8.70)	38.35 (7.24)
Sex n (%)				
Male	0 (0%)	2 (12.5%)	1 (4.8%)	1 (5%)
Female	12 (100%)	14 (87.5%)	20 (95.2%)	19 (95%)
Ethnicity[*]				
New Zealand European	0 (0%)	13 (81.3%)	11 (52.4%)	16 (80%)
Maori	0 (0%)	1 (6.3%)	0 (0%)	0 (0%)
Australian European	10 (83%)	2 (12.5%)	1 (4.8%)	0 (0%)
Other	4 (33%)	2 (12.5%)	9 (42.9%)	4 (20%)
Qualification[§]				
High school certificate	4 (33.3%)	5 (31.2%)	2 (9.5%)	0 (0%)
Post-high school non-university (e.g. trade certificate)	1 (8.3%)	2 (12.5%)	8 (38.1%)	9 (45%)
University level	5 (41.7%)	9 (56.3%)	11 (52.4%)	11 (55%)

[*] For the dissociative identity disorder (DID) group, four participants chose two ethnicities. For the simulator group, two participants chose two ethnicities. [§] For the DID group, two participants reported no qualifications. For the amnesic control group, one participant chose two ethnicities.

Approximately five minutes after hearing their last vignette, participants engaged in the aIAT. They were instructed to categorize the sentences as quickly as they could while minimizing errors. The DID and simulators completed the aIAT in the identity that heard the first vignette (Identity A).

The researcher who engaged in data collection (RM) was blind to who was in the DID and simulator groups, and simulators were instructed to ensure the researcher believed they had a DID diagnosis (i.e., they did not break role). After blindly testing each simulator and DID participant, the researcher completed a survey assessing whether the participant appeared to authentically have DID. All but three simulators were rated as authentic.

Analysis

The aIAT was scored using Greenwald, Nosek, and Banaji's (2003) improved scoring algorithm. Trials with RTs greater than 10 seconds were deleted leading to the exclusion of 1.4% of data. There were no participants that needed to be excluded for having more than 10% trials <300 ms. The D score is calculated using the difference between the mean response latencies in the combined Blocks 3–4 (e.g., bank and true; supermarket and false) versus combined Blocks 6–7 (supermarket and true; bank and false) and dividing it by their pooled standard deviation, making it roughly equivalent to Cohen's d. D scores that do not significantly differ from zero suggest that both events were in memory during retrieval and considered to be true. A significant positive D score indicated that identities were more likely to classify their experienced vignettes as being true compared to the events experienced in the other identity (i.e., supporting the presence of interidentity amnesia). aIAT analyses were conducted by the fourth author (BV), who was blind to which sample each participant belonged to.

Table 2
Structure of the Autobiographical Implicit Association Test (AIAT) With Example Stimuli

Block number	Left label	Right label	Example stimulus (category)	Number of trials
1	TRUE	FALSE	"I am sitting at a computer" (true); "I am sitting by a television" (false)	20
2	I HAD MUCUS ON MY FACE IN THE BANK	I HIT A CHILD WITH MY TROLLY IN THE SUPERMARKET	"I went to the bank" (bank); "I went to the supermarket" (supermarket)	20
3–4	I HAD MUCUS ON MY FACE IN THE BANK or TRUE	I HIT A CHILD WITH MY TROLLY IN THE SUPERMARKET or FALSE	"I am sitting by a television" (false); "I am sitting at a computer" (true); "I went to the bank" (bank); "I went to the supermarket" (supermarket)	20 (practice) + 40 (test)
5	I HIT A CHILD WITH MY TROLLY IN THE SUPERMARKET	I HAD MUCUS ON MY FACE IN THE BANK	"I went to the bank" (bank); "I went to the supermarket" (supermarket)	40
6–7	I HIT A CHILD WITH MY TROLLY IN THE SUPERMARKET or TRUE	I HAD MUCUS ON MY FACE IN THE BANK or FALSE	"I am sitting by a television" (false); "I am sitting at a computer" (true); "I went to the bank" (bank); "I went to the supermarket" (supermarket)	20 (practice) + 40 (test)

Results

There were no significant group differences in gender, $\chi^2(3) = 2.12$, $p = .55$, *Cramer's V* = .18, age, $F(3, 65) = 2.00$, $p = .12$, $\eta_p^2 = .09$, or education level, $\chi^2(6) = 10.63$, $p = .10$, *Cramer's V* = .40 (broken into high school; post-high school, nonuniversity; university).

Comparing the bank vignette ratings, the groups differed significantly, $F(3, 55) = 3.52$, $p = .021$, $\eta_p^2 = .16$, with Gabriel's post hoc tests indicating that DID patients ($M = 70.83$; $SD = 35.02$) rated the vignette close to significantly ($p = .057$) more embarrassing than the amnesic comparisons ($M = 31.82$; $SD = 35.73$), and significantly more embarrassing ($p = .022$) than the nonamnesic controls ($M = 32.50$; $SD = 32.91$). The difference between DID and simulators ($M = 42.50$; $SD = 36.79$) was not significant ($p = .20$), nor were the other comparisons ($p > .95$). Comparing the supermarket vignette ratings, the groups also differed significantly, $F(3, 54) = 3.85$, $p = .014$, $\eta_p^2 = .18$, with Gabriel's post hoc tests indicating that DID patients ($M = 65.00$; $SD = 31.48$, $p = .047$) but not simulators ($M = 60.00$; $SD = 31.41$, $p = .086$) rated the vignette as more embarrassing compared to nonamnesic comparisons ($M = 33.00$; $SD = 30.97$). All other comparisons were not significant ($p > .18$).

Table 3 shows the D scores and their significance for each group. Nonamnesic comparison participants had aIAT scores that did not differ from zero; in other words, the aIAT correctly concludes that they subjectively experienced both embarrassing events to be true. Amnesic comparison participants had a significantly positive aIAT score; in other words, the aIAT correctly recognized that they had experienced only one of the two events. Thus, these results validate the aIAT methodology and allow interpretation of DID patients and simulators scores. DID participants had an aIAT score that did not differ from zero, meaning the events experienced by Identity A were not considered to be more true than events occurring in identity B. Simulators similarly were found to classify both events (i.e., those experienced by Identity A and B) as equally likely to be true. The simulators' aIAT score was slightly positive (which hints at successful faking of amnesia), but the score did not differ significantly from zero ($p = .07$).

These findings were confirmed by a significant one-way between subjects ANOVA on Group (DID, simulator, amnesic comparison, nonamnesic comparison), $F(3, 65) = 3.79$, $p = .014$, $\eta_p^2 = .15$. An independent *t* test showed a large difference in aIAT scores between the amnesic comparison group and the nonamnesic comparison group, $t(39) = 3.42$, $p < .01$, Cohen's $d = 1.08$ (95% CI [0.43, 1.74]), confirming the aIAT methodology. The aIAT D score of the DID patients differed significantly from that of the amnesic comparison group, $t(31) = 2.15$, $p = .04$, Cohen's $d = 0.78$ (95% CI [0.04, 1.51]), but did not differ significantly from the nonamnesic comparison group, $t(30) = 0.72$, $p = .47$, Cohen's $d = 0.28$ (95% CI [−0.44, 0.99]), nor the simulators, $t(26) = 0.70$, $p = .49$, Cohen's $d = -0.26$ (95% CI [−1.02, 0.49]). These results were complemented with Bayesian statistics (see Table 3), providing additional results rendering a conclusion of anecdotal evidence for no amnesia in the DID sample and amnesia for the simulators.

Discussion

This study was unique in examining transfer of episodic self-referential memory across different self-reported amnesic identities in DID. Results in the comparison groups confirmed the aIAT methodology as the aIAT could discriminate the comparison group who were amnesic for one event (i.e., had not experienced one of the embarrassing events) from the comparison group who were not amnesic (i.e., had experienced both embarrassing events). The aIAT results of the DID participants indicated they had episodic memory of both events; in other words, the tested identity did not discriminate between the event experienced in the same versus another identity, so that both were considered to be true. The results of the DID patients were similar to nonamnesic comparisons and simulators.

The DID trauma model indicates that traumatic events are experienced by trauma identities and kept separate from avoidant identities who have a role in preserving functioning in day-to-day tasks by interidentity amnesia. By compartmentalizing these events so they are separated from avoidant identities, integration with other identity-specific memories cannot occur, further perpetuating the existence of separate identities. Results indicate, however, that retrieval for episodic self-referential memories with embarrassing emotional content was evident in both traumatic and avoidant identities. These results are in line with previous research showing that stimuli can transfer between identities despite full amnesia being reported (e.g., Huntjens et al., 2003, 2007, 2012).

Thus, information is subjectively reported to be irretrievable but objectively retrieved. There are several possible explanations for these findings. First, patients were consciously simulating amnesia resulting in self-reports of amnesia but transfer of information between identities. No firm conclusions can be drawn about this possibility, as DID patients did not differ from

Table 3

D Scores (With SD) for Autobiographical Implicit Association Test (AIAT)

Diagnostic group	aIAT D score (SD)	*p* value one sample *t*-test against zero (with Cohen's *d*)	Bayes factor (BF$_{10}$)
DID ($n = 12$)	+.13 (.43)	.32 (.30)	.45 (anecdotal evidence for aIAT = 0)
Simulator ($n = 16$)	+.26 (.53)	.07 (.49)	1.17 (anecdotal evidence that aIAT score differs from 0)
Amnesic Comparison ($n = 21$)	+.49 (.48)	.001 (1.02)	190 (extreme evidence that aIAT score differs from 0)
Nonamnesic Comparison ($n = 20$)	+.02 (.38)	.78 (.06)	.24 (moderate evidence for aIAT = 0)

Note. The Bayes factor for the one-sample *t*-test against zero, calculated with JASP (https://jasp-stats.org) and the Cauchy prior width set to JASP default $r = .707$, indicates how much more likely the data are under the alternative hypothesis (aIAT differs from zero) than under the null hypothesis (aIAT is zero). Interpretation of Bayes factor following Lee and Wagenmakers (2013).

nonamnesic controls and also not from simulators. The Bayes factors, however, indicated anecdotal evidence for the simulator aIAT scores differing from 0 (indicating amnesia). The DID aIAT results indicated anecdotal evidence against amnesia, rendering this possibility less likely. Second, the patient results are determined by metacognitive beliefs of being unable to retrieve past events experienced in another identity with the accompanying alternative self-concept. The patient's subjective perception of the self as fragmented may result in the motivation not to engage in a search of the autobiographical memory base or not acknowledge retrieved material if this is deemed ego-dystonic to the current personality state (e.g., adult activities in a child personality state). These metacognitive beliefs may have resulted in self-reports of interidentity amnesia, although the capacity to engage in searching past experience was unaltered. Future work should investigate the content and role of metacognitive beliefs in memory retrieval and identity reconstruction in DID (Huntjens & Dorahy, 2018). Clinically, amnesia in DID may result from metacognitive rather than cognitive processes. Thus, a metacognitive focus in therapy may assist in overcoming subjective identity fragmentation and subjective compartmentalization of information.

This research was limited by quite small sample sizes, although effect sizes indicated medium to large effects. Generalizations from this laboratory study should be limited to those participants with DID who have been in therapy for some time, who are aware they have identities that have different experiences and different first person perspectives, who can move between these identities on command from a researcher or their therapist, and who have the mental energy and cognitive faculties to complete a very complex task. This grouping of DID participants is unlikely to reflect those not seeking treatment or those in the early stages of therapy. Further caution should be exercised in overgeneralizing from the analogy procedure and embarrassment-laden content used here to genuine and more intense and distressing experiences often reported in those with DID. Future studies should utilize autobiographical experience to assess the validity of the current findings.

In summary, DID participants demonstrated transfer of episodic memories across identities that claimed to have no knowledge of events that occurred in the other identity. Health practitioners may seek to use these findings to understand further the connection between identities, such that amnesic identities may have access to the experiences of other identities, although at this stage it is unclear why patients subjectively report having no awareness of these experiences (i.e., amnesia) and do not always willfully engage in retrieval of events experienced in other identities. The latter may reflect a general habitual strategy influenced by the motivation not to acknowledge or take ownership of events that threaten that identity's subjective self-coherence. The discrepancy between the ability to retrieve experiences on the one hand and the inability to take ownership of what is retrieved on the other hand requires further attention.

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