Clinical Psychology Review 114 (2024) 102514

Contents lists available at ScienceDirect

Clinical Psychology Review

journal homepage: www.elsevier.com/locate/clinpsychrev

Inter-identity amnesia and memory transfer in dissociative identity disorder: A systematic review with a meta-analysis

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ARTICLE INFO

Keywords:
Dissociative identity disorder
Inter-identity amnesia
Memory transfer

ABSTRACT

Individuals with dissociative identity disorder (DID) often report an inability to retrieve memories associated with other identities, termed inter-identity amnesia (IIA). Research investigating IIA has amassed, and interest surrounds whether objective deficits in retrieval mechanisms necessarily underlie the experience of IIA. This study conducted a systematic literature review with meta-analyses to examine current findings on IIA in DID. In particular, we explored whether DID patients' clinical reports of retrieval failure across identities were substantiated by controlled measures of memory. Nineteen empirical and four case studies informed the systematic review. The meta-analyses comprised twelve of the included studies. The systematic review findings suggested a degree of inter-identity memory transfer, a conclusion which was supported by two of the four meta-analyses. The remaining two meta-analyses evidenced patterns closer to IIA. Closer examination drew attention to methodological considerations that may limit definitive conclusions drawn from present studies. These include substantial heterogeneity between participants' scores which is masked by group statistics, a small and homogenous cumulative sample, limited research teams, and minimal domains of memory assessed. The paper urges a nuanced understanding of the phenomenon of IIA in light of current findings.

Dissociative Identity Disorder (DID; formerly multiple personality disorder) is marked by the experience of having two or more distinct identities with their own 1) senses of agency and ownership over specific psychological manifestations (e.g., thoughts, feelings, memories, impulses), 2) bodily functions and movements, and 3) interactions with physical and social environments (American Psychiatric Association [APA], 2022). Memory retrieval impairments are core phenomenological experiences in those with DID. One clinical manifestation of these memory deficits is the experience in one identity of being unable to retrieve memories encoded by another identity. A person with DID in one dissociative identity may also report no awareness of another identity's existence nor experience any benefit from the previous learnings of other identities. This collection of inter-identity memory deficits is typically referred to as *inter-identity amnesia* (IIA). Though IIA is a key phenomenological feature of DID, its manifestation differs significantly across different individuals, and across different identities within the same individual. In fact, three levels of awareness may coexist within an individual with DID (Ellenberger, 1970). That is, identities may have mutual awareness, one-way (asymmetric) amnesia, or two-way (symmetric) amnesia.

Despite this descriptive account, and although such memory anomalies are evident in the earliest scientific accounts of DID (e.g., Mitchell, 1888; Mitchill, 1816), a lack of understanding continues to prevail regarding the phenomenon's conceptualization. On the one hand, IIA may reflect a major deficit in cognitive retrieval processes, such that the internal experience of being unable to access memories associated with another identity is supported using memory tests that are less influenced by subjective processes (e.g., complete inability to recall information associated with another identity on memory tasks). Alternatively, the experience of IIA may rely more heavily on metamemory processes and beliefs about self-experience in the presence of intact retrieval processes; in this case, memory transfer would be apparent with the use of objective memory tests. It is entirely possible that both explanations are needed to offer a full account of the experience of IIA in DID. That is, in some cases, even within the same person, IIA experiences may be underpinned by deficits in retrieval apparatus, while other IIA experiences are based on beliefs about the self and associated metacognitive monitoring and control processes (Dorahy, 2023).

In recent years, a burgeoning body of research has accrued aiming to explicate the nature of IIA in DID and the degree to which cognitive

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https://doi.org/10.1016/j.cpr.2024.102514
Received 31 May 2024; Received in revised form 13 September 2024; Accepted 25 October 2024
Available online 30 October 2024

retrieval deficits are implicated. In line with the principle that "the foundation of science is the cumulation of knowledge from the results of many studies" (Hunter, Schmidt, & Jackson, 1982, p. 10), the goal of the current investigation was to review the cognitive empirical research directly assessing IIA in DID. To that end, we sought to examine whether research to date offers greater clarity into the nature of IIA as a symptom of DID, so as to inform future empirical and theoretical work on the psychological foundations of the disorder's memory deficits. The nature of memory anomalies in DID is best captured through nuanced and complex empirical investigation and conceptualization, so this review took both a narrative and statistical form.

1. Memory dysfunction in DID: a short history

Idiosyncratic memory function, akin to what is now clinically known as IIA, has been a discernable feature of DID from the earliest reports of the disorder. Among the first published descriptions are those of Jeanne Fery from the late 1500s, who reported amnesia for experiences and actions associated with another identity (Van der Hart, Lierens, & Goodwin, 1996), and Dr. Eberhardt Gmelin's case of "exchanged personality" in 1791. In the latter, a 20-year-old middle-class German woman regularly "switched" into an aristocratic French woman. Descriptions of the patient's anomalies center upon the 'French woman's' intact memory functioning, whilst the 'German woman' denied any knowledge of her other identity's existence, and reported an inability to retrieve her encoded experiences (see Ellenberger, 1970). As Ellenberger (1970, p. 127) described, "in her French personality, the subject had complete memory for all that she had said and done during her previous French states. As a German, she knew nothing of her French personality".

The famous case of Mary Reynolds (1793–1854), accounted for orally by those who knew her and depicted in the medical literature by Mitchill (1816) and Mitchell (1888), is also replete with descriptions of the distinct memory retrieval deficits across identities. "In her old state", Mitchill (1816, p. 186) wrote, "[Mary] possesses all her original knowledge; in her new state, only what she has acquired since". The marked lack of awareness between identities was likewise observed, where Mitchill (1816, p. 186) described that "she is as unconscious of her *double* character as two distinct persons are of their respective separate natures". Later, Mitchell (1888, p. 14) pointed out that, "the thoughts and feelings, the likes and dislikes, of the one state did not in any way influence or modify those of the other". However, Mary's procedural memory, perceptual representations, and semantic memory associated with language, though not explicitly reported as known to her other identity, nonetheless had an impact on her capacity to learn. For example, Mitchell (1888) noted the rapid rate at which she learned to read and write in the 'illiterate' identity, seemingly drawing on skills and representations already acquired in, and associated with, the amnesic identity. Thus, Mary's description need not be taken to reflect that a lack of awareness definitively equated to deficits in the retrieval apparatus or a conceptualization of seemingly impermeable cognitive blocks between identities that implicate deficits in memory retrieval processes.

Descriptions of DID cases were replete with memory anomalies during the height of interest in dissociative phenomena in the late 1880s and early 1900s. For example, such phenomena were described in detail in Prince's famous cases (e.g., Miss Beauchamp & B.C.A; Prince, 1906). B.C.A. articulated that the amnesia experienced by identity A for events identity B was exposed to commenced after a "psychic crisis" activated by intolerable shame and humiliation (Anonymous., 1908; Prince, 1906). Likewise, the Italian case of Elena in the 1920s provided many examples of the gaps in her memory and IIA that covered episodic, semantic, and procedural memory retrieval (Ellenberger, 1970; Schimmenti, 2017). Pierre Janet, who had the greatest historical impact on the study and understanding of dissociation (Craparo, Ortu, & Van der Hart, 2019), described total amnesia between dissociative states in several of his cases, including Lucie, Léonie and Rose (Janet, 1889/2022). Yet, in these cases there were states that had more complete access to the person's autobiographical history so that different states reported different access to episodic and semantic memory.

The fascination with dissociative identities has given way to contemporary conceptualizations that have a greater emphasis on avoiding reification. Here, dissociative identities are seen as self-states with their own sense of self and self-consciousness, that are subjectively experienced with elaborated identity characteristics (e.g., an age, gender, beliefs, values; Loewenstein & Brand, 2023). They are organized around generative models of self, others and the world, drawn from discrete emotional, cognitive and social representations. These models attempt to predict and adapt to internal and environmental demands, which may lead to characteristic psychological and behavioral actions. The phenomenological features of DID include repetitive, and at times unbidden, intrusions from other identities (e.g., intrusive feelings, images, behaviors; voice hearing reflecting communication of other identities, switching between dissociative identities; e.g., Dell, 2009), along with fear- and shame-based avoidance of internal experience, including other dissociative identities (e.g., Brand, Schielke, Schiavone, & Lanius, 2022; Steele, Boon, & Van der Hart, 2017).

The ubiquity of memory dysfunction in descriptive accounts of DID remains evident, with amnesia being the most commonly reported dissociative symptom (Dell, 2006). Its importance has been increasingly acknowledged over the years by being steadily translated into diagnostic criteria. For example, in moving Multiple Personality to the newly coined category of 'Dissociative Disorders', the Diagnostic and Statistical Manual of Mental Disorders third edition (DSM-III) noted that "[u]sually the original personality has no knowledge or awareness of the existence of any of the other personalities" (APA, 1980, p. 257). While amnesia between identities is implied here, no explicit criterion associated with memory was formulated until the text's fourth edition. Here, the experience of amnesia became a formal diagnostic criterion, listed as an "inability to recall important personal information that is too extensive to be explained by ordinary forgetfulness" (APA, 1994, p. 487). The DSM-5 and 5-Text Revision retained the amnesia criterion in the form of "recurrent gaps in the recall of everyday events, important personal information, and/or traumatic events that are inconsistent with ordinary forgetting" (APA, 2022, p. 292). Despite being a regularly-occurring clinical phenomenon in DID, IIA is not explicitly part of the current diagnostic criteria, even though it can be implied to explain some amnesic phenomena (e.g., forgetting of everyday events).

Experimental work exploring IIA dates back to the early twentieth century. Prince and Peterson (1908) conducted a single case study examining whether the experiences had by one identity (i.e., identity B) might activate physiological arousal in a reported amnesic other identity (i.e., identity A). This work primarily examined whether physiological measures registered in response to inter-identity stimuli exposure, rather than assessing whether the cognitive representations of the stimuli were available for implicit or explicit retrieval. Results showed evidence of physiological activation for cues that identity A reported no awareness of, suggesting that identity A had at least a preconscious awareness of experiences thought to be beyond retrieval ability. Still, Prince and Peterson (1908) noted that "all writers are not in accord as to the interpretation which shall be put upon these manifestations" (p. 114). Almost 100 years later, in a review of IIA, Dorahy (2001) could draw no clearer conclusions, stating that "the empirical data are not far-reaching enough to support [a] parsimonious theory", highlighting the need for "further controlled, ethically-sensitive, experimental studies" (p. 792).

Prince and Peterson (1908) provided fascinating and seminal findings whereby physiological evidence did not necessarily corroborate the patient's clinical reports of IIA. However, their research design did not require the active engagement of retrieval processes nor their assessment through controlled cognitive and behavioral means. A more robust and controlled cognitive literature on IIA began to emerge in the 1970s (see Allen & Iacono, 2001; Dorahy, 2001), and since the turn of the century more methodologically sophisticated and technically sound studies have added to the foundational work (e.g., Huntjens et al., 2002, 2006; Huntjens, Postma, Peters, Woertman, & Van der Hart, 2003; Huntjens, Verschuere, & McNally, 2012; Marsh et al., 2021; Marsh, Dorahy, Verschuere, Butler, & Huntjens, 2018). These investigations have begun to draw attention to whether objective deficits in retrieval processes are necessary for the experience of IIA. Instead, studies have suggested that the subjective experience of not being able to retrieve memory representations associated with another identity may occur in the absence of such representations actually being inaccessible.

Likewise, a body of work uses advanced neuroimaging methods to investigate IIA in DID, making exemplary contributions to the DID literature (e.g., Reinders et al., 2003, 2006, 2016; Reinders, Willemsen, Vos, den Boer, & Nijenhuis, 2012; Schlumpf et al., 2014; Vissia et al., 2022). Though this work does not fulfill the eligibility criteria of the present review (see Methods), given a lack of comparable behavioral data assessing the active retrieval of memory material, it is certainly important when assessing present theoretical models related to IIA in DID. For more comprehensive delineations of such work, see reviews by Modesti, Rapisarda, Capriotti, and Del Casale (2022); Bhanarjee, Ram, and Hassan (2023), and Blihar, Delgado, Buryak, Gonzalez, and Waechter (2020). A systematic review can be found in Reinders et al. (2022; Table 1), with the inclusion of neuroimaging work.

2. The present review

The present review sought to systematically collate the empirical research using controlled cognitive means to assess IIA in DID. A systematic literature search was conducted, with a subsequent systematic review of the findings, including quantitative assessment using meta-analytic methods with eligible studies. The question underpinning the review was: from the cognitive empirical literature, are DID patients' clinical reports of retrieval failure across identities substantiated by controlled measures of memory? Alternatively stated, when probed through experimental tasks for availability of memory representations across dissociative identities, does a pattern of memory transfer exist for DID patients reporting IIA? More broadly, the review aimed to investigate whether the cognitive empirical research on IIA in DID is robust and comprehensive enough to provide clarity on the nature of IIA. To that end, the investigation assessed where the field sits presently in terms of the stability and limitations of its empirical research, in order to reliably account for the phenomena of IIA in DID.

3. Methods

3.1. Protocol and eligibility criteria

The present study, including search protocol, was pre-registered on the Open Science Framework (*https://osf.io/g7b6n*) on March 24th, 2023; registration preceded data extraction, however followed completion of search procedures. A systematic search was conducted seeking literature that investigated IIA and memory transfer between identities in individuals with DID. While the meta-analytic portion of the present review was limited to primary empirical studies that included quantitative outcomes, a more comprehensive systematic search allowed the inclusion of case studies and qualitative assessments to inform the broader narrative review.

Inter-identity amnesia in the present review was defined as a reported inability in one identity to retrieve information experienced as accessible to another identity within the same individual. For inclusion, studies needed to (1) explore inter-identity memory *transfer* as the primary outcome measure, operationalised as the empirical accessibility, or lack thereof, of learned information across identities reporting amnesia, (2) report on any method of measuring inter-identity memory transfer, including cognitive, physiological, behavioural, and neurobiological means of examination, insofar as the design of the experiment required participants to actively engage retrieval processes which were subsequently or concurrently assessed, and (3) employ an identifiable sample of individuals with DID as the primary presenting diagnosis. The diagnosis was required to be based on the year-appropriate Diagnostic and Statistical Manual of Mental Disorders (DSM) or the International Classification of Diseases (ICD), which could include diagnosis via the Structured Clinical Interview for DSM-IV Dissociative Disorders (SCID-D; Steinberg, 1994) or the Dissociative Disorders Interview Schedule (DDIS; Ross et al., 1989), both of which are based on DSM criteria. Eligible studies also needed to include participants of at least 18 years of age, although no studies were identified with younger samples.

For the meta-analytic portion of the review, studies were examined for sufficient quantitative data. Empirical studies needed to include adequate information to calculate an effect size that could be used to compare retrieval ability or memory accessibility either across dissociative identities within a single individual (i.e., identity A versus identity B), or between a single amnesic identity in DID individuals and healthy control participants who were instructed to feign amnesia (i.e., simulator subjects). In the identified literature, memory transfer was primarily indexed through three separate methods. In one, individuals learn information in one identity (identity A) and are subsequently given tests of memory recall or recognition in a reported amnesic identity (identity B). In the second, retrieval ability is assessed by priming tasks whereby initial material is given to identity A with a subsequent task ascertaining implicit priming evident in identity B. Finally, an index of memory accessibility across reported amnesic identities draws on reaction time data, whereby depending on the task set-up, memory accessibility is indexed through either longer or shorter response times being indicative of information recognition/familiarity. The meta-analyses in the present review were coded such that these data are comparable across studies. Papers utilising all of the aforementioned methodologies were included in the meta-analysis.

3.2. Search strategy and study selection

In accordance with the Preferred Reporting Items for Systematic reviews and Meta-Analysis (PRISMA; Page et al., 2021), a comprehensive systematic literature search was conducted. All studies published prior to the search date (3rd April 2023) were eligible for inclusion.

Primary searches were conducted on the online databases PsycINFO, PubMed and Scopus, where related terms were combined using Boolean search logic (e.g., "AND", "OR", "NOT"). The search terms used were as follows: ("Dissociative identity disord*" OR "multiple personalit*") AND (amnesia OR "memory loss" OR forget*) AND (Memory OR recall OR recognition OR recollect OR semantic OR episodic OR autobiograph* OR self-referen* OR procedural OR implicit). Broad scope searches were also conducted on Google Scholar and the University of Canterbury Library electronic database using the aforementioned key terms in order to ensure inclusion of all potentially eligible studies. The search was not limited by language, though only studies in English were found. Inclusion in the present study was limited to primary empirical studies, as well as reanalyses of quantitative data associated with published empirical studies.

Titles and abstracts obtained from each database were stored and managed in EndNote Reference Manager. The first author (JCB)

independently screened the titles and abstracts of all articles manually to identify potentially eligible studies. All duplicates were excluded using the EndNote software, before independent examination of the full text articles. Additional articles were identified by manually searching bibliographies of the chosen articles and using reference lists from previous review-style papers on similar topics. Another member of the research team (JM) conducted an identical but completely independent search, using terms provided by the primary investigator to ensure replicability of the systematic search. Discrepancies regarding the inclusion of returned studies were resolved via discussion between the researchers to reach a consensus decision.

Follow-up searches were conducted in September 2023 and August 2024 to identify any additional studies published since the initial search, and any new articles were screened according to the inclusion/exclusion criteria below.

Data were extracted using a standardised data extraction form for both the meta-analysis and broader systematic review. Extracted data included, where available: authors; year and country of publication; number, age and gender of DID participants; number of control participants; measure of DID; study design (e.g., recall/recognition, reaction time, or priming tasks); type of memory measured (e.g., semantic, episodic, autobiographical); and, relevant outcome measures, including qualitative and quantitative results. Four studies did not have the necessary data to be adequately included in the analyses. The authors of these studies were contacted for further data, of which a reply was obtained from one (Huntjens et al., 2006). Data extraction was conducted by the first author and collated quantitative data were subsequently checked by the second (MJD) and fourth (JC) authors independently. Qualitative data were also extracted by a second independent researcher (JM) to ensure accuracy of the content. Any discrepancies for both quantitative and qualitative data were resolved via consensus.

3.3. Meta-analytic statistical analysis

For the meta-analytic portion of the review, two primary outcome measures were identified as comparable across studies: (1) retrieval ability of indexed information, measured as the proportion of correct answers in given memory and priming tasks, and (2) reaction time during such tasks. Data were extracted for DID participants in each tested identity, as well as for control participants instructed to feign amnesia (i.e., 'simulating controls'). The latter was included as it is often argued that the inclusion of simulator subjects allows for inferences regarding whether memory performance of DID participants can be reproduced by clinically healthy individuals (and therefore whether there is indication of feigning performance among those with DID; e.g., Boysen & VanBergen, 2013).

Effect sizes were meta-analytically combined using Comprehensive Meta-Analysis Software (CMA; Borenstein, 2022) for each of the following four effects: (a) the difference in the proportion of correct answers in memory and priming tasks *within* DID patients (i.e. across amnesic identities); (b) the difference in reaction times *within* DID patients (i.e. across amnesic identities); (c) the difference in the proportion of correct answers in memory tasks *between* DID patients in their amnesic identity versus simulator participants; (d) the difference in reaction times *between* DID patients in their amnesic identity versus simulator participants. While it was initially planned to conduct subgroup analyses, such as the difference in effects by memory type (e.g., semantic, procedural), there was insufficient eligible studies to reliably assess this or any sub-populations or moderator variables.

Where memory performance was given as raw scores (e.g., number of answers correct), the first author (JCB) manually converted these values into proportions. The raw quantitative data and relevant calculations were first coded and collated in a Microsoft Excel spreadsheet (https://osf.io/h8f39/).

A notable overlap of DID participants across studies characterized the IIA empirical literature base, whereby a number of independently published studies utilised the same samples, often assessed at the same time points. As such, a multi-level meta-analytic approach was necessary. Where multiple studies reported on the same outcome variable using overlapping samples, effect sizes were averaged using CMA software across these studies and tasks before being meta-analysed. This was employed to correct for the lack of statistical independence between effects measured within overlapping samples, which if not corrected, artificially reduces the standardised error calculated for the pooled effect size.

The difference between scores/reaction times for participants or identities was measured and meta-analysed using a standardised mean difference score (Cohen's *d*). This allows for the comparison of effects between independent groups while accounting for heterogeneity across studies (e.g., sample size, specific memory task used). Cohen's *d* values of 0.2–0.5 are considered small, values of 0.5–0.8 are considered medium, and values >0.8 are considered large (Cohen, 1988).

In the first analysis, which assessed the difference between memory performance across dissociative identities within DID individuals, a larger Cohen's *d* value indicated amnesia between identities. That is, where one identity is able to recall their own information but not that of another identity's, there was a larger difference in performance scores, and hence a larger effect size. Conversely, where individuals performed similarly across dissociative identities, a presentation whereby memory transfer can be inferred, effect size values were closer to zero.

On the other hand, across the remaining three analyses, a larger Cohen's *d* value indicated a difference score that could be interpreted as indicative of memory transfer, whilst values closer to zero indicated a pattern more similar to amnesia. That is, when comparing proportion scores from DID patients' amnesic identities to that of simulators (who are instructed to feign amnesia), a larger difference score suggests that DID individuals have at least some retrieval ability in their identity reporting amnesia. For the reaction time analysis, the literature identifies two differing interpretations to support inter-identity memory transfer: 1) DID patients should have slowed reaction times in their amnesic identities relative to non-amnesic identities or simulator subjects (e.g., Allen & Movius, 2000; Huntjens et al., 2012), due to an emotional or cognitive reaction to the stimuli that slows their decision making latency, or 2) DID patients should have faster on average reaction times for "amnesic" stimuli learned in another identity (e.g., Marsh et al., 2018), due to familiarity with the stimuli, or a priming effect. For sake of uniformity within the present analyses, the data were extracted from each article and coded such that a larger Cohen's *d* was always indicative of memory transfer, while an effect size closer to 0 may be interpreted as IIA.

Outputs from both fixed and random effects models are provided in tables in the Results section. Given that fixed effects modelling tends to be more robust where there are a small number of included studies (Borenstein, Hedges, Higgins, & Rothstein, 2021), fixed effects results are interpreted in text.

Publication bias was assessed using funnel plots and Egger's regression intercept (Egger, Smith, Schneider, & Minder, 1997). Publication bias is indicated by asymmetrical funnel plots and statistically significant Egger's test results. Here, regression outcomes are given in-text in the Results section, while the present funnel plots can be found at https://osf.io/h8f39/. Readers should note that due to a small number of studies (<20) in each of these analyses, these statistics may only be taken as an indication of potential bias (Moreno et al., 2009).

Finally, the heterogeneity of the results across studies was measured using the Q and I^2 statistics. A statistically significant Q outcome rejects the null hypothesis that all studies included in the analysis share a common effect size, and the I^2 statistic is an effect size measure that quantifies such heterogeneity. These statistics were also used to identify outliers; where removal of an individual study from the analysis resulted in a decrease of at least half in the Q statistic, such studies were deemed outliers.

3.4. Transparency and openness

Authors adhered to the PRISMA guidelines for systematic reviews (Page et al., 2021), and MARS guidelines for meta-analytic reporting (Appelbaum et al., 2018). All systematic and meta-analytic data and associated materials are available at https://osf.io/h8f39/.

4. Results

4.1. Systematic search results

The PRISMA flow diagram displayed in Fig. 1 details the selection strategy and resulting outcomes. The primary search yielded an initial 814 articles; this reduced to 546 following the removal of duplicates. Screening of titles and abstracts resulted in 67 empirical studies and 27 case studies warranting full-text examination, after which 17 and 2 studies remained, respectively.[1] A search of reference lists indicated an additional three eligible studies, of which two were case studies. A follow-up search conducted in September 2023 gave rise to no new eligible studies. However, an additional follow-up search in April 2024 identified a new study which was included in the analyses (Dimitrova et al., 2024).

Replication of the systematic search gave rise to generally strong agreement between the independent researcher (JM) and primary researcher (JCB). JM found one additional case study and one additional empirical study, which were both subsequently excluded due to their failure to empirically assess the research question. JCB identified two additional empirical studies, and two case studies. All articles found by JCB remained in the review through researcher consensus. Three of the four articles additionally found by JCB were identified via a search of reference lists and bibliographies, a process in which replicability is generally more tenuous. Replicability of the systematic search and their discrepancies can be found at https://osf.io/h8f39/. Overall, four case studies (Table 1) and 19 experimental papers (Table 2) were included in the present review.

From the 19 studies identified by the systematic search, 12 studies provided adequate quantitative information to be eligible for meta-analysis (see key in Table 2). Across these studies, 43 effect sizes were reported. However, after multi-level procedures of pooling and averaging dependent outcomes, 22 effect sizes across the four analyses remained.

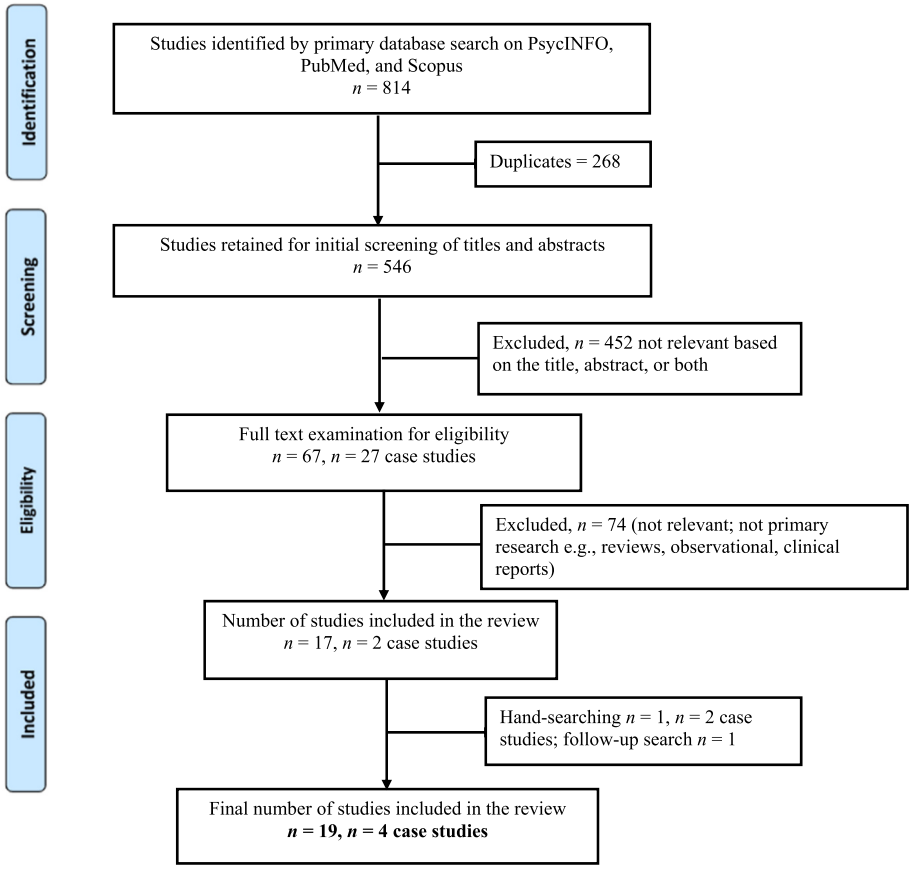

Fig. 1. Flowchart of the search process and study selection.

[1] Authors allowed full-text examination of a liberal number of studies so as to be thorough in their search, though few studies were found to assess the specific research question in a controlled manner.

Table 1
Table of case studies investigating memory transfer in dissociative identity disorder.

Author, Year, Country	Age[a], Sex[b], *N* identities[c]	Measure of DID[d]	Method of memory measure	Results
Ludwig, Brandsma, Wilbur, Bendfeldt, and Jameson (1972), USA	27, F, 4	Clinician's diagnosis	Paired associate memory and learning tasks; logical memory task; galvanic skin response	• In the paired-word task, transfer of information occurred from "host" personality to three alters, however, no transfer across the three alters; these results were corroborated by physiological (galvanic skin) responses. • Conversely, clear practice effects and generalisation of learning occurred on associate learning task and logical memory task across personalities, suggesting inter-identity memory transfer.
Dick-Barnes, Nelson, and Aine (1987), USA	28, F, 3	DSM[e]-III	Paired associate learning task	• When presented with cue words and asked to give the learned target word, the number of errors made by the participant did not differ depending on whether the target had been learned within tested identity versus when it had been learned in amnesic identity, suggesting inter-identity memory transfer.
Nissen, Ross, Willingham, Mackenzie, and Schacter (1988), USA	45, F, 22	DSM-III	Broad selection of implicit and explicit memory tests	• Found complete compartmentalisation (no transfer) in explicit tests of memory (i.e., cued recall and recognition). • Some implicit tests (e.g., repetition priming) showed access of memories across identities, while others (e.g., story recall) showed no evidence of such access. • Concluded that accessibility of knowledge across personalities depends on the nature of material and the extent to which their encoding and retrieval are susceptible to personality-specific factors.
Bryant (1995), Australia	31, F, 23	Clinician's diagnosis	Self-reports of early autobiographical experiences	• DID "host" personality reported no memories from childhood; however, when patient switched to a 9-year-old child personality, childhood memories were reported freely. • Also, the "host" personality retrieved primarily positive memories, whereas the child personality reported negative memories. • Findings suggest that DID is associated with alterations in autobiographical memory wherein memories may differ across personalities.

[a] Age in years of presenting patient.
[b] F = female.
[c] N = number of known identities.
[d] DID = dissociative identity disorder.
[e] DSM = Diagnostic and Statistical Manual of Mental Disorders.

Table 2
Table of primary experimental research on memory transfer in dissociative identity disorder.

Author, Year, Country	*N*[a], %F[b], Age[c], *N* controls	Measure of DID[d]	Method of memory measured	Results
Silberman, Putnam, Weingartner, Braun, and Post (1985), USA	9, 66.7%, 37.1, 10 controls	DSM-III[e]	Interference paradigm of words learned across identities	• DID subjects did not evidence a greater ability to discriminate stimuli learned in tested versus amnesic identity and versus control participants (i.e., inter-identity memory transfer). • However, evidence for qualitative differences between patients and controls which do not support purely subjective or confabulated experience of patients.
Eich, Macaulay, Loewenstein, and Dihle (1997a, 1997b), USA	9, 89%, 36.1, 9 controls	DSM-IV	Word-stem and picture-fragment completion tasks across identities	• No evidence of priming between identities in word-stem completion task (i.e., IIA). However, evidence of priming in picture-fragment completion was as robust between different identities as it was within the same identity (i.e., evidence for inter-identity memory transfer). • Simulators revealed within-identity, but not, between-identity priming, showing that inter-identity amnesia in DID may not be the result of deliberate response suppression.
Peters, Uyterlinde, Consemulder, and Van der Hart (1998), The Netherlands[j]	4, 100%, 41.25,18 controls	Recruited via Dutch DID Patients Association and clinicians[i]	Free recall and recognition tasks and word-stem completion	• Explicit memory tests supported inter-identity amnesia, including the support of clinically-observed asymmetry (one-way amnesia). • In implicit memory tasks, three of the four patients displayed inter-identity amnesia, while leakage across identities occurred in one patient.
Forrest (1999), USA	38, 94%, 48 controls, 34 simulators	DSM-III-R and DSM-IV	Paired-associate cued recall test, free recall paradigm, story recall	• Explicit tests of memory demonstrated one-way amnesia. However, the DID group displayed nonzero levels of information transferred ($N = 25$), suggesting some information transfer. • The simulator group did not reproduce this effect, displaying robust amnesia. • No significant difference found between neutral and emotional content of stimuli.

(*continued on next page*)

Table 2 (*continued*)

Author, Year, Country	N[a], %F[b], Age[c], N controls	Measure of DID[d]	Method of memory measured	Results
Allen and Movius (2000), USA[•]	4, 100%, 41.5, 60 simulators	DSM-IV criteria confirmed using SCID-D[f]	Event-related potentials (ERP) during recall and forced-recognition test	• Recall results indicated amnesia across identities; however, an increased propensity to make incorrect forced-choice. recognition responses and slowed reaction times showed that words learned in one identity influenced the behavior of another amnesic identity. • ERP[h] results showed larger amplitude (physiological response) to words learned by amnesic identities compared to unfamiliar control words. • Thus, evidence for inter-identity memory transfer.
Huntjens et al. (2002), The Netherlands[j]	31[Δ], 100%, 38.48, 25 controls, 25 simulators	DSM-IV criteria confirmed using SCID-D	Perceptual and conceptual priming, and word-stem completion tasks	• Across identities, DID patients showed evidence of priming in the perceptual ($N = 24$), conceptual ($N = 26$), and word-stem completion ($N = 22$) tasks, comparable to that of controls. • Thus, evidence of inter-identity memory transfer.
Elzinga, Phaf, Ardon, and Van Dyck (2003), The Netherlands[j]	12, 91.7%, 40.17, NA	Referring clinician's use of the SCID-D	Perceptual identification task and picture-fragment completion task; cued-recall task	• DID patients showed a strong reduction of memory performance between identities, though still preservation of explicit memory in cued-recall task in amnesic identity. • Implicit memory was also evidently preserved. Repetition priming was particularly evident in the perceptual identification task and, to a lesser extent, in the picture-fragment completion task. • Thus, evidence of inter-identity memory transfer.
Huntjens et al. (2003), The Netherlands[j]	31[Δ], 100%, 37.71, 25 controls, 25 simulators	DSM-IV criteria confirmed using SCID-D	Recall (interference paradigm), recognition, and list discrimination	• In the recall paradigm ($N = 20$), patients showed interference of another identity's words when tested in an amnesic identity. In the recognition task ($N = 20$), patients recognised a considerable number of words learned in another identity. Both results did not differ from those of normal controls. • Patients also displayed no superior list discrimination performance ($N = 20$). • Thus, evidence of inter-identity memory transfer.
Huntjens, Postma, Woertman, Van der Hart, and Peters (2005), The Netherlands[j]	31[Δ], 100%, 38.48, 25 simulators, 25 controls	DSM-IV criteria confirmed using SCID-D	Serial reaction time from procedural memory task	• Patients ($N = 27$) showed a decrease in response times after their switch to their amnesic identity, indicating a pattern of inter-identity amnesia. • However, this pattern was able to be mimicked by simulators, and thus cannot be unambiguously interpreted.
Huntjens et al. (2005), The Netherlands[j]	22°, 100%, 39.95, 25 simulators, 25 controls	DSM-IV criteria confirmed using SCID-D	Interference paradigm using emotionally valanced material	• DID patients ($N = 19$) showed evidence of transfer of declarative content, as evidenced by an identity priming effect, as well as of emotional connotation (both positive and negative), as indicated by an affective priming effect, of trauma-related words between identities. • Thus, evidence of inter-identity memory transfer.
Huntjens et al. (2006), The Netherlands	22°, 100%, 38.68, 25 controls, 25 simulator, 25 "guessing" controls	DSM-IV criteria confirmed using SCID-D	Multiple-choice recognition test	• On the recognition test, DID patients ($N = 19$) behaved like simulators, seeming to use their knowledge of the correct answer in order to determine their given incorrect answer, therefore indicating a metamemory process. • DID patients found not to be characterized, however, by a well-thought-out simulating behaviour style, as indicated by qualitative differences from simulators.
Huntjens, Peters, Woertman, Van der Hart, and Postma (2007), The Netherlands[j]	22°, 100%, 39.95, 25 controls, 25 simulators	DSM-IV criteria confirmed using SCID-D	Trauma-related memory by intrusion, recognition, and list assignment tasks	• The number of patients recalling negative word intrusions was equal to that of normal controls. Patients' ($N = 19$) average intrusions of words learned in another identity also differed significantly from zero (i.e., inter-identity memory transfer). • In the recognition test, patients ($N = 19$) also recognised a considerable amount of words learned by the other identity (i.e., inter-identity memory transfer). • In a list assignment task ($N = 19$), patients were better able to assign words learned in the same versus other identity (i.e., inter-identity amnesia).
Kong, Allen, and Glisky (2008), USA	7, 86%, 46.43 (36–54), 34 controls	Practitioner's DID diagnosis, confirmed by SCID-D	Cross-modal exclusion task of material in one identity, learned by another	• DID participants were able to exclude unfamiliar distractor words in list discrimination but not words learned in another identity, akin to simulators. • Despite self-reported inter-identity amnesia, memory for experimental stimuli transferred

(*continued on next page*)

Table 2 (*continued*)

Author, Year, Country	N[a], %F[b], Age[c], N controls	Measure of DID[d]	Method of memory measured	Results
				between identities. DID patients showed no superior ability to compartmentalize information. Thus, evidence of memory transfer.
Huntjens et al. (2012), The Netherlands[j]	11, 100%, 43.67, 27 controls, 24 simulators	DSM-IV criteria confirmed using SCID-D	Concealed information task; Recognition of autobiographical details	• DID patients ($N = 9$) took longer to classify other identity words than irrelevant words whereas their reaction times for other and same identity words were indistinguishable. • Thus, evidence of inter-identity memory transfer with semantic autobiographical information.
Lee, Lodewyckx, and Wagenmakers (2015), USA	22, 100%, 38.7, 25 controls, 25 simulator, 25 "guessors"	Referring clinician's diagnosis using SCID-D	Reanalysis of Huntjens et al.'s (2006) recognition task data	• Reanalysis of Huntjens et al.'s (2006) paper using Bayesian statistical methods showed that the data do not allow one to conclude whether DID patients behave in a way consistent with inter-identity amnesia, simulation, or different from both of these.
Morton (2017), UK[j]	3, 100%, 37.7, (28–45), 24 controls	DSM-V criteria	Forced recognition task of words learned in another identity (replication of Huntjens et al., 2003)	• Subject KS showed breakthrough of information between identities (i.e., inter-identity memory transfer). • Subject JO showed no interference in one identity from material presented in another in all four identities tested (i.e., inter-identity amnesia). • Subject DT had one pair of identities unaffected by information learned in disparate identities (i.e., inter-identity amnesia). However, another pair of identities showed asymmetry in their amnesia (both inter-identity amnesia and memory transfer).
Marsh et al. (2018), New Zealand/Australia[j]	19*, 100%, 39.17, 16 simulator, 21 partial information, 20 controls	Pre-existing DID diagnosis confirmed by DDIS[g]	Episodic self-referential memory tested via aIAT (using audio vignettes)	• Results of the DID participants ($N = 12$) indicated that the tested identity did not discriminate between the event experienced in the same versus another identity, so that both were considered to be true. These results were similar to controls and simulators. • Thus transfer of episodic self-referential memory.
Marsh et al. (2021), New Zealand/Australia[j]	19*, 100%, 39.17, 14 simulators, 21 partial information, 20 controls	Pre-existing DID diagnosis confirmed by DDIS	Neutral episodic self-referential and autobiographical memory tested via free recall and forced-choice recognition tasks	• On recognition tasks for both self-referential and self-experimental autobiographical memory, DID patients ($N = 12$) recognised significantly more of an event that occurred in another identity than did simulators and partial information comparisons, indicating that the reported amnesia in DID was not complete. • DID patients had lower recognition sensitivities and more conservative response biases for stimuli encoded in another versus same identity, and their performance was most similar to partial information controls (those exposed to only one set of stimuli). Therefore some memory transfer across identities.
Dimitrova et al. (2024), The Netherlands, UK[j]	14, 100%, NA, 16 simulators, 16 healthy controls	Pre-existing DID diagnosis confirmed by SCID-D	Reaction time and neural activation pattern related to non-self-relevant and self-relevant trauma-related words	• A trauma-avoidant identity state was tested on trauma-related words both self-relevant to that identity (St) and self-relevant to a trauma-related identity state (XSt), as well as non-self-relevant trauma-related words (NSt). • No difference in reaction times were found between XSt and St words (i.e., inter-identity memory transfer); faster reaction times were found for XSt relative to NSt (suggests recognition of the XSt stimuli). • Neural activation patterns of cognitive control were found in response to XSt compared to St words.

[Δ◇*]Studies with the same symbols have identical participant overlap.

[a] Number of DID participants included in demographics information (where discrepancies arise, the number of participants used in data analysis may be found in "*results*" column).

[b] F = % of females in DID sample.

[c] Age in years of DID sample.

[d] DID = Dissociative Identity Disorder.

[e] DSM = Diagnostic and Statistical Manual of Mental Disorders.

[f] SCID-D = Structured Clinical Interview for DSM-IV Dissociative Disorders.

[g] DDIS = Dissociative Disorders Interview Schedule.

[h] ERP = Event Related Potentials.

[i] no information on DID measure given.

[j] Study's data used in meta-analysis.

4.2. Study characteristics from the systematic search

The oldest empirical study that specifically investigated inter-identity memory transfer under the aforementioned criteria was published in 1972 (Ludwig et al., 1972), and the most recent in 2024 (Dimitrova et al., 2024). The average number of DID participants included in the empirical investigations was 14 ($SD = 11$). Samples had an average of 94.0% females ($SD = 8.7\%$) and an average age of 40.0 years ($SD = 3.1$).[2]Three case studies reported on a female participant, whilst one used a male participant. The average age of case study participants was 33.8 years ($SD = 5.2$), with one study not including age information.

Most (90.0%) empirical studies used control participants (i.e., clinically healthy individuals used to ascertain results in those without major psychopathology), and 70.0% used simulating controls (i.e., participants instructed to feign amnesia). Simulating controls included in the meta-analyses had an average age of 34.3 years ($SD = 3.8$), and 98.6% ($SD = 4.2$) were female. A total of 245 DID participants were reported as contributing to effect sizes across studies, however due to the large overlap of participants, the total unique number of DID participants tested across studies was 110.[3]

Eleven studies measured DID using the SCID-D as their validated measure, while two studies used the DDIS and one study did not clearly explicate their means of DID diagnosis. Four further studies measured DID using the year-relevant DSM diagnostic criteria, without explicating a specific measurement tool. Two case studies used the DSM-III criteria of DID (then MPD) while two stated "clinician's diagnosis" as their measure.

All of the experimental studies either explicitly stated that DID patients were actively involved in long-term psychotherapeutic treatment, or stated that patients had been referred by clinicians, by which active therapeutic procedures may be inferred. By the nature of engagement in experimentation, DID patients were also described to have the following abilities or characteristics: the capacity to self-select and engage two amnesic identities who report a lack of memory for events experienced by the other identity; the capacity to perform memory tasks without the interference from other identities; and the capacity to switch between the two chosen identities upon experimenters' request.

Studies were conducted in the USA, Australia, New Zealand, The Netherlands, and the United Kingdom.

4.3. Narrative findings from the systematic search

Four case studies (Table 1) and 19 primary experimental investigations (Table 2) were identified that directly assessed the accessibility of memories across dissociative identities reporting amnesia. Prince and Peterson (1908) first observed empirical evidence that could be interpreted from physiological measures as support for the preservation of memories experienced as not retrievable by the patient's amnesic identity. Yet it was not until Ludwig et al. (1972) that inter-identity memory transfer was investigated in a controlled manner via the simultaneous engagement and assessment of cognitive retrieval ability. Their results, as well as those of each case study to follow, largely corroborated the findings of Prince and Peterson (1908). That is, in case-reports of single DID patients experiencing IIA, respective authors each concluded that such amnesia between dissociative identities may not be wholly evident in controlled tests of memory accessibility (i.e., some inter-identity memory transfer occurred; see Table 1).

In 1988, Nissen et al. found that the experience of one identity either facilitated or interfered with the performance of another when the experimental material was more perceptual in nature and did not depend on "personality-specific interpretations" (e.g., single words, photographs of faces in isolation). Material that required processes of interpretation by the individual (e.g., semantically ambiguous sentences, stories or pictures), on the other hand, generally showed little evidence of transfer across identities reporting amnesia. Thus, the researchers hypothesised that the availability of amnesic memories may in part depend on the extent to which experimental material is interpreted in ways that are unique to the tested identity, as well as the extent of congruence of experience between identities at the times of retrieval and encoding. That is to say, "when material does not demand a level of embellishment at which personality-factors might operate, […] there is greater access across personalities" (Nissen et al., 1988, p. 130). From this view, it is not sufficient to say that IIA is or is not wholly evident, but rather that its presentation depends on factors both internally and externally present during experimentation. Thus, this was the first study to put forth the hypotheses of state-dependent learning and mood-congruity effects as constituent cognitive mechanisms underlying the experience of IIA. However, such processes were only directly investigated once more by Eich et al. (1997a, 1997b), and are yet to be addressed further, despite them being known mechanisms for memory retrieval difficulties in the cognitive literature (Forgas & Eich, 2012).

Larger, more methodologically-sound empirical investigations into IIA have increased in the previous decades (Table 2). The first of these studies was conducted by Silberman et al. in 1985, using nine DID patients. The researchers found that the patients were no better able to discriminate stimuli learned by two separate dissociative identities, relative to that of control participants, and thus concluded inter-identity memory transfer, despite reported amnesia. This result was found by the present review to be typical of the empirical investigations that followed. That is, across a wide range of tasks and a number of seemingly independent investigations, the authors of each included study were able to conclude a pattern of at least some accessibility of memory representations across dissociative identities, despite their patients' self-reports of retrieval inability (see Table 2).

The present review also highlights the prominent impact of Huntjens et al.'s seminal work in the field. In 2002, employing 31 DID patients, she and her colleagues found evidence for inter-identity memory transfer on perceptual, conceptual, and word-stem completion priming (i.e., implicit retrieval) tasks. Huntjens continues to significantly contribute, not only with empirical findings that largely support transfer of different types of memories across amnesic identities, but also by setting the standard for methodologically robust experimental work in the field.

4.4. Meta-analysis results

Table 3 displays the pooled effect sizes for both fixed and random effects for the four analyses conducted to ascertain potential memory transfer in individuals with DID.

4.4.1. Within-subject comparison of DID patients' proportion recalled

Comparison of proportion scores between amnesic identities within DID patients was reported in 15 effect sizes across nine studies. After accounting for overlapping samples, a total of eight effect sizes were included in the meta-analysis.

As shown in Table 3, a significant, positive pooled effect size was obtained. This indicated a medium effect size difference in the proportion of correct answers on memory tasks when comparing amnesic identities with identities who learned the material within DID individuals. This supports the presence of a pattern of amnesia between dissociative identities. It is notable that this significant effect was only observable through the collation of effects across studies; all but two of the effects included in the analysis were themselves statistically non-significant, likely due to small sample sizes.

[2] These demographics are calculated by the data provided in research papers, and do not include missing demographic data.

[3] This number may still include overlapping participants where these overlapping samples across studies were not mentioned in text, or not altogether realised by authors.

Table 3
Within- and between-subjects meta-analysis of DID[a] and simulator participants' retrieval ability.

Meta-Analysis	Random		Fixed		*Q*	I^2	*n*	*k*
	d	95% CI[b]	*d*	95% CI				
Within-Subjects Proportion	0.55***	0.23, 0.87	0.55***	0.23, 0.87	4.19	0.00	72	8
With outlier	0.65**	0.20, 1.11	0.60***	0.29, 0.92	12.64	44.64	76	9
Within-Subjects Reaction Time	0.19	−0.13, 0.51	0.19	−0.13, 0.51	0.65	0.00	73	5
Between-Subjects Proportion	0.63**	0.18, 1.08	0.59***	0.25, 0.93	5.03	40.36	63	4
Between-Subjects Reaction Time	0.83***	0.50, 1.16	0.83***	0.50, 1.16	2.19	0.00	69	4
With outlier	0.72***	0.38, 1.05	0.72***	0.42, 1.03	4.73	15.37	78	5

*** $p < .001$, ** $p < .01$, *$p < .05$. *d* = pooled Cohen's *d*; *n* = total number of participants contributing to pooled effect; *k* = total number of samples contributing to pooled effect.

[a] Dissociative Identity Disorder.

[b] Confidence Interval. A significant result in the 'Within-Subjects Proportion' analysis indicates IIA (i.e., larger Cohen's *d* indicates greater pattern of amnesia). For the remaining three analyses memory transfer is indicated with a significant result and larger Cohen's *d*.

Heterogeneity across the studies was shown to trend towards statistical significance with a low-to-moderate effect (see Table 3). Notably, Peters et al. (1998) was identified as an outlier, the removal of which led to a substantial decrease, and lack of statistical significance, in the heterogeneity across studies. The subsequent pooled effect size after removal of Peters et al. (1998) remained statistically significant in the direction supportive of IIA, though to a weaker degree. The forest plot for this within-subjects analysis (Fig. 2) visually displays the individual and pooled effect sizes. The Egger's regression intercept was non-significant ($p = .200$), indicating no evidence for publication bias in the present analysis.

4.4.2. *Within-subject comparison of DID patients' reaction times*

Comparison of DID patients' reaction times on memory tasks between dissociative identities comprised nine individual effects that reduced to five combined effect sizes following multi-level procedures to account for overlapping samples (see Fig. 3). As shown in Table 3, the pooled effect size across samples was non-significant. This indicates that the amnesic identities' reaction times did not statistically differ from the identities who learned the material, and so a lack of evidence for inter-identity memory transfer was found. No outliers were identified in this analysis.

As shown in Table 3, heterogeneity across the samples was found to be statistically non-significant with a low effect size. Egger's regression intercept also indicated statistical non-significance for publication bias ($p = .163$).

4.4.3. *DID versus simulator subjects' proportion recalled*

Ten effects from four studies comprised the between-subjects comparison of simulator versus DID participants in their memory performance, measured by proportion of information recalled. Averaging of effects across overlapping samples resulted in four effect sizes for the final analysis (see Fig. 4).

The pooled effect size (see Table 3) indicated a statistically significant difference in memory performance between DID participants in their amnesic identity and control participants instructed to feign amnesia, such that DID participants were indicating more retrieval ability than simulators (i.e., inter-identity memory transfer). This effect was medium in size. It is notable that the only effect size in this comparison which was individually found to be statistically significant was that of Marsh et al. (2018, 2021, $p = .001$).

As shown in Table 3, heterogeneity across the present studies was found to be statistically non-significant with a low-to-moderate effect. There were no outliers identified for this analysis. Egger's regression intercept also indicated statistical non-significance for publication bias ($p = .214$).

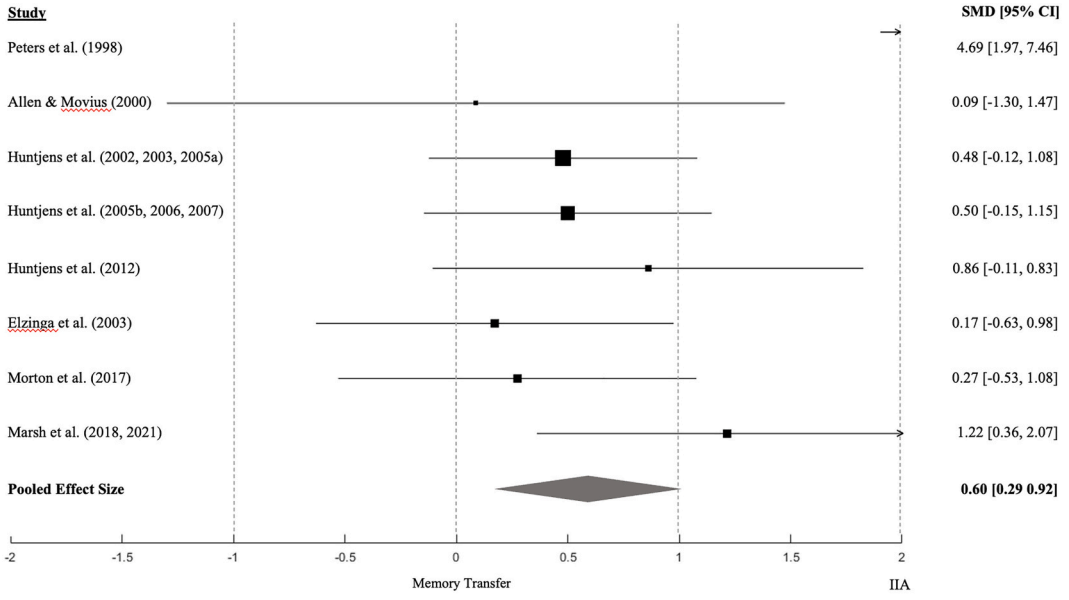

Fig. 2. Forest plot of within-subject comparison of DID patients' proportion recalled.
Note. [a]Inter-Identity Amnesia [b]Standardised Mean Difference.

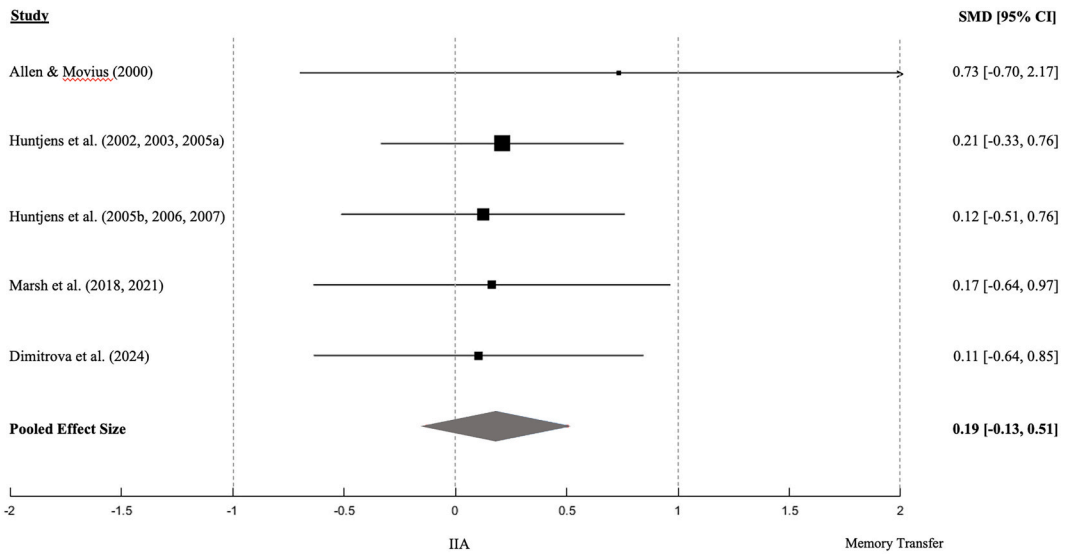

Fig. 3. Forest plot of within-subject comparison of DID patients' reaction times.
Note. [a]Inter-Identity Amnesia [b]Standardised Mean Difference.

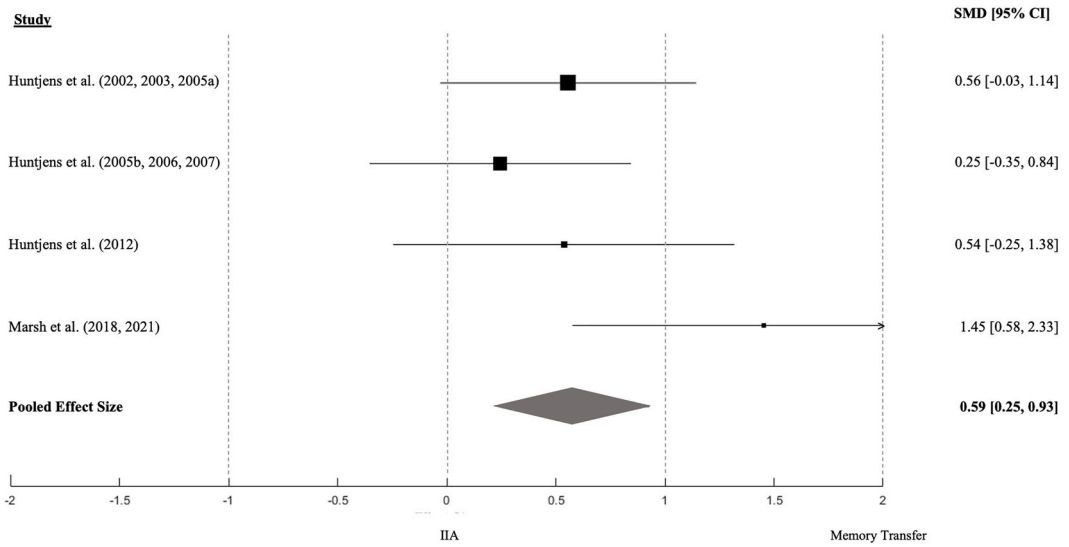

Fig. 4. Forest Plot of DID versus simulator subjects' proportion recalled.
Note. [a]Inter-Identity Amnesia [b]Standardised Mean Difference.

4.4.4. DID versus simulator subjects' reaction times

The final meta-analysed effect compared the reaction times of simulating controls to that of DID patients tested in their amnesic identity. This analysis drew from nine individual reported effects, however averaging of scores across overlapping participants left five combined effect sizes to pool in the final analysis.

The initial pooled effect size for this analysis indicated a statistically significant difference between DID patients amnesic identities' and simulator participants' reaction times, such that DID patients took significantly longer to respond relative to simulators (i.e., evidence of inter-identity memory transfer); this result was medium in effect (see Fig. 5; Table 3).

However, as shown in Table 3, the heterogeneity statistic decreased by over half following the removal of Huntjens et al. (2012). As such, this study was identified as an outlier in the present analysis. Its removal increased the estimated pooled effect, which remained significant and was now large in size.

Similar to the previous analyses, the Egger's regression intercept of the present analysis was found to be statistically non-significant, indicating no evidence of publication bias ($p = .410$).

5. Discussion

The present review aimed to systematically examine the body of literature that has cognitively assessed inter-identity amnesia in individuals with DID. A systematic literature review with meta-analyses examined whether existing empirical research has validated clinical reports of retrieval failure across dissociative identities. More broadly, the present review aimed to provide a comprehensive overview of the state of the literature in this area, to assess whether research to date provides clarity into the nature of IIA in DID.

Addressing the research questions using evidence from the systematic literature search, it appears that complete retrieval failure across identities in those with DID is not substantiated by controlled measures of memory accessibility. From pioneering case work using psychophysiological measures (Prince & Peterson, 1908), through the first investigations to simultaneously engage and assess retrieval processes (e.g., Ludwig et al., 1972), to the twenty-first century's body of empirical

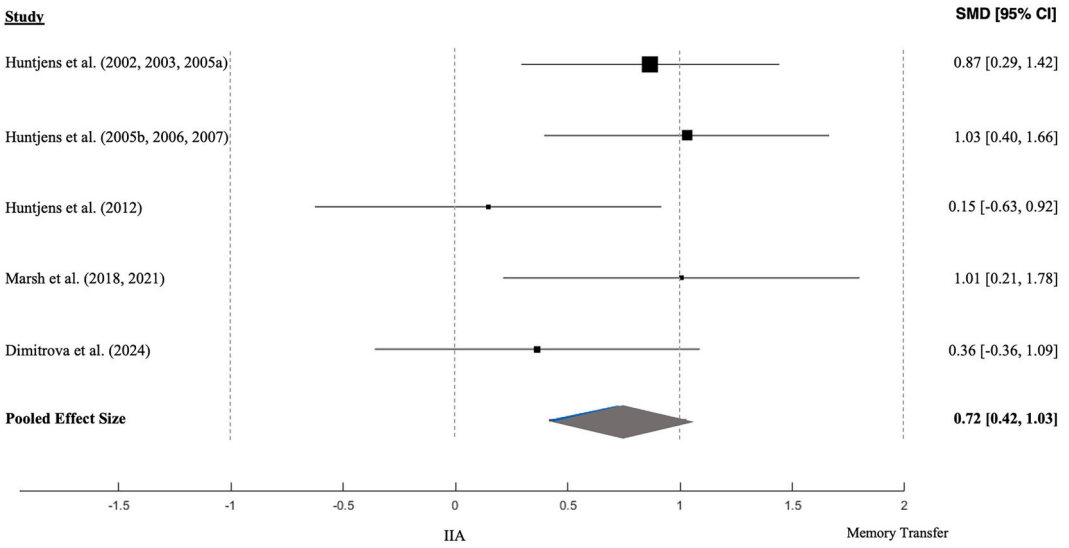

Fig. 5. Forest plot of DID versus simulator subjects' reaction times.
Note. [a]Inter-Identity Amnesia [b]Standardised Mean Difference.

investigations using more sophisticated methodological designs, authors have reported that there was at least a degree of transfer of information across dissociative identities reporting amnesia. However, the quantitative analyses from this study show disparate and heterogeneous findings, providing a more critical and nuanced lens in assessing the field's empirical outcomes.

5.1. Quantitative findings from the meta-analyses

Twelve of the empirical studies contributed quantitative data to the meta-analyses of the present review. Data were compared 1) between identities that reported amnesia for each other and identities that learned the material within individual DID patients and, 2) between patients in their amnesic identity and healthy controls who were instructed to feign amnesia (i.e., simulator participants). Comparable data included the participants' proportion of correct results in tasks of memory accessibility using recall, recognition, and cognitive priming tasks, as well as the reaction time data from such tasks. Thus, four separate analyses were conducted.

Here, two of the four analyses, comparing both the performance and reaction times of DID participants' amnesic identities to that of simulators instructed to feign amnesia (i.e., between-subjects design), provided statistical support for the accessibility of at least some memory representations across dissociative identities, despite self-reports of amnesia. Thus, a pattern of at least some memory transfer across identities does appear to exist. The other two analyses however, which compared memory performance and reaction times within DID individuals across dissociative identities (i.e., within-subjects design), failed to provide support for such a notion. That is, within-subject analyses failed to find support for inter-identity memory transfer, instead supporting an interpretation of amnesia across identity states, akin to that reported clinically by the patients (i.e., IIA). Thus, support for opposing findings is evident.

It is worth noting here that the comparisons of memory performance,

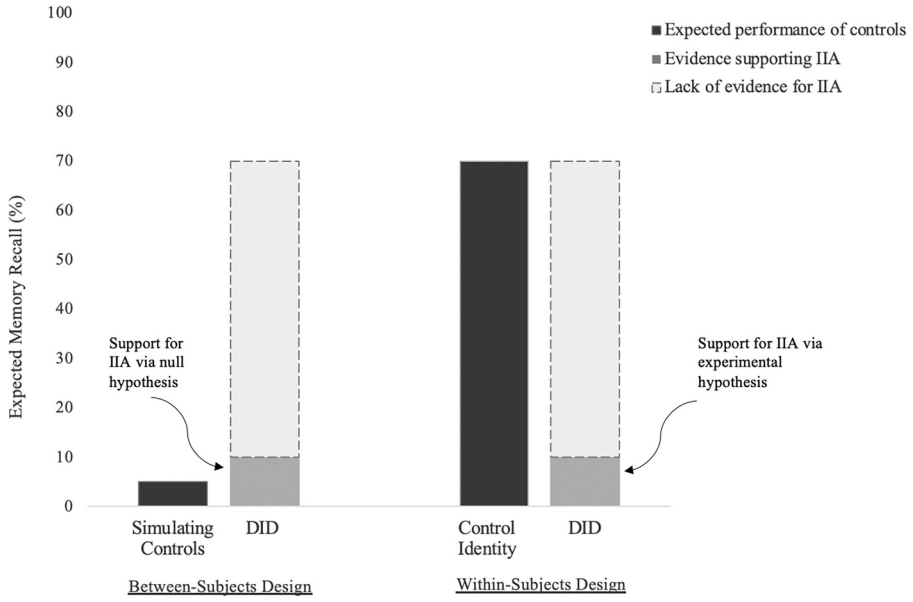

Fig. 6. Expected performance of DID participants and different control and their statistical implications.

as indexed through proportion scores using 1) simulator or 2) different dissociative identities, take on differing anchors in their control groups. That is, in a *between-subjects* design in which DID patients' scores are compared to that of simulators, the control condition (simulators) is marked by little to no retrieval ability (see Fig. 1). To indicate amnesia in these designs, DID patients are expected to show similar (very poor) levels of retrieval (i.e., a null hypothesis). On the other hand, in a *within-subjects* design, comparing identities within DID patients, the amnesic identity's performance is relative to the identity in which information is known, and therefore recalled to a greater degree. Here, to indicate IIA, the amnesic identity should be unable to mimic the typically good retrieval capacity of the identity for whom the information is known or experienced (they retrieve little information relative to the 'control' identity; i.e., the experimental hypothesis; see Fig. 6). In sum, IIA is evident if amnesic identities of DID participants retrieve little information versus a control that also retrieves little (for simulators), or retrieves little versus another dissociative identity that retrieves a lot.

Interestingly, the results of the current meta-analyses for both designs provided support for the experimental, as opposed to the null, hypotheses. For example, in the within-subject analysis of participants' proportion scores, results supported the interpretation that the amnesic identity retrieved significantly less stimuli learned and retrieved by the 'control' identity (supporting IIA). Comparatively, in the between-subjects analysis, the amnesic DID identities retrieved significantly more stimuli than the simulators (supporting memory transfer). This is notable because of the difference between the null and experimental hypotheses in within- and between-subjects designs, where the null hypothesis for a between-subjects design (i.e., using simulators) infers amnesia, while the null hypothesis of a within-subjects design (i.e., comparing identities) infers inter-identity memory transfer. With the commonly small samples used in this area of research, statistical power is often relatedly low. This means that non-significant findings that fail to show support for the experimental hypotheses would be expected at a greater rate than may be reflective of the actual phenomena (i.e., there is an increased chance of Type II error). However, in this case, statistically significant support was nonetheless found for both, seemingly contradictory, experimental hypotheses, despite the increased Type II error rate. This is likely due to the increased statistical power afforded by meta-analytic approaches, which increases our confidence in the reliability of the findings, which show mixed results. It is still unclear, however, whether the discrepancy found in the present results arises from methodological design differences, or whether it is actually indicative of differing underlying mechanisms between the IIA experienced by those with DID (e.g., possible cognitive and/or metacognitive deficits) and the amnesia manufactured by simulating control subjects (i.e., intentional feigning). Future work may benefit from addressing if one type of control condition produces more reliable results in determining the true underlying mechanism(s) of IIA.

These disparate findings may suggest that the search for an underlying mechanism of the experience of IIA in DID needs to be more nuanced than is presently accounted for in the literature. This point is only strengthened by what is perhaps the most striking finding of the present quantitative analyses: the vast variability and heterogeneity within the data. This is evident not only in the effects compared between studies, but also in effects reported within the individual studies themselves, as indicated by large quantitative ranges and wide confidence intervals. This point is described in depth below (see 'Quantitative Variability'). The wide confidence intervals here draw attention to the small sample sizes from which conclusions are drawn, as well as the fact that, even where an effect size was conclusive of IIA (as in within-subjects analyses), there was still a portion of participants who were experiencing some transfer of information across identities. Conversely, when there was statistical support for inter-identity memory transfer, still there was evidence of IIA in some participants. Thus, a degree of caution is needed in adopting a single universal explanation for findings at this stage and a more nuanced interpretation is highlighted in order to fully account for the results of the present review.

5.2. A critical examination of the knowledge base

The findings of the quantitative analyses draw attention to the broader aim of the present review. Here, we ask: is the body of literature investigating IIA in DID robust enough that we may sensibly begin to draw conclusions from their findings? It may be sufficient to say that a conservative, non-overzealous approach is best adopted, with the field still in its infancy, and current conclusions being drawn as tentative, at best. Along with the disparate meta-analytic findings, this conclusion is supported by the following considerations and concerns.

5.2.1. Sample size and characteristics

The cumulative number of DID participants that comprise the whole international body of literature on IIA still remains just above 100 participants ($N = 110$). This is captured visually by the meta-analyses' wide confidence intervals. While epidemiological studies of DID are somewhat lacking in strong methodological rigor, the disorder is thought to be present in approximately 1% of the population (e.g., Johnson, Cohen, Kasen, & Brook, 2006; Şar, 2011). Thus, it is difficult to draw conclusions about the entire DID population from approximately 110 people.

This point becomes particularly pertinent when considering the marked homogeneity of the samples of DID participants in the present review. For example, due to the nature of the methodology, DID individuals are recruited into these studies only if they possess: (1) the capacity to actively engage in cognitively-demanding memory tasks, (2) the awareness of their amnesic identities, such that they have the cognitive ability to self-select and engage them, as well as to switch between them upon an experimenter's request, and (3) the ability to complete experimentation without the spontaneous interference of other identities. Likewise, all participants used in the included experiments were stated to be in some way engaged in active psychotherapy; given the awareness and control over their identities that was required for participation, it is also likely DID participants were at least some way along in their therapeutic journeys.

These inclusion criteria are critical when considering implications and conclusions across the field. Individuals who were eligible to partake in the included studies, and therefore those that make up the sample from the database, may be clinically quite different from those with DID who are newly diagnosed and/or untreated, and thus may perform rather differently in cognitive experimental tasks. It has been shown empirically that with increased time in treatment, individuals show a greater awareness of their identities and a steady decrease in their symptoms of dissociative amnesia (Brand & Loewenstein, 2014). This increased level of co-consciousness, and decreased levels of amnesia, is likely to influence task performance such that a higher degree of information transfer across identities may be evident. Thus, it should be emphasised that drawing conclusions on individuals with DID as an entire population is problematic from the present data, given that broader, or altogether different, inclusion criteria, may lead to substantially different results, from which potentially opposing conclusions could be drawn.

This narrow representation of individuals with DID is significant given the markedly heterogeneous nature of the disorder. As stated previously, not only have DID cases been noted to differ strikingly between patients, but also, across separate identities within each single individual. It is noted that different degrees of amnesia within a single patient may exist, "ranging from complete awareness of all experiences of another identity, through some awareness of the existence of other identities, and finally, to complete unawareness of other identities" (Peters et al., 1998, p. 28). DID patients with complete unawareness might fall on a spectrum ranging from those who report IIA and demonstrate this on empirical tests, to those who report IIA but show a

little through to a large amount of inter-identity memory transfer via empirical means.

5.2.2. Quantitative variability

While samples in this area of investigation are small and characteristically homogenous, it is important to note that there still exists a great deal of heterogeneity in the overall findings. Two of the four pooled effect sizes in the present meta-analyses supported the interpretation of memory transfer between identities, while the remaining two instead supported findings indicative of IIA.

Likewise, when the individual studies are examined, there are substantial differences between the performances of their individual participants. Here, we give an account of a few studies that displayed sufficient individual data for this point to be evident. In Allen and Movius' (2000) investigation, the authors concluded that "virtually every measure provided evidence consistent with the hypothesis that DID participants did not have amnesia between tested identities" (Allen & Movius, 2000, p. 34). However, participants in their study demonstrated proportion scores as low as 0.03 (i.e., 1 piece of information correctly recognised out of a total of 30). Thus, by drawing a blanket conclusion regarding the nature of amnesia in their investigation, they mask a depth of information which holds equal importance for the clinical significance of the paper. Extrapolating from the author's conclusions to form further generalisations and interpretations about the nature of IIA may lead to theoretical conclusions that omit the nuance which is needed to capture the true psychological foundations that account for the experience of IIA in DID.

Morton (2017) employed a case-series approach, whereby the results of each of the three participants who reported IIA were analysed and discussed independently. Here, one of the cases (KS) showed retrieval of information between identities, supporting the interpretation of inter-identity memory transfer. However, one other case (JO) displayed complete inter-identity amnesia in two pairs of identities, in that they evidenced no interference of material between identities. Finally, the third case (DT) displayed complete IIA in two pairs of identities, with the one exception being the identity, Lorna, who displayed some retrieval of information. Thus, there was a pattern more akin to one-way amnesia across two identities. In short, in just three individuals, marked variability was shown, not only between the participants, but also across different identities within them. This variability, as well as the nuance of an amnesic presentation, may have been lost had an overall effect size (i.e., group statistics) been instead employed. Clinically, the individual is paramount, because a specific person coming to therapy is not a prototype entity based on a group average.

Such variability is evident in a number of studies included in the present review, despite somewhat sweeping conclusions based on overall effect sizes. For example, Peters et al. (1998) specifically looked at asymmetrical amnesia (i.e., identity A reports access to identity B's memories, but identity B does not report the same ability for identity A's memories). Though the authors state that "at least some leakage was present between the apparently amnestic identities" (Peters et al., 1998, p. 27), they also articulate that "individual performance scores are given, as averaging of results would mask the potentially interesting differences between subjects" (Peters et al., 1998, p. 33). It is evident when examining such individual scores that only one of the four participants showed such leakage of information across dissociative identities. The other three participants showed patterns more akin to IIA. Likewise, in the figures provided by Huntjens et al. (2012), whereby individual scores are perceptible, it appears that at least three participants were providing results whereby an interpretation of IIA is most viable. More so, the variability within the figures presenting individual scores show some participants with a considerable amount of memory transfer, and others with little to no such transfer. These findings, which would provide a depth of clinical insight, are concealed by the group data which lead to the conclusion that "the results indicated transfer of information between identities" (Huntjens et al., 2012, p. 1).

In a reanalysis of Huntjens et al.'s (2006) data, Lee et al. (2015) identified that the original conclusions stating that "DID patients were found not to be characterized by an actual memory retrieval inability" (Huntjens et al., 2006, p. 857) cannot be drawn confidently and unequivocally. In fact, using three separate Bayesian analyses, Lee et al. (2015) concluded that "we cannot be confident about whether DID patients are more similar to malingerers or amnesiacs" (Lee et al., 2015, p. 14). That is, from the data available, one cannot be confident in concluding that DID participants' performances on memory tasks more closely mimic that of amnesic control participants (i.e., amnesia borne out of retrieval failure), or simulator participants (i.e., amnesia as a product of malingering/feigning). Thus, the current state of experimental memory results in DID may preclude the adoption of a single mechanism account which forecloses on the nuances and complexity of research findings.

Marsh et al. conducted three studies using an overlap of participants. One study (2021) assessed recall and recognition in a self-referential episodic memory task (Study 1) and an autobiographical episodic memory task (Study 2). In the other study, the Autobiographical Implicit Association Task was administered, which relies on reaction times and is more difficult to simulate compared to recall and recognition tasks. Eight DID participants completed all three tasks, while another nine completed one or two. Of the eight engaged in all tasks, three showed a pattern of complete amnesia (38%), where no stimuli encoded by one identity was retrieved by the amnesic identity (https://osf.io/h8f39/). The remaining 5 participants, who all reported IIA, showed a little through to a lot of retrieval for the encoded information. Of the 14 DID simulator participants who completed the three studies, 5 showed complete amnesia for all encoded experiences (36%), while nine showed some degree of retrieval, despite conscious and practiced efforts to avoid doing so (https://osf.io/h8f39/).

The presentation of these data draws attention to the fact that a small group of DID participants showed complete amnesia for information across three studies, something that was not possible in the majority of simulator participants, despite their best efforts to avoid any memory retrieval. That a similar percentage of simulator to DID participants showed complete amnesia may lead one to conclude that the DID participants were simulating their results, as the simulators showed this was possible, and that the DID results did not reflect genuine problems in the cognitive apparatus of retrieval. However, studies of IIA have found no evidence that the pattern of results in DID participants is best explained by simulation (e.g., Eich et al., 1997a, 1997b; Kong et al., 2008; Lee et al., 2015).

Another possibility worth empirical investigation, therefore, is that some DID individuals in the studies conducted to date, may have genuine retrieval deficits and others may report retrieval deficits based on metamemory appraisals of memory inaccessiblility. These two mechanisms may also be operative in the same individual at different time points. For example, when treatment begins to remedy (any genuine) retrieval problems (i.e., IIA) to the point where memory representations in other identities are available, the patient comes to believe they are still not available for retrieval in order to maintain coherence of their sense of self (e.g., Chefetz, 2015; Dorahy, 2023). At that point a memory retrieval deficit becomes a metamemory belief that functions to hold in place the idea that the experiences of other identities remain inaccessible. In short, many participants in current DID studies may be in a place where because the methodology requires they know, can control, and can at will switch between dissociative identities, retrieval deficits have given way to metamemory beliefs that previously inaccessible memories are still inaccessible. In this case, IIA persists but is underpinned by a different mechanism (i.e., metamemory beliefs rather than deficits in retrieval apparatus). A closer look at the current

empirical data suggests this possibility needs to be explored further.

Overall, it is argued here that quantitative findings of heterogeneity currently evident in the literature must hold equal importance to single generalized conclusions in discussing the nature of IIA in DID. Statistically significant findings are important for making robust generalisations about the wider population. However, when they are themselves embedded in large variation between participants, caution is needed in using them to draw definitive conclusions, particularly given the small and homogenous samples used thus far in inter-identity memory studies in DID. The variation among individuals in IIA studies is an important consideration in the advancement of the field, as it speaks to the broader clinical significance of the empirical findings.

5.2.3. Research teams

A third consideration associated with the infancy of the field is that the empirical studies included in the present review have been conducted by a limited number of research teams. Most prominent is the exemplary work of Huntjens and colleagues. Huntjens and teams' publications have contributed significantly to the growing understanding of DID patients who experience amnesia. Of the 12 studies included in the meta-analytic portion of the review, Huntjens is primary or co-author in all but five, one of which she is mentioned in the acknowledgments. In any scientific field, this diminishes the overall generalisability of the body of findings, and highlights the need for independent replication. This is particularly important given that the variability in data available across studies can support multiple competing conclusions, highlighting the importance of diverse viewpoints in parsing the significance of findings. The field could benefit from large international collaborations, researchers with opposing perspectives working to gain clarity, or pooling a larger number of participants. However, "research output and funding for DID are vastly lagging behind" (Reinders, Young, & Veltman, 2023, p. 1) other disorders, which accounts for the limited number of teams who are feasibly able to carry out such research.

5.2.4. Types of memory measured

Finally, the present review highlights that the scope of memory domains measuring memory deficits in DID are few, limiting possible clinical implications. Largely due to the sensitive and complex nature of experimentally investigating IIA, the overwhelming majority of studies in the present review probed semantic memory, whereby information is both learned and tested within the experimental sessions. Investigators have used materials that differ in their characteristics (e.g., neutral versus positive/negative emotional, words versus pictures etc.). However, due to the nature of their methodological procedures, these investigations largely fall under the employment of a narrow set of memory systems.

IIA has been examined in other memory systems, though clear results have not always been possible. For example, Huntjens, Postma, et al. (2005) probed procedural memory, using the Serial Reaction Time Task, but concluded their results were "impossible to interpret" (p. 377), due to the simulators mimicking of the patients' performance (i.e., a null result). Furthermore, two investigations (Huntjens et al., 2012; Marsh et al., 2021) examined autobiographical memory, with the former focused more on semantic and the latter on episodic memory. Two additional studies by Huntjens, Wessel, Hermans, and Van Minnen (2014) ; Huntjens et al. (2016) did use episodic trauma-related stimulus material, investigating autobiographical memory specificity, and self-defining memories and future goals, respectively, in those with DID. Although neither of the latter studies assessed IIA and therefore did not met eligibility for inclusion in the present analyses, it is urged that such stimulus types are further investigated in the present area.

Thus, despite its centrality for the 'amnesia' criteria in the diagnosis of DID (i.e., "Recurrent gaps in the recall of everyday events, important personal information, and/or traumatic events that are inconsistent with ordinary forgetting"; APA-5-TR, p. 331), work in the critical area of episodic autobiographical memory for historical personal experiences has been lean. The majority of IIA studies instead include experimentally learned/induced material. This compromises the stability and scope of conclusions drawn. It may also critically limit the clinical implications that can be drawn from the field's data when issues of ecological validity are raised, such that learning and retrieving material in the laboratory may not mimic retrieving historical autobiographical material from the past, that has been at the behest of psychological and dynamic processes for years. Neuroimaging studies have used self-relevant symptom provocation methods, finding psychobiological differences in distinct dissociative identity states (Reinders et al., 2006). Studies investigating memory transfer across self-reported amnesic identities may utilise such techniques more broadly, to increase external validity of research findings, as some studies are beginning to do (e.g., Dimitrova et al., 2024).

6. General discussion

It is evident from the present review that, particularly since the turn of this century, an influx of empirical investigation into IIA in DID has arisen. The systematic review evidenced a large majority of studies challenging the proposition that DID patients' clinical reports of amnesia are wholly replicable in empirical settings using validated memory tasks. Instead, there seems to be a pattern of at least some memory transfer across dissociative identities. Quantitatively, however, the meta-analyses provided disparate findings, whereby two pooled effect sizes statistically supported the notion of inter-identity memory transfer, while the remaining two showed patterns more similar to IIA. While a small number of studies, and indeed participants, contribute to the included meta-analyses, the quantitative procedures more clearly highlight statistical patterns that are somewhat masked in the narrative conclusions.

Studies in the previous two decades have begun to advance the understanding of IIA in many ways. Research shows that patients' experiences of IIA are much more complex than objective and pure retrieval failure. That said, it is important that the findings from these studies are not oversimplified as evidence to challenge the validity of DID and its amnesic symptomology, as has been previously suggested (e.g., Allen & Movius, 2000). While evidence of memory transfer in these cognitive tasks does indicate a degree of disjunction between actual and perceived retrieval failure, this is quite similar to what is characteristic of many psychiatric disorders. Similar disconnection can be found in weight perception in anorexia nervosa, whereby an individual may perceive their emaciated body as overweight, or the perception of voice hearing in an individual with schizophrenia, where internal anomalous experience is interpreted as an ego-dystonic 'voice' (Dorahy, 2023).

Indeed, Huntjens et al. (2002) first theorised that patients' genuine reports of amnesia may be more adequately accounted for by "disturbance[s] in meta-memory functioning, with meta-memory referring to knowledge, beliefs, and feelings about memories" (Huntjens et al., 2002, *p*. 787). This suggestion continues to permeate the field, and has lead to the development of an explanatory model drawing on theoretically-validated cognitive and metacognitive mechanisms (Dorahy, 2023). Still, this conclusion may not alone account for all experiences of IIA in DID.

Most strikingly, the present review draws attention to the caution needed in firmly holding a theoretical position regarding the nature of IIA, in light of limited research and methodological limitations. Not only does the work draw on a very small and characteristically narrow sample of individuals, but also, the quantitative findings from the review, as seen in the meta-analytic portion, are variable, a finding that is not always accounted for in overall conclusions made in the studies. Furthermore, stable and robust investigation has not yet accounted for all domains of memory that may be evident in the manifestations of memory dysfunctions in DID. In Haig's (2014) Abductive Theory of Method (ATOM) for psychological research, phenomena should be detected and robustly established, before they can be explained through abductive theory construction. Phenomenon-detecting strategies

include empirical procedures such as controlling for confounds, replicating findings, and meta-analyses (Haig, 2014). Whilst the present review aimed to explore possible candidate mechanisms underlying IIA in DID, it instead clarified that the current data may still be in the 'detecting phenomena' stage of scientific inquiry. That is, a more cohesive and concrete base is required before theoretical abductive reasoning can begin to explain the phenomena.

As with any psychological phenomenon, the true answer is much more intricate than typically accounted for by a singular theory, a point particularly true for the pathology of DID which is cited to be "among the most challenging of mental disorders" (Kluft, 1999, p. 3). It is important that IIA findings are collated and their quality assessed with a critical lens that aims to find nuanced accounts of the data, rather than focusing on only some aspects of it or going beyond it. This is particularly important given the field is young, and investigates a psychopathology that has, in its short modern history, faced a great deal of scientific scrutiny.

6.1. Broader implications

The findings of the present review have major implications for the understanding of IIA in DID, and highlight the importance of a nuanced approach to conceptualising and treating this rather perplexing phenomenon. Equally, implications arise that transcend the scope of the present review.

First, quite strikingly, it is evident that research into DID remains a nascent field of literature. Although case reports, descriptive accounts, and papers of a theoretical nature are rather prolific historically, a dearth of robust empirical investigation uses controlled experimental measures to examine many domains of the disorder. Indeed, though not specific to DID as a psychopathology, there is still no clear consensus regarding DID's etiological factors. That is, why do some individuals who experience the chronic and severe developmental trauma that generally precedes DID go on to develop the disorder while others develop other psychopathology, such as complex PTSD. Individual differences, such as hypnotisability (Dell, 2019, 2023) or absorption (Dalenberg, Katz, Thompson, & Paulson, 2023), have been proposed to play a role, though empirical assessment is limited. Well-controlled research is conceptually important as the amnesic phenomenon probed in the present review may reflect the potential product of a dissociative process involving failed integration at the level of personality structure or meta-representations of self that capture a belief in this lack of integration. Evidently, DID research in all domains of its presentation merits increased investigation, and robust experimentation into its origin may provide fruitful evidence for the maintenance of amnesia experienced between identities.

Second, the robust empirical examination of DID may yield interesting results about cognitive and metacognitive processes associated with experienced retrieval failure that could inform the understanding of memory anomalies present within clinical phenomena more broadly. An impaired ability to retrieve significant memories arises in a number of clinical presentations, including cases of PTSD, borderline personality disorder, depression, schizophrenia, and other dissociative disorders. Indeed, the mechanisms may be dependent upon different contexts, as well as differ between disorders. For example, encoding problems associated with attentional difficulties or absorption in other activities may contribute to memory deficits in numerous disorders, along with cognitive and metacognitive processes associated with perceived or actual retrieval failures. Yet, the degree to which the mechanism/s accounting for IIA in DID might assist in the understanding of memory deficits in other disorders remains to be explored. In addition, a fervent debate still follows the nature of autobiographical memory following trauma, including the degree to which memories are able to be 'recovered' after a period of non-retrieval (e.g., Brewin & Andrews, 2017; Goodman, Gonzalves, & Wolpe, 2019). In fact, as seen in parallel lines of literature (e.g., dissociative amnesia; see McNally, 2007), extreme forms of forgetting and the clinical manifestation of amnesia are themselves fraught with difficulties and challenges, both in the interpretation of findings and in the subsequent theoretical accounts. Experimentation into the degree to which retrieval apparatus are engaged relative to top-down meta-memory and self-control processes in reported IIA in DID would have wide-ranging implications from which a number of other psychiatric conditions could benefit.

Finally, the present review highlights the nature of statistical methods used in psychological research more generally. In this paper, careful examination of the included studies showed striking variability in IIA results. Individual cases spanned clinical presentations on two opposing ends of a continuum (complete amnesia to considerable memory transfer), though this variability was often masked by group means and effect sizes. Indeed, this point is prominent in all fields of research, though its consequences hold great weight in psychopathology, where phenomena are wholly complex and variable. It demands one to consider the implications of using group statistics to make generalisations about such nuanced presentations that not only vary across individuals but vary over time within an individual, impacted by factors such as treatment and natural developmental processes.

6.2. Future directions

The limitations outlined in the present review apprise clear research directions. As far as empirical investigation allows, and with the advancement of more intricate research designs, the use of a larger and more heterogenous sample of participants will increase the certainty of findings. This will allow analyses of subgroups that may show contrasting results and may provide more refined generalisations and conclusions. This endeavour may require the development of more sophisticated methodologies that do not require control of switching between amnesic identities, so a wider range of DID participants can be explored. Likewise, experimentation probing a wider range of memory systems with naturalistic (rather than laboratory induced) experiences would prove fruitful in the advancement of understandings. This may be particularly relevant for autobiographical memory systems, where conditions are more akin to the everyday experiences of an individual for which amnesia arises and is reported clinically. This may include utilising highly emotive tasks, or even trauma memories, via techniques like the symptom provocation method, which has been used in neuroimaging work in DID (e.g., Reinders et al., 2012; see Nijenhuis, 2023), as well as non-emotive recent or distant autobiographical memories, given amnesia in DID is not limited to traumatic stimuli, but affects neutral, everyday memories (APA, 2022).

Akin to the latter point, it may be prudent to investigate the possible influences of state-dependent learning and mood-congruity effects on IIA. As previously mentioned, such effects were touched on twice in the present empirical body (Eich et al., 1997a, 1997b; Nissen et al., 1988), but have not been explored since. This may be due to the findings of an apparent lack of objective retrieval failure. However, it is argued here that the role of such mechanisms should be considered in at least some capacity in ongoing work in this field, particularly given the collated findings outlined in a review by Forgas and Eich (2012). These researchers articulate that while affective states often "produce powerful assimilative or congruent effects" (*p.* 62) on the way information and memory operates, the effects are not universal. Instead, the influence of affect and state-dependency on learning and memory appear to depend on certain situational and contextual variables, producing the most reliable effects when: 1. Moods are intense; 2. There are meaningful causal connections between mood and cognitive tasks; 3. The tasks employed are self-referential; and 4. Tasks require a high degree of open and constructive processing.

Regarding empirical investigation, mood-congruity and state-dependent effects may be much less likely to occur under cognitive tasks in which simple, well-rehearsed stimuli are assessed for retrieval, and where internal strategies are not relied upon to retrieve the desired

memory (i.e., recall is aided by external cues). Thus, such effects tend to arise more often in tasks of free recall, relative to tasks of cued-recall, recognition, or when implicit retrieval techniques are used. Heightening the ecological validity of research on IIA in DID is a priority. Therefore, experimental materials and tasks could be designed in a way that is both self-referentially relevant to the individual identities, but that importantly prioritise internal cuing for retrieval that relies on one's own desire to search for internal cues. In this way, it could be ascertained whether the results under such conditions align more closely with patients' clinical experiences, as well as ascertain whether specific affect or state differences lead to greater or lesser amnesic experiences across dissociative identities. The dissociative disorders field has sophisticated theoretical frameworks that could help guide such empirical investigation, like Putnam's Discrete Behavioural States theory (e.g., Loewenstein & Putnam, 2023; Putnam, 2016) and the Theory of Structural Dissociation of the Personality (e.g., Van der Hart, Nijenhuis, & Steele, 2006).

7. Conclusion

The present review outlines empirical data investigating IIA and memory transfer in individuals with DID. There has been a great increase in methodologically-sound empirical work in the previous two decades, yet the field remains in its infancy and there are considerations that limit conclusions. These include heterogenous and variable quantitative outcomes, small and homogenous samples, minimal research teams, and limited investigation of differing memory systems. Thus, current experimental foundations need to be built upon. As eloquently stated by Kihlstrom (2005), "as complex as [dissociative disorders] surely are, they deserve to be studied in a spirit of open inquiry that avoids both the excessive credulity of the enthusiast and the dismissal of the determined skeptic" (p. 244). Likewise, in making theoretical conclusions, researchers should avoid binary thinking. Instead, the most sophisticated conclusions will reflect the entirety of the data and keep in mind the complexity of the disorder and its symptomology. Indeed, present theoretical implications in the field are best reconciled through open discussion and ongoing empirical work, whereby multiple mechanisms may be needed to account for the phenomena of IIA across DID cases, and even at different stages of the clinical and developmental journey out of having DID.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

All materials associated with the study are available at: https://osf.io/g7b6n

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