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Original Research Article

Overgeneral Autobiographical Memory in Patients with Chronic Pain

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Abstract

Objective. Overgenerality and delay of the retrieval of autobiographical memory (AM) are well documented in a range of clinical conditions, particularly in patients with emotional disorder. The present study extended the investigation to chronic pain, attempting to identify whether the retrieval of AM in patients with chronic pain tends to be overgeneral or delayed.

Design. With an observational cross-sectional design, we evaluated the AM both in patients with chronic pain and healthy controls by Autobiographical Memory Test. Pain conditions were assessed using the pain diagnostic protocol, the short-form McGill Pain Questionnaire (SF-MPQ), and the Pain Self-Efficacy Questionnaire (PSEQ). Emotion was assessed using the Beck Depression Inventory-II (BDI-II) and the Beck Anxiety Inventory.

Subjects and Settings. Subjects included 176 outpatients with chronic pain lasting for at least 6 months and 170 healthy controls.

Results. 1) Compared with the healthy group, the chronic pain group had more overgeneral memories (OGMs) ($F = 29.061$, $P < 0.01$) and longer latency ($F = 13.602$, $P < 0.01$). 2) In the chronic pain group, the stepwise multiple regression models for variables predicting OGM were significant ($P < 0.01$). Specifically, the variance in OGM scores could be predicted by the BDI score (9.7%), pain chronicity (4.3%), PSEQ score (7.1%), and Affective Index (of SF-MPQ) score (2.7%). 3) In the chronic pain group, the stepwise multiple regression models for variables predicting latency were significant ($P < 0.05$). Specifically, the variance in latency could be predicted by age (3.1%), pain chronicity (2.7%), pain duration (4.3%), and PSEQ score (2.0%).

Conclusions. The retrieval of AM in patients with chronic pain tends to be overgeneral and delayed, and the retrieval style of AM may be contributed to negative emotions and chronic pain conditions.

Key Words. Autobiographical Memory; Overgenerality; Delay; Chronic Pain

Introduction

Autobiographical memory (AM) is concerned with the recollection of personally experienced past events and is central to human functioning. AM contributes to an individual's sense of self, to his (or her) ability to remain oriented in the world, and to pursue goals effectively in the light of the experience of problem solving. Such orientation and goal pursuit are particularly important for interpersonal goals, where AM arises and then contributes to a shared social world [1–3]. AM can be specific, meaning

memories referring to one isolated event that occurred at a particular time and place. Inability to retrieve specific autobiographical events is reflected by overgeneral memory (OGM), which means that the memories summarize several different events (i.e., categoric memories) or refer to events lasting more than 24 hours (i.e., extended memories). Research on OGM phenomenon is quite recent and stems from a tradition of research on human memory. Williams et al. have indicated a robust link between psychopathology and OGM [3]. Such memory dysfunction has been found in various clinical groups, particularly in patients with emotion disorders [3].

Over the past 20 years, some studies have explored the relationship between pain experience in patients with chronic pain and AM [4–9]. One focus of this field is the recall bias for AM. Results show that current pain experience in patients with chronic pain may be directly influenced by the ways in which negative emotional or pain-related AMs are recalled [4–6]. For patients with chronic pain, many of them display recall bias for unpleasant and pain-related AMs, which enhances their current pain experience [5]. Their memories of pain are usually recalled significantly faster than non-pain memories [6]. An other focus is the accuracy of pain-related AMs in patients with chronic pain. Feine, Matera, Bryant et al. found that memory of the pretreatment pain was inaccurate and the errors in recall increased with the passage of time [7–9]. During a 10-week randomized controlled clinical trial, Feine et al. asked patients with chronic pain to recall their pretreatment pain and rate their present pain on 100 mm visual analog scales (VAS); the results suggested that accuracy of recall for pretreatment pain depended on the level of pain before treatment, and patients with low pretreatment pain exaggerated its intensity afterwards, while those with the highest pretreatment pain underestimated it [7]. Memory of pretreatment pain was also dependent on the level of pain at the moment of recall. Matera et al. found that patients with chronic pain tended to overestimate initial pain when being asked to recall after a period of time. The pain memory distortion is related to pain intensity variation during treatment rather than present pain, and it is inversely related to the initial pain intensity [8]. Bryant also demonstrated that patients with chronic pain who reported increased pain or depression overestimated their memory of initial pain or depression [9].

However, to our knowledge, OGM in patients with chronic pain still remains largely unknown. The aim of the present study was to explore OGM in patients with chronic pain. It was predicted that 1) patients with chronic pain would give more general responses and longer latencies to cue words than healthy controls; 2) patients with chronic pain would be more severely depressed and anxious than the controls, and negative emotions were positively correlated with OGM and latency of AM; and 3) pain variables (e.g., intensity, chronicity, duration) were also positively correlated with OGM and latency of AM.

Methods

Participants

We recruited 176 chronic pain outpatients and 170 healthy controls. The demographics of the two groups were shown in Table 1. All the patients were recruited from a large general hospital in Hunan province located in central south of China. The testing occurred after the patients had met with their doctor or clinical psychologist. The patients should meet the following inclusion criteria: 1) diagnostic definition of chronic pain by the International Association for the Study of Pain [10], a diagnosis of chronic pain for at least 6 months; 2) had chronic non-cancer pain with VAS score ≥ 30 for assessment of

Table 1 Basic characteristics of patients with chronic pain (N = 176) and control participants (N = 170)

	Patients with Chronic Pain	Healthy Controls	*P*
Male/female, (N)	88/88	89/81	0.662
Age, mean ± SD (years)	34.84 ± 11.92	33.91 ± 10.72	0.447
Formal education, mean ± SD (years)	11.24 ± 3.45	11.68 ± 3.31	0.235
BDI score, mean ± SD	16.81 ± 12.07	7.32 ± 6.09	<0.001
BAI score, mean ± SD	12.18 ± 11.39	4.11 ± 4.52	<0.001
Age of pain onset, mean ± SD (years)	29.93 ± 11.65	—	
Pain chronicity, mean ± SD (months)	52.23 ± 63.84	—	
Pain frequency, mean ± SD (day/week)	5.31 ± 2.20	—	
Pain duration, mean ± SD (h/day)	9.75 ± 7.85	—	
VAS score, mean ± SD	53.70 ± 19.55	—	
SI score, mean ± SD	7.42 ± 5.45	—	
AI score, mean ± SD	3.84 ± 2.96	—	
PPI score, mean ± SD	2.17 ± 1.03	—	
PSEQ score, mean ± SD	33.52 ± 14.52	—	

BDI = Beck Depression Inventory; BAI = Beck Anxiety Inventory; VAS = visual analog scale; SI = Sensory Index; AI = Affective Index; PPI = Present Pain Intensity; PSEQ = Pain Self-Efficacy Questionnaire.

pain intensity; 3) taking analgesic medication before seeing outpatient service, but no using any analgesic drugs and other medications (e.g., tricyclics, anticonvulsants, and others) in the last 2 weeks prior to memory testing; 4) age from 18 to 65 years; 5) no history of head trauma or severe physical disorders; 6) no clinically diagnosed psychiatric disease according to Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (e.g., major depressive disorders, anxiety neurosis); and 7) no alcohol or other substance abuse, no heavy smoking (<20 cigarettes per day), and no heavy caffeine use (<5 cups per day).

All the healthy volunteers were recruited via advertisement from the same district as the patients. They should meet the inclusion criteria (4–7) above and did not take any medications in the last 2 weeks.

The study has been approved by the Ethical Committee of Hengyang Normal University and the Second Xiangya Hospital of Central South University. Before enrollment, all participants received detailed written and verbal information regarding the aims, protocol of the study, and signed informed consent. All participants were compensated for their time in the study.

Assessment of Pain

All patients were assessed by pain specialists using the pain diagnostic protocol which made reference to the Multiperspective Multidimensional Pain Assessment Protocol [11], including the rating of pain (e.g., chronicity, frequency, location, pain treatment history), the medical information, the mental health status, and the functional limitation.

Pain intensity was measured using the Chinese version of the short-form McGill Pain Questionnaire (SF-MPQ) [12]. The main component of the SF-MPQ consists of 15 descriptors (11 sensory; 4 affective) which are rated on an intensity scale as 0 = none, 1 = mild, 2 = moderate, or 3 = severe. Three pain scores are derived from the sum of the intensity rank values of the words chosen for sensory (Sensory Index [SI]), affective (Affective Index [AI]), and total descriptors (Pain Rating Index [PRI]). The SF-MPQ also includes the Present Pain Intensity (PPI) index of the standard MPQ and a VAS. The test-retest reliability coefficients of the Chinese version of SF-MPQ were 0.85–0.98, and the correlation coefficients between the scores of PRI, PPI, and VAS were 0.48–0.91 [12].

The Pain Self-Efficacy Questionnaire (PSEQ) is a 10-item self-report inventory that assesses the strength and generality of a patient's self-efficacy beliefs and his or her confidence to accomplish a range of activities despite chronic pain (e.g., "I can do most of the household chores, despite the pain" "I can gradually increase my activity level, despite the pain"). Each item is scored on a 7-point Likert scale (ranging from 0 = "not at all confident" to 6 = "completely confident"), with a higher total score indicating stronger self-efficacy beliefs. The potential maximum score is 60. The Chinese version of the PSEQ has good retest reliability (intraclass correlation coefficient 0.75), and exploratory factor analysis showed a one-factor model that accounted for 61% of the total variance [13].

Assessment of AM

AM was assessed using the Autobiographical Memory Test (AMT) [14] which measures patients' ability to retrieve life events as quickly as possible and specificity of such memories in response to cue words. The Chinese version of AMT comprised 12 emotional cue words: six negative (painful, horrible, sad, lonely, angry, guilty) and six positive (proud, successful, honest, happy, safe, interested, brave) adjectives. Words were presented on 12.5 cm × 7.5 cm laminated cards and were written in black ink in capital letters 3.5 cm high in a fixed order alternating between negative and positive, and at the same time were read aloud by the experimenter. Participants were asked: "What event does this word remind you of?" Participants described their memories out loud. The latency to the first word of each response was timed using a stopwatch. If participants offered a non-specific response, a standardized prompt was given ("Can you think of a specific time, a particular event?") immediately, and the cumulative time was recorded. Participants were given 60 seconds to retrieve specific memory. Before testing, participants were given training examples until they demonstrated their understanding of the task. Events recalled were later coded by the experimenter as a specific memory (lasting a day or less and at a certain place) or an OGM; the latter were further qualified as an extended memory (lasting a number of days but with specifiable start and end points) or a categoric memory (referring to a class of memories). To permit assessment of interrater reliability, a random sample of 20% videotaped responses were coded independently by a rater blind to participant's group. Inter-rater agreement on all responses was high (Cohen's K = 0.95) [15].

Assessment of Depression and Anxiety

Depression was assessed using the Chinese version of Beck Depression Inventory-II (BDI-II) [16] which consists of 21 items scored on a 4-point scale (0–3). A total score is determined by aggregating the item responses. The Cronbach α of Chinese version of BDI-II was 0.94, the test-retest coefficients was 0.55, and its convergent validity coefficients (correlation with the score of Hamilton Depression Scale) was 0.67 [17].

Anxiety was assessed using the Chinese version of Beck Anxiety Inventory (BAI) [18] which consists of 21 items of physiological and cognitive components of anxiety. Respondents rate the degree to which they have been bothered by each symptom in the past week on a 4-point scale ranging from 0 (Not at all) to 3 (Extremely). The Cronbach α of Chinese version of BAI was 0.95, and the coefficient of half-split was 0.92. The confirmatory factor analysis suggested that a simple two-factor model would best accommodate the BAI data set (comparative fit

index = 0.934, bentler fit index = 0.9335, root mean square error of approximation = 0.067) [19].

Procedure

Each patient participated in a single session of about 90-minute duration that included a structured clinical interview, pain questionnaires, psychological distress questionnaires, and AMT. To avoid potential mutual interference, a break of about 5 minutes was included between the four parts of the session. The overall order of the procedure was: the structured clinical interview, SF-MPQ, PSEQ, BDI, BAI, and AMT. The healthy controls only completed background questions, psychological distress questionnaires, and AMT, and the whole procedure took them approximately 60 minutes to complete.

Statistical Analysis

Statistical analysis was carried out using the SPSS 15.0 software (SPSS Inc., Chicago, IL, USA) using a two-tailed significance level of 0.05. For demographic measures, depression and anxiety measures, we computed independent samples *t*-tests or the chi-square test. 2 (groups: patients with chronic pain and the controls) × 2 (emotional valence of cue words: negative and positive) mixed analysis of variance (ANOVA) was computed across all outcome measures of the AMT. After these analyses, correlation analyses were used to assess the relationship of outcome measures of the AMT and the negative emotions, then, analyses of covariance (ANCOVA) with the negative emotions as covariates were performed. Furthermore, linear multiple regression analyses were computed, in order to identify predictors of OGM and latency.

Results

Basic Characteristics of the Participants

Demographic and psychological distress were displayed in Table 1. The groups did not differ in sex, age, and years of formal education ($P > 0.05$), but the group of patients with chronic pain obtained higher scores on BDI-II and BAI than the healthy group ($P < 0.001$). Pain clinical data (e.g., age of pain onset, pain chronicity, pain frequency, pain duration in a day, the scores of VAS, SI, AI, PPI, and PSEQ) were also presented in Table 1.

The Differences of AM Between the Patients with Chronic Pain and the Healthy Controls

The AMT results of chronic pain group and control group were displayed in Table 2. The mixed type ANOVA (2 × 2) showed significant main effect of OGM between the two groups [$F(1,688) = 29.061$, $P < 0.01$], with memories of patients with chronic pain being more overgeneral than those of the controls. However, the main effect of cue valence was not significant [$F(1,688) = 3.718$, $P > 0.05$], as well as the group × cue valence interaction [$F(1,688) = 0.675$, $P > 0.05$].

Table 2 Mean of overgeneral memories and response latency (M ± SD)

	Patients with Chronic Pain (N = 176)	Healthy Controls (N = 170)
OGM of all cue words	5.07 ± 2.72	3.88 ± 2.43
OGM of negative cue words	2.69 ± 1.51	2.00 ± 1.37
OGM of positive cue words	2.39 ± 1.59	1.88 ± 1.39
Latency of all cue words	21.78 ± 12.32	18.33 ± 8.57
Latency of negative cue words	19.44 ± 12.48	17.83 ± 8.99
Latency of positive cue words	23.90 ± 14.40	18.83 ± 10.92

OGM = overgeneral memory.

We also analyzed response latency with a mixed type ANOVA (2 × 2). Results showed significant group effect [$F(1, 688) = 13.602$, $P < 0.01$], with patients with chronic pain retrieving more slowly than the controls. The main effect of cue valence was also significant [$F(1,688) = 9.109$, $P < 0.01$], with response latency being more slowly on positive cue words than those on negative cue words. The group × cue valence interaction was close to significance level [$F(1,688) = 3.632$, $P = 0.057$], with patients with chronic pain retrieving more slowly than the controls only on positive cue words, and only the group of patients with chronic pain retrieving more slowly on positive cue words than negative cue words.

As the two groups differed on levels of depression and anxiety as measured by BDI score and BAI score, the AMT results were correlated with means of BDI score and BAI score. The BDI score was significantly correlated with OGM ($r = 0.303$, $P < 0.01$) and latency ($r = 0.146$, $P < 0.01$). The BAI score was also significantly correlated with OGM ($r = 0.255$, $P < 0.01$).

Given the potential role of depression and anxiety, ANCOVA with BDI score and BAI score as covariates were conducted. The between-group effects remained significant for OGM [$F(1, 686) = 5.484$, $P < 0.05$] and latency [$F(1, 686) = 6.518$, $P < 0.05$].

The Variables Predicting OGM and Latency in Patients with Chronic Pain

To examine the influential factors of OGM and latency in patients with chronic pain, linear regression analyses were conducted with OGM and latency being the dependent variables. Independent variables included four blocks: the first block included age and years of formal education; the second block included BDI score and BAI score; the third block included age of pain onset, pain chronicity, pain frequency, and pain duration in a day; and the fourth block included VAS score, PPI score, SI score, AI score, and PSEQ score.

Table 3 Summary of stepwise regression analysis for variables predicting OGM

Variables	R^2	Adjusted R^2	R^2 Change	F	*P*	B	SE B	β	*t*	*P*
Step 1	0.097	0.092	0.097	18.636	<0.001					
BDI						0.070	0.016	0.311	4.317	<0.001
Step 2	0.140	0.130	0.043	14.053	<0.001					
BDI						0.072	0.016	0.321	4.543	<0.001
Pain chronicity						0.009	0.003	0.208	2.941	0.004
Step 3	0.211	0.197	0.071	15.356	<0.001					
BDI						0.038	0.018	0.167	2.144	0.033
Pain chronicity						0.007	0.003	0.168	2.455	0.015
PSEQ						–0.058	0.015	–0.310	3.949	<0.001
Step 4	0.238	0.220	0.027	13.369	<0.001					
BDI						0.017	0.019	0.075	0.882	0.379
Pain chronicity						0.008	0.003	0.187	2.758	0.006
PSEQ						–0.046	0.015	–0.246	3.019	0.003
AI						0.196	0.080	0.213	2.461	0.015

BDI = Beck Depression Inventory; PSEQ = Pain Self-Efficacy Questionnaire; AI = Affective Index; SE B = The regression coefficient of standard error.

Inter-correlations between the variables of chronic pain were significantly. For example, pain frequency was significantly correlated with pain duration in a day ($r = 0.416$, $P < 0.01$), VAS score was significantly correlated with PPI score ($r = 0.649$, $P < 0.01$), and AI score was significantly correlated with BDI score ($r = 0.581$, $P < 0.01$). To avoid potential problems with multicollinearity, stepwise regression was carried out in which the order of variables included in the equation was not specified but was determined by the magnitude of bivariate correlations.

Table 3 summarized the results of the stepwise multiple regression for variables predicting OGM. As shown, the four regression models in the steps were significant ($P < 0.001$); BDI score was entered in the first step and accounted for 9.7% of the variance in OGM scores. Pain chronicity was entered in the second step and explained an additional 4.3% of the variance in OGM scores. PSEQ score was entered in the third step and explained an additional 7.1% of the variance in OGM scores. AI score was entered in the fourth step and explained an additional 2.7% of the variance in OGM scores. The procedure halted without including the rest of the variables because they did not add significantly to the variance explained.

Table 4 summarized the results of the stepwise multiple regression for variables predicting latency. As shown, the four regression models in the steps were significant ($P < 0.05$). Age was entered in the first step and accounted for 3.1% of the variance in latency scores. Pain chronicity was entered in the second step and explained an additional 2.7% of the variance in latency scores. Pain

Table 4 Summary of stepwise regression analysis for variables predicting latency

Variables	R^2	Adjusted R^2	R^2 Change	F	*P*	B	SE B	β	*t*	*P*
Step 1	0.031	0.025	0.031	5.514	0.020					
Age						0.181	0.077	0.175	2.348	0.020
Step 2	0.092	0.081	0.061	8.755	<0.001					
Age						0.081	0.080	0.078	1.004	0.317
Pain chronicity						0.051	0.015	0.266	3.414	0.001
Step 3	0.135	0.120	0.043	8.917	<0.001					
Age						0.077	0.079	0.074	0.973	0.332
Pain chronicity						0.048	0.015	0.248	3.241	0.001
Pain duration						0.326	0.112	0.208	2.913	0.004
Step 4	0.155	0.135	0.020	7.828	<0.001					
Age						0.052	0.079	0.050	0.654	0.514
Pain chronicity						0.052	0.015	0.270	3.529	0.001
Pain duration						0.349	0.111	0.222	3.132	0.002
PSEQ						0.123	0.061	0.145	2.020	0.045

PSEQ = Pain Self-Efficacy Questionnaire.

duration was entered in the third step and explained an additional 4.3% of the variance in latency scores. PSEQ score was entered in the fourth step and explained an additional 2.0% of the variance in latency scores. The procedure halted without including the rest of the variables because they did not add significantly to the variance explained.

Discussion

Similar to the studies on patients with emotional disorders [3], we found that the patients with chronic pain showed more OGMs and longer latency than the healthy controls in line with the first prediction. According to the self-memory model by Conway and Pleydell-Pearce [1], AMs are transitory dynamic mental constructions generated from an underlying knowledge base; there are three levels of representation within the autobiographical knowledge base: lifetime periods (the highest level), general event (intermediate level), and event-specific knowledge (the lowest level). This model suggests that the autobiographical knowledge base could undergo continuous fluctuation of activity, as environmental and internal cues activate aspects of stored representations [1]. The main pattern of retrieval is generative retrieval process (top-down search processes), namely, the activation of retrieval spreads through the knowledge base from general event representations to event-specific knowledge. If the activation failed to spread to the event-specific knowledge, the retrieval would linger at general event representations, and the response to the cue word would be expressed as OGM [1]. The overgenerality of AM in patients with chronic pain may account for the impairment of processing speed, especially when they recall positive autobiographical events, as patients with chronic pain retrieved more slowly on positive cue words than the controls. However, response latency may just be an important mediator variable between OGM and other factors. In the following, some potential affecting factors which may account for OGM of patients with chronic pain will be discussed.

The second prediction of the present study was demonstrated by the results which showed that patients with chronic pain were more severely depressed and anxious, and depression could predict the variance of OGM in patients with chronic pain. Negative emotions contributing to OGM has been well demonstrated in emotional disorders [3]. The affect-regulation model has been put forward to explain the origin of increased overgenerality. It assumes that being more general might help to prevent negative or painful emotions by recalling events in a more general way. Such avoidant memory strategy may have beneficial effects in the short run (less emotional impact of stressful specific events) but is detrimental in the long run. This strategy may get so ingrained that it loses all flexibility. Even in situations where being specific is highly beneficial (e.g., in situations of social problem solving), they fail to access the relevant information in their autobiographical "database" [20]. Furthermore, the present study found the emotional valence effected on latency of AM. In response to the cue words, patients with chronic pain retrieved positive memories more slowly but negative memories faster. The theory of mood congruent effect assumes that chronic pain makes patients stuck in the conditions of negative emotions. The cue words of negative emotional valence are in line with the current emotions of patients while the cue words of positive emotional valence conflict with the current emotions of patients, leading to the decrease of speed of response to the cue words [21]. There must exist other factors which contribute to recall bias in patients with chronic pain, as the recall bias is still significant with the effect of negative emotions being controlled.

The results were partly in line with the third prediction. Pain chronicity, pain duration, and affective dimension of pain made statistically significant contributions to the explanation of the retrieval style of AM. Previous studies have found significantly negative correlation between pain intensity and the performance of memory [22–24]. Our results also showed that pain self-efficacy could predict the variance of AM in patients with chronic pain. To our knowledge, this is the first study on the relationship between pain self-efficacy and memory. Previous studies suggest that pain and memory share a large number of common brain structures. Most of the structures, noted as abnormal in neuroimaging in chronic painful conditions, are also the part of memory network. For example, prefrontal cortex was noted as a major structure involved in both the pain and memory networks [25–27]. Thus, once such neural networks were impaired by pain, memory functioning was most likely to be affected. However, this explanation should be further demonstrated by empirical researches.

Finally, we found that age could predict the variance of response delay of AM rather than OGM. Normal aging is associated with a decline in various memory abilities in many cognitive tasks, especially for episodic memory [28]. Results of the present study implied that aging did not make patients with chronic pain easy or difficult to forget autobiographical events in 1-minute time frame for retrieving, but aging would decrease the speed of retrieval of autobiographical events.

Our findings may be limited regarding their ability to be generalized. There is a need to replicate our findings for three reasons. Firstly, the clinic population studied was quite heterogeneous with regard to pain etiology; the performance of AM in one subtype of chronic pain may differ from that in other subtypes of chronic pain. Secondly, many psysio-psycho-social factors may potentially affect the performance of AM, but the present study failed to explore such influence. Finally, there's not enough conclusive evidence of the causality between retrieval style of AM and chronic pain or emotions in that the present study is just a cross-sectional study. Therefore, further investigations, including longitudinal studies, are highly recommended.

Overall, our findings suggest that retrieval of autobiographical memories in patients with chronic pain is

overgeneral and delayed, and this retrieval pattern may contribute to negative emotions in chronic pain conditions. Clinicians should carefully evaluate the extent to which AMs are influenced by chronic pain and negative emotions. As AM deficits are related to chronic pain and negative emotions, it can be expected that AM deficits will decline if chronic pain and negative emotions are alleviated. Therefore, AMs should be considered as a potentially important to the assessment of chronic pain and the evaluation of chronic pain treatment outcomes.

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