ARTICLE

Psychosocial Intervention for Postdisaster Trauma Symptoms in Elementary School Children

A Controlled Community Field Study

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Context: Natural disasters negatively affect children's emotional and behavioral adjustment. Although treatments to reduce psychological morbidity following disasters are needed, it has been difficult to conduct treatment research in postdisaster environments because of the sensitivity of victims to perceived intrusiveness and exploitation.

Objective: To evaluate the efficacy of a public health–inspired intervention combining school-based screening and psychosocial treatment to identify and treat children with persistent disaster-related trauma symptoms.

Design: To identify children with continued high levels of trauma-related symptoms 2 years after a major disaster, we conducted a community-wide school-based screening of disaster-exposed public elementary school children. Children with the highest levels of trauma-related symptoms were randomly assigned to 1 of 3 consecutively treated cohorts. Children in the cohorts awaiting treatment served as wait-list controls. Within each cohort, children were randomly assigned to either individual or group treatment to allow comparison of the efficacy of the 2 treatment modalities.

Setting: All 10 public elementary schools on the island of Kauai (one of the Hawaiian Islands) 2 years after Hurricane Iniki.

Participants: All 4258 children in second through sixth grade were screened. The 248 children with the highest levels of psychological trauma symptoms were selected for treatment.

Intervention: Children were randomly assigned to either individual or group treatment provided by specially trained school-based counselors. Treatment comprised 4 sessions.

Main Outcome Measures: The Kauai Reaction Inventory, a self-report measure of trauma symptoms, and the Child Reaction Inventory, a semistructured clinical interview for posttraumatic stress disorder symptoms.

Results: After treatment, children reported significant reductions in self-reported trauma-related symptoms. This symptom reduction was maintained at the 1-year follow-up. Clinical interviews also indicated that treated children had fewer trauma symptoms compared with untreated children.

Conclusions: School-based community-wide screening followed by psychosocial intervention seems to effectively identify and reduce children's disaster-related trauma symptoms and may facilitate psychological recovery. While group and individual treatments did not differ in efficacy, fewer children dropped out of the group treatment. This approach may be applicable to screening and treating children exposed to a variety of large-scale disasters.

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A GROWING literature documents the negative effects of natural disasters on children's emotional and behavioral adjustment.[1-7] Disaster-related symptoms include intrusive reexperiencing of the disaster, avoidance of disaster reminders, and persistent hyperarousal and anger. Although it seems that a substantial proportion of children can develop persistent psychological impairment if left untreated,[7,8] there is a paucity of research on effective postdisaster psychological interventions.[9] This is consistent with the fact that treatment research on child posttraumatic stress disorder (PTSD) is in its infancy.[10,11]

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The treatment of psychological symptoms in elementary school–aged children following a disaster has been evaluated in only 1 uncontrolled group comparison study.[12] Two uncontrolled studies of postdisaster treatment compared treated with untreated groups of adolescents.[13,14] While

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PARTICIPANTS AND METHODS

SCREENING OF CHILDREN FOR TRAUMA SYMPTOMS

Treatment participants were drawn from a screening of the population of all children on Kauai attending the second through sixth grades (N=4258) at Kauai's 10 public elementary schools. The school district's enrollment rolls defined the population of elementary public school children on Kauai and provided demographic information such as names, birth dates, grade, school lunch status, and student ethnicity. Children in kindergarten or first grade were not included in the screening because they were too young to respond adequately to a self-report instrument. Parents were mailed notification of the screening and given the opportunity to decline participation by their child.

SCREENING MEASURES

Disaster Exposure

Four multiple-choice hurricane exposure questions were included to assess disaster exposure. These items were keyed to the event exposure criteria for PTSD diagnosis, as revised in the most recent *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)*[15] of the American Psychiatric Association, permitting us to assess whether the children met the exposure criterion for PTSD. The questions were: (1) During the hurricane, did you think you would die or get hurt? (2) During the hurricane, did you think your mom or dad or brother or sister, or other close relatives, would die or get hurt? (3) How much did the hurricane hurt your home? (4) How scared were you during the hurricane? The last 2 questions were rated on 5-point scales.

Trauma Symptoms

We used the Kauai Recovery Inventory (KRI)[16] to measure trauma symptoms. The KRI is a 24-item self-report scale adapted for elementary school children from the Reaction Index.[17] The KRI includes items about intrusive reexperiencing of the disaster, avoidance of reminders, and arousal symptoms such as hypervigilance and irritability. With the exception of the event exposure criterion, these items are keyed to the diagnostic criteria for PTSD contained in the *DSM-IV*.[15] Children rated on a 3-point scale ("no," "sometimes," "almost all the time") the frequency of experiencing hurricane-related trauma symptoms in the past week. The KRI has high internal consistency (Cronbach $\alpha=.84$) and adequate 4-week test-retest reliability ($\alpha=.77$). The finding that children with high exposure scores had significantly higher trauma symptoms supports the validity of the inventory.[16]

Procedure

Each school's counselor coordinated screening administration. Second- and third-grade teachers were given a standardized lesson plan used to teach the children in those grades how to respond to a self-report measure. The KRI was group-administered in the children's classrooms by their usual teachers. Teachers read the items aloud to the children during the administration to minimize the effects of variability in reading skills. Answer sheets were designed for machine scoring, permitting rapid tally of responses. An arbitrary cut-off score corresponding to the 94th percentile was used to identify the children reporting the most severe trauma symptoms.

INTERVENTION DESIGN

Overview

Following the screening, children reporting the highest levels of trauma symptoms were provided school-based treatment. Resource limitations restricted our treatment capacity; consequently, children were randomly assigned to 1 of 3 consecutively treated treatment cohorts. This ensured equity with respect to which child got treated when, and simultaneously provided for the randomized allocation of participants to treatment cohorts required by our wait-list design. Our design also permitted us to compare the efficacy of group treatment with that of individual treatment through random assignment of children to each treatment type, within treatment cohorts. Treatment efficacy was measured using (1) self-reports of trauma symptoms pretreatment, posttreatment, and at follow-up (obtained using the KRI measure described above); and (2) clinician ratings of treated vs untreated children. The clinician raters were kept unaware of whether the child they examined had been treated.

Randomization

Once treatment candidates were identified through screening, the randomization facility of SPSS (Statistical Package for the Social Sciences, SPSS Inc, Chicago, Ill) was used to randomly assign children to cohorts, and within each cohort, to individual or group treatment. Following screening, children were randomly assigned to 1 of 3 treatment cohorts. The children within each treatment cohort were then randomly assigned to a treatment modality. For the first 2 cohorts, we used a ratio of 1 participant in individual treatment to 4 in group treatment. For the third cohort, we pragmatically increased participant allocation to individual treatment to ensure adequate numbers for the analyses comparing the 2 treatments.

"Retest Only" Group

To control for the possibility that simply repeating testing might account for KRI score reductions through practice effects, we drew a sample of 42 children from the screened population whose KRI scores were in the next highest scoring range of distress (ie, the 90th to 93rd percentile). This sample was administered the KRI twice, approximately 1 month apart, to approximate the time between measurements before and after treatment. Sixty-one percent of this

suggestive of the value of postdisaster treatment for children, these studies were inconclusive because of significant methodological limitations. Participants were not randomly assigned; posttrauma symptoms were not specifically measured in the child study; information on attrition was not provided; and the treatment was not protocol-guided, making it difficult to know what was done. Significantly, these studies were conducted with small

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sample were girls, with a mean age of 8.47 years (SD = 1.17 years).

TREATMENT OUTCOME ASSESSMENT

Kauai Recovery Inventory

The KRI[16] was used to measure trauma symptoms pretreatment, posttreatment, and at follow-up. It was administered individually to treatment participants. As noted above, the KRI measures the frequency of reexperiencing, avoidance, and arousal symptoms in the previous week.

Child PTSD Reaction Index

The Child PTSD Reaction Index (CRI)[18] is a widely used semistructured clinician-administered interview that assesses psychological trauma symptoms experienced by children. Test-retest interitem agreement across 7 days has been reported as 94% with a κ coefficient of 0.88. Because of limited availability of interviewers, the CRI was used to compare a randomly drawn sample of treated children with a randomly drawn sample of untreated children.

TREATMENT

Treatment was manual-guided and consisted of 4 weekly sessions. As there were no postdisaster trauma treatment manuals in existence, we designed a developmentally appropriate treatment manual for the individual treatment and another for group treatment. The intervention philosophy incorporated in the treatment assumed that most children recover naturally from a disaster. We posited that to recover from a disaster, children must master disaster-related psychological challenges. These include restoring a sense of safety; grieving losses and renewing attachments; adaptively expressing disaster-related anger; and achieving closure about the disaster to move forward. Our intervention was designed to provide a context in which children would be prompted to review their experiences in a structured way, while receiving support to master the psychological tasks that had not been completed. The treatment manual comprised session-by-session protocols that outlined each session's content and provided a specific repertoire of activities designed to elicit material relevant to each session. Therapists were provided a standard box of play and art materials to use. Treatment groups were conducted with 4 to 8 children. The primary foci for each session were defined as follows: Session 1: "Safety and Helplessness"; Session 2: "Loss"; Session 3: "Mobilizing Competence and Issues of Anger"; and Session 4: "Ending and Going Forward." For example, in Session 2, children were asked whether they had lost pets or favorite toys. They were engaged in play intended to help them identify any losses, express feelings about the losses, think about the present significance of the losses, and finally, come up with forward-looking ways of integrating the loss into the present. This was done through a combination of play, use of expressive art, and talk. Similar activities were used in both treatments, except that in group treatment, children were engaged in adaptations of the treatments that involved cooperative play and discussion.

Therapists

There were 2 male and 2 female therapists. All were experienced at working with children in schools. Three were school counselors; 1 was a clinical social worker. Therapists received 3 days of training regarding postdisaster trauma psychology and a day and a half of didactic training specific to the treatment manual.

Treatment Fidelity

To facilitate learning the treatments, therapists were given lighter workloads during the first cohort's treatment period. Therapists were provided identical play therapy kits to help standardize treatment activities. Therapists received 3 hours of group supervision weekly to encourage adherence to the treatment protocol. They took turns presenting their work orally and received supervision aimed at promoting treatment uniformity.

Human Subjects Oversight

The work reported here was conducted as part of the program evaluation of a school disaster recovery program that the Hawaii State Legislature directed the Department of Education to design and implement. The program was considered by the Department of Education to be an extension of its school counseling function. The authors took several specific steps to safeguard student and family rights. This included establishing an advisory committee that reviewed proposed activities and materials and periodically reviewed program progress. The committee comprised representatives of parents, local child researchers, teachers, mental health service providers, community leaders, school counselors and administrators, and included among its active members, the chairman of the Hawaii Board of Education (Honolulu). Our written procedural plans were submitted for review and comment to the Department of Education's Assessment and Measurement Office, and were reviewed by the office's director and assistant director (both of whom were experienced researchers in educational measurement). We also submitted our plans for independent review and approval by the district superintendent and the state superintendent of education and their staffs. At each step of the project, our communications with parents and children fully disclosed project goals, procedures, and potential risks. Participation in the screening was based on passive consent. If following notification, a parent did not communicate that they wanted their child excluded, consent was assumed. Following screening, as a condition of enrollment in treatment, parents were informed personally, and written consent was obtained for counseling. Importantly, we emphasized to both parents and children that participation was voluntary and could be discontinued at any time.

samples of convenience and did not address the problem of screening and treating large groups of children.

To our knowledge, this article describes the first randomized controlled study of a psychosocial treatment for postdisaster trauma symptoms. Hurricane Iniki struck Kauai, one of the Hawaiian Islands, on September 11, 1992, damaging 71% of the island's homes, and causing more than 2 billion dollars in damage. Iniki is ranked one of the most

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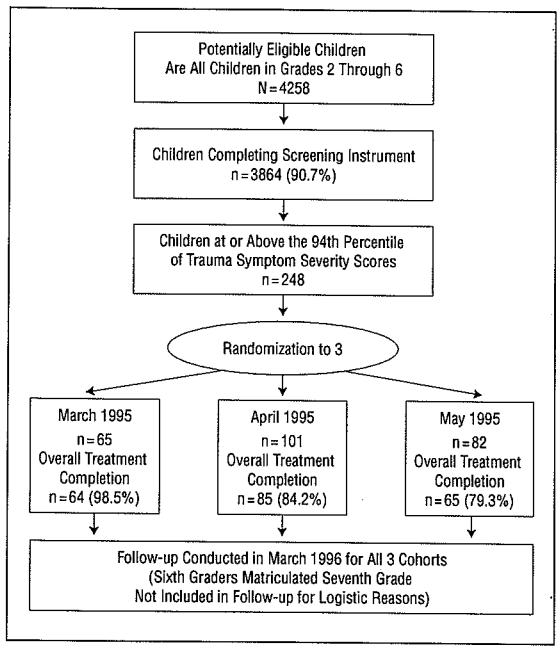

Flowchart for trial.

destructive disasters in United States history. Two years after Iniki, because school personnel reported continuing distress among children, this intervention study was undertaken. The present study addressed 2 clinical problems facing those proposing to intervene with children following a disaster: (1) how to identify symptomatic cases in a large population of children given that relatively few children are symptomatic, and that not all symptomatic children outwardly display disordered behavior; and (2) the feasibility and efficacy of providing treatment to relatively large numbers of affected children.

RESULTS

PARTICIPANT SCREENING

The screening KRI was completed by 90.7% of the grade-eligible children (second through sixth grades). There were 248 children who met the treatment-screening criteria on the KRI. The KRI items were keyed to the core symptoms, which comprise the diagnostic criteria for PTSD. This permitted estimating whether the children met *DSM-IV*[16] criteria for self-reported PTSD based on the child's endorsing "sometimes" or "almost all the time" for the required pattern of symptoms (1 reexperiencing symptom, 3 avoidance symptoms, and 2 arousal symptoms). This should be considered with caution, as diagnosis requires clinical evaluation and because our data did not include a measure of functional impairment. Eighty-eight percent of the children who entered the study met *DSM-IV* criteria for self-reported PTSD. Treatment-eligible children ranged in age from 6 to 12 years (mean age, 8.2 years; SD, 1.3 years). The largest ethnic groups represented were Hawaiian and part-Hawaiian (30.1 %), white (24.9 %), Filipino (19.7 %), and Japanese (9.2 %). Compared with the total population of screened children, those identified as having the highest levels of trauma symptoms were significantly more likely to have feared death or injury to self (χ^2_1=80.9, P<.001) and family (χ^2_1=53.2, P<.001), and had more intense fear reactions to the hurricane (χ^2_4=279.2, P<.001). Girls were significantly more likely to be among the KRI-identified group (60.9% vs 46.2%) than their representation in the population (χ^2_2=20.4, P<.001). Treatment-eligible children were also poorer, as indexed by eligibility for subsidized school lunches (χ^2_4=20.2, P<.001) (**Figure**).

TREATMENT FINDINGS

Treatment was completed by 214 of the KRI-identified children (86.3%). There were 176 children who were assigned to receive group treatment, while 73 children were assigned to individual treatment. Parents asked that 6 children (2.4%) be excluded; 13 children (5.2%) started treatment but did not attend all sessions; the remaining 15 children (5.6%) did not start treatment for many reasons, including family moves. Among the treatment completers, there were 152 girls (61.4%) and 97 boys (38.6%). Noncompleters were significantly older (mean age=8.85 years) than completers (mean age=8.22 years); t_{246}=2.6; P < .01. There were no significant differences in sex or ethnicity between treatment completers and noncompleters.

Effect of Treatment on Self-reported Trauma Symptoms (KRI)

To assess the efficacy of treatment within waves, we used a repeated-measures analysis of variance (ANOVA) in which treatment wave and treatment type (group or individual) were the between-group factors, and trauma symptoms (pretreatment and posttreatment assessment) was the repeated measure. The within-subject treatment factor was significant ($F_{1,208}$=51.34; P<.001). The effect size for this repeated-measures analysis was 0.50, and is comparable with an effect size of 0.70 in an unmatched-samples t test.[19] There were no significant main effects for treatment cohort ($F_{1,208}$=1.97) or for treatment type (individual vs group) ($F_{1,208}$=1.55; neither P nor any of the interactions was significant). A 1-way ANOVA confirmed that the pretreatment scores were comparable despite the passage of time (F=1.35; P=.26). **Table 1** presents means and confidence intervals.

To further examine possible effects of treatment type, we compared treatment attrition using a χ^2 analysis. Children were significantly more likely not to complete individual treatment (14.6%) than group treatment (5.1%) (χ^2_1=7.1; P < .01).

In our design, children in each treated cohort were administered the KRI measure 1 time more than the untreated next cohort. Therefore, treatment effects could have been due to the additional administration of the KRI. To control for the possible effects of repeated administration of the KRI, the retest-only group was administered the KRI measure twice, without intervening treatment. There was no discernible change in KRI scores between these 2 administrations (paired sample t_{41}=0.15, P=.88).

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Table 1. Means and Confidence Intervals for Pretreatment and Posttreatment Points of Assessment by Type of Treatment and Treatment Cohort

Treatment Type	Cohort When Treated	Point of Assessment	Mean (SE) [95% Confidence Interval] Score
Group treatment	1	1	45.60 (1.12) [43.40-47.81]
		2	40.96 (1.18) [38.64-43.28]
	2	1	46.57 (0.96) [44.68-48.46]
		2	41.57 (1.01) [39.58-43.56]
	3	1	43.74 (1.4) [40.98-46.49]
		2	40.91 (1.47) [38.02-43.81]
Individual treatment	1	1	46.27 (2.46) [41.43-51.16]
		2	38.64 (2.58) [33.55-43.74]
	2	1	44.00 (2.26) [39.55-48.45]
		2	37.54 (2.37) [32.86-42.22]
	3	1	43.77 (1.46) [40.89-46.66]
		2	40.16 (1.54) [37.13-43.19]

Child Reaction Index

To obtain a clinician evaluation of the effects of treatment to complement the self-report data, the CRI was administered by clinicians blinded to whether the child they were evaluating had been treated or not. Because of resource limitations, we drew random samples of treated (n=21) and untreated (n=16) children for this comparison. The treated wave had significantly lower scores (mean score=11.65) than the untreated wave (mean score=20.32); $t_{34}=2.76$; $P=.01$. This reflects an effect size of 0.76.

FOLLOW-UP

Ninety-three percent of treatment participants were available at follow-up. As they had matriculated to different schools, for logistic reasons, children who were sixth graders (n=25) at the time of treatment were not included in the follow-up. A repeated-measures ANOVA, with time of assessment (pretest vs posttest vs follow-up) as the repeated factor, again showed statistically significant differences in KRI scores between measurements ($F_{1,174}=63.72$, $P<.001$). The significant effect was accounted for by the reduction in KRI scores between pretreatment and posttreatment. Follow-up KRI scores were also significantly lower than pretreatment scores. There was no significant difference between posttreatment and follow-up KRI scores. **Table 2** presents means and confidence intervals.

Table 2. Means and Confidence Intervals for Pretreatment, Posttreatment, and Follow-up Points of Assessment by Type of Treatment and Treatment Cohort

Treatment Type	Cohort When Treated	Point of Assessment	Mean (SE) [95% Confidence Interval] Kauai Recovery Inventory Score
Group treatment	1	1	46.13 (1.19) [43.78-48.47]
		2	41.67 (1.23) [39.25-44.08]
		3	37.85 (1.32) [35.25-40.46]
	2	1	46.67 (1.09) [44.52-48.82]
		2	42.00 (1.12) [39.78-44.22]
		3	40.67 (1.21) [38.28-43.05]
	3	1	43.72 (1.45) [40.85-46.59]
		2	40.59 (1.50) [37.63-43.56]
		3	40.03 (1.61) [36.85-43.22]
Individual treatment	1	1	45.43 (3.11) [39.30-51.56]
		2	36.14 (3.21) [29.81-42.47]
		3	38.71 (3.45) [31.90-45.53]
	2	1	45.75 (2.91) [40.01-51.49]
		2	39.25 (3.00) [33.33-45.17]
		3	40.38 (3.23) [34.00-46.75]
	3	1	44.09 (1.71) [40.70-47.47]
		2	40.83 (1.77) [37.33-44.32]
		3	41.23 (1.90) [37.46-44.98]

COMMENT

These results illustrate that it is feasible to screen a large population of children 2 years after a major disaster for disaster-related trauma symptoms. Our results suggest strongly that schools provide an effective mechanism by which to accomplish this screening. The screening suggested a number of risk factors for developing the highest levels of symptoms. These included female sex, younger age, lower socioeconomic status as indexed by eligibility for school lunch subsidy, reacting with panic to the event, and fearing the physical safety of family and self during the disaster.

Reductions in the children's reports of trauma-related symptoms following treatment suggested that the intervention was effective. Consistent with the children's self report, clinical interviewers rated the treated children as having fewer symptoms than the untreated children. Notably, group and individual treatment modalities did not differ in effectiveness, but group treatment was associated with better treatment completion rates. The convergence of clinician ratings and self-report findings, as well as controls for the passage of time and for the effects of assessment, suggest that these results did not merely reflect situational demand characteristics.

Several methodological limitations should be acknowledged. For ethical reasons, we could not compare treated with untreated children with the same levels of symptoms by withholding treatment from some throughout the full course of the study period. However, we did randomize children to treatment waves, and pretreatment scores on the KRI were comparable despite the passage of time. We also provided a partial control for this limitation through the recruitment of a comparison group of children who were only slightly less symptomatic, and who showed no change due to mere retesting. Finally, sensitivity to the postdisaster context prevented us from administering measures that could not be tied directly to a specific benefit for these children. Therefore, we were unable to administer the KRI to all treatment waves at every assessment point. These limitations reflect restrictions associated with conducting intervention research in postdisaster environments because of heightened sensitivity to perceived researcher intrusiveness. Future research might circumvent this problem by comparing alternative treatments.

This study also has several strengths. The population-based selection of treatment participants was extraordi-

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What This Study Adds

This article outlines a public-health–inspired school-based methodology for screening and identifying elementary school–aged children who continue to suffer disaster-related trauma symptoms 2 years after a major natural disaster. It also describes the provision of psychosocial treatment and its evaluation using randomized lagged group designs. To our knowledge, ours is the first study to ever conduct a randomized evaluation of postdisaster trauma symptom treatment in children or adults. Besides validating these screening and treatment methods, the study shows that it is possible to conduct such research in the very difficult psychosocial environment of a community affected by a catastrophic disaster. These methods are likely to be applicable to assisting the recovery of children exposed to other types of disaster.

narily comprehensive. Participants were randomized to treatment waves. A far larger number of children were involved than in prior studies. Converging measures of treatment outcome, child self-reports and clinician rating of trauma symptoms supported the positive effects of treatment. Moreover, the intervention included a "1-year" follow-up, which demonstrated that there was no resurgence of trauma-related symptoms. Importantly, follow-up was used to identify treatment nonresponders and to provide them subsequent, more intensive, clinical treatment.[20] This subsequent treatment study demonstrated that 1 outcome of successful treatment was reduced help-seeking for somatic complaints reported by school nurses during the year following treatment.

Research in postdisaster environments is difficult to perform because disaster-affected people often wish to avoid disaster reminders. This complicates the implementation of research because people can experience knowledge gathering as an unwelcome disaster reminder and as exploitative of their misfortune. Our experience suggests that it is possible to conduct systematic postdisaster intervention research when the research aim is clearly secondary to providing supportive services to an affected community.

We evaluated a systematic strategy to assist in the postdisaster psychological recovery of a community's children. This approach uses schools as a natural means through which to (1) provide cost-effective screening of a population of children; (2) deliver cost-effective treatment to disaster-affected children (using school-based therapists); and (3) monitor recovery through follow-up screening. Follow-up provides the opportunity to identify children with symptoms and to treat them using more intensive methods by more highly trained clinicians as described elsewhere.[20] This public-health–inspired strategy seems to merit further evaluation with children exposed to disasters. It may also be useful in other posttraumatic contexts, such as facilitating children's psychological recovery in the aftermath of war or community violence.

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