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Contents lists available at ScienceDirect

Psychiatry Research

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

Lockdown, quarantine measures, and social distancing: Associations with depression, anxiety and distress at the beginning of the COVID-19 pandemic among adults from Germany



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ARTICLE INFO

Keywords:

Public health measures
Loneliness
Panic attack
Life-satisfaction

ABSTRACT

The COVID-19 pandemic is suggested to have a negative impact on mental health. To prevent the spread of Sars-CoV-2, governments worldwide have implemented different forms of public health measures ranging from physical distancing recommendations to stay-at-home orders, which have disrupted individuals' everyday life tremendously. However, evidence on the associations of the COVID-19 pandemic and public health measures with mental health are limited so far. In this study, we investigated the role of sociodemographic and COVID-19 related factors for immediate mental health consequences in a nationwide community sample of adults from Germany ($N = 4335$). Specifically, we examined the effects of different forms and levels of restriction resulting from public health measures (e.g. quarantine, stay-at-home order) on anxiety and depression symptomatology, health anxiety, loneliness, the occurrence of fearful spells, psychosocial distress and life-satisfaction. We found that higher restrictions due to lockdown measures, a greater reduction of social contacts and greater perceived changes in life were associated with higher mental health impairments. Importantly, a subjectively assumed but not an officially announced stay-at-home order was associated with poorer mental health. Our findings underscore the importance of adequate risk communication and targeted mental health recommendations especially for vulnerable groups during these challenging times.

1. Introduction

The coronavirus disease (COVID-19) has recently evolved into a global crisis affecting the physical and mental health of people worldwide. Due to the rapid dissemination of the Sars-CoV-2 virus and its potential deleterious effects for physical health, governments worldwide have imposed different forms and levels of public health measures ranging from physical distancing recommendations to stay-at-home orders to contain an uncontrolled spreading of the Sars-CoV-2 virus. Although being effective in preventing a further dissemination of the coronavirus (Nussbaumer-Streit et al., 2020), these measures may have changed peoples' everyday life significantly and may have led to an immediate disruption of self-regulated behavior and a reduction of social connections (e.g. loss of reinforcer and social support, perceived controllability) which may lead to specific mental health problems, especially in vulnerable people (Lewinsohn and Atwood, 1969; Brooks et al., 2020; Holmes et al., 2020). Moreover, people are faced with the risk of a potentially life-threatening COVID-19 infection,

which may trigger feelings of uncertainty, fear, anxiety and even result into social isolation (Asmundson and Taylor, 2020; Mertens et al., 2020).

A few previous studies from different countries worldwide investigated the role of sociodemographic and COVID-19 related factors for mental health (González-Sanguino et al., 2020; Losada-Baltar et al., 2020; Pierce et al., 2020; Tull et al., 2020; Wang et al., 2020; see Luo et al., 2020; Vindegaard and Eriksen Benros, 2020 for a review). Their findings suggest that especially women, younger people, as well as individuals with a mental disorder, chronic somatic disease, and predisposing factors for a potentially severe course of COVID-19 are at risk for mental health problems during these challenging times. However, studies on the effects of different forms and levels of restrictions resulting from public health measures (e.g., stay-at-home orders, being quarantined or reduction of social contacts) on mental health are scarce. Studies from previous epidemics and the current COVID-19 pandemic investigated the role of quarantine and related measures for mental health. Some of these studies revealed that quarantine was

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associated with elevated mental health problems (Wang et al., 2020; Liu et al., 2012; Wu et al., 2009; Bai et al., 2004). However, these findings were not entirely conclusive, given that other research did not find such associations (Wang et al., 2011; Zhu et al., 2020; Wang et al., 2020; Zhang et al., 2020). Consequently, to adequately inform the public health care system and enable adequate measures to protect from or mitigate adverse mental health effects, the consequences and relevant factors influencing the psychological response to the pandemic and public health measures need to be characterized.

In Germany, daily infection rates rapidly increased early in March 2020. At that time, each federal state started to implement public health measures (e.g., closure of schools and kindergartens) to prevent a further spread of COVID-19. Although various measures were implemented all over Germany, some measures (e.g. stay-home orders) and the associated degree of restriction for individuals' personal and social life differed between German federal states. The present study was conducted four weeks after all German federal states had implemented public health measures (e.g., minimum distance of 1.5 m to other persons, closure of non-essential shops, such as bookstores, warehouses; see Steinmetz et al., 2020). At the time of the study, the highest rate of COVID-19 related death per day in Germany was recorded since the outbreak of COVID-19 in Germany. The present study was aimed at identifying potential predictors for immediate mental health consequences to the COVID-19 pandemic and related public health measures in Germany.

2. Methods and materials

2.1. Participants

Between 17th April and 15th May 2020, a cross-sectional study was conducted among 4335 adults (75.8% women and 24.2% men) from all federal states of Germany. Participants were aged between 18 and 95 years ($M = 40.50$ years, $SD = 12.45$ years). The study started during the first peak of the corona crisis in Germany (highest rate of COVID-19 related deaths per day), four weeks after all German federal states had implemented public health measures. Participants were recruited via convenience sampling methods (social media, personal contacts, e-mails, etc.) and completed an online survey (sosicisurvey.de). All participants provided informed consent. The study was approved by the local Ethics Committee of the University of Marburg.

2.2. Measures

2.2.1. Sociodemographic and COVID-19-related variables

In addition to sociodemographic and COVID-19-related variables (see Table 1 for an overview), we assessed the following variables related to implemented public health measures:

2.2.1.1. Perceived changes in life due to public health measures. Participants were asked to rate how much their everyday life had changed due to governmental measures that were taken to contain COVID-19 spreading on a 9-point Likert-scale (ranging from 'not at all' to 'very strong') and whether they perceived these changes as positive, neutral, or negative.

2.2.1.2. Social distancing. Participants were asked to indicate how frequently they currently engage in social contacts with reference to January 2020 (prior to COVID-19 outbreak in Germany; converted scale: much less, less, unchanged) and whether they are distressed (5-point Likert-scale ranging from not stressful at all to extremely stressful) by the restriction of social contacts.

2.2.1.3. Restrictions due to public health measures. 14 forms of restriction measures that have been suggested to disrupt self-regulated and psychologically relevant behavior of individuals were systematically

recorded for each of the 16 German federal states on a day by day basis (e.g., prohibition to meeting with others in public places, closure of kindergartens or daycare, prohibition to leave the apartment without reason) by the Leibniz Institute for Psychology Information (ZPID, Germany; Steinmetz et al., 2020). Each type of restriction was coded as not present (=0), partially (=1) or fully (=2) in place. For each public health measure, we determined the highest level of restriction (i.e., not present, partially or fully in place) within the period prior to the start of the survey. Afterwards, the score of each measure was summed up to determine the overall level of personal and social restrictions resulting from public health measures in each federal state.

2.2.1.4. Stay-at-home-order. Data provided by the ZPID were also used to objectively determine which German federal state had announced a prohibition to leave the apartment without reason.

2.2.1.5. Perceived stay-at-home order. Moreover, participants were asked to indicate whether they assumed that the government of their federal state had imposed a prohibition to leave the apartment without reason. This allowed us to delineate the effect of officially announced and subjectively perceived stay-at-home-orders on psychological outcome measures.

2.2.2. Outcome measures

The following psychological outcome measures were assessed:

Depressive symptoms were assessed with the Patient Health Questionnaire-9 (PHQ-9; Kroenke et al., 2001). Generalized anxiety was assessed with the 7-item Generalized Anxiety Disorder scale (GAD-7; Spitzer et al., 2006; Kroenke et al., 2007), health anxiety with the short version of the Whitely Index (Fink et al., 1999; Hiller et al., 2002). Moreover, using the respective question of the DSM-5 CIDI, participants were asked to indicate whether they had experienced a fearful spell during the last 4 weeks.

Loneliness was assessed with the 3-item version of the UCLA Loneliness Scale (Russell, 1996). Psychosocial distress (e.g., due to financial problems or worries, distress at work, distress resulting from childcare, etc.) was assessed with the Stress module of the Patient Health Questionnaire. Finally, and as in previous research (see Lucas and Donnellan, 2012), general life satisfaction was assessed with a single item ("All things considered, how satisfied are you with your life these days?") and a 11-point Likert-scale ranging from 0 (completely dissatisfied) to 10 (completely satisfied).

2.3. Data analysis

Statistical analyses were conducted with SPSS 26 (SPSS for windows, IBM). Analyses including data provided by the ZPID (Restrictions by public health measures and officially announced stay-at-home orders) were limited to those participants who reported their zip codes ($n = 4185$). First, linear regressions (adjusted for gender and age) were used to test associations of sociodemographic and COVID-19-related factors with psychological outcomes. Second, all sociodemographic and COVID-19-related variables being significantly associated with outcomes were used as multiple predictors for outcome measures. The alpha level was set at 0.05.

3. Results

3.1. Clinical characteristics

In the present study, 31.1% of the sample exceeded the cutoff score for a potential depression diagnosis (PHQ-9 ≥ 10), 21.2% exceeded the cutoff score for a potential anxiety disorder diagnosis (GAD-7 ≥ 10), 29.4% exceeded the cutoff score for health anxiety (WI-7 ≥ 3), 55.2% reported to be lonely (Loneliness ≥ 6), 41.4% of the sample reported mild psychosocial distress (PHQ stress module scores ranging between

Table 1
Associations of sociodemographic and COVID-19-related predictors with psychological outcome measures.

Sociodemographic variables		n (%)	Depression β	Anxiety β	Health Anxiety β	Loneliness β	Fearful spell OR	Psychosocial distress β	Life-satisfaction β
Gender									
Male		1051 (24.2%)							
Female		3284 (75.8%)	.034*	-.033*	.007	-.0003	1.166	.120***	.059***
			-.0186***	-.0144***	.015	-.0146**	.977***	-.0048**	.132***
Age									
Educational level									
Low (reference)		184 (4.2%)							
Middle		2233 (51.5%)	-.0132***	-.0116**	-.0143	-.0149**	0.887	-.0102**	.107*
High		1918 (44.2%)	-.0215***	-.0178***	-.0221	-.0207***	0.598*	-.0175***	.183***
Employment									
Employed (reference)		3507 (80.9%)							
Unemployed/non-working		828 (19.1%)	.119**	.098***	.073***	.081***	1.508***	.029	-.0124***
Relationship									
Single (reference)		1494 (34.5%)							
Partnership – not living together		368 (8.5%)	-.0018	.003	-.0018	-.0011	1.212	.016	.031
Partnership – living together		2473 (57.0%)	-.0111***	-.0033	.006	-.0078***	.891	.043*	.166***
Living alone									
No		3287 (75.8%)							
Yes		1048 (24.2%)	.090***	.032*	.001	.083***	1.212	-.0035*	-.0121***
Living with underage children									
No		2967 (68.4%)							
Yes		1368 (31.6%)	-.0042**	.015	-.0009	.015	.815*	.146***	.038*
Current or previous psychiatric/psychotherapeutic treatment									
No		2683 (61.9%)							
previous		1015 (23.4%)	.185**	.183**	.161***	.069**	3.209***	.161***	-.0127***
current		634 (14.6%)	.362***	.329***	.249***	.136***	6.001***	.265***	-.0251***
COVID-19-related variables									
COVID-19 risk group - self									
No		2728 (62.9%)							
Yes		1606 (37.1%)	.161***	.143***	.270***	.043**	2.097***	.115***	-.0113***
COVID-19 risk group – loved ones									
No		984 (22.7%)							
Yes		3350 (77.3%)	.003	.019	.056***	-.0046**	1.206	.019	-.0004
Quarantine									
No		3975 (91.7%)							
Yes - voluntary		229 (5.3%)	.022	.008	.050**	-.0012	1.504*	.007	-.0007
Yes – regulatory action		131 (3.0%)	.007	-.0007	.004	.019	1.076	.020	-.0001
COVID-19 diagnosis - self									
No		4313 (99.5%)							
Yes		21 (0.5%)	.009	-.0015	-.0002	.034*	1.521	.011	.002
COVID-19 diagnosis – loved ones									
No		4096 (94.5%)							
Yes		238 (5.5%)	-.0010	-.0013	-.0012	.009	0.821	.007	.020
Restrictions by public health measures									
Reduction of social contacts			.014	.022	.015	.036*	1.021	.034*	-.0036*
Distress related to restriction of social contacts			.120***	.116***	-.0013	.272***	1.150*	.088***	-.0121***
Perceived changes in life due to public health measures			.427***	.442***	.107***	.766***	1.678***	.371***	-.0402***
Appraisal of perceived changes in life			.209***	.238***	.020	.521***	1.176***	.215***	-.0207***
Officially announced stay-home order			.240***	.259***	.014	.528***	1.778***	.217***	-.0272***
No		2998 (71.6%)							
Yes		1187 (28.4%)	.012	.019	.000	.018	1.061	.015	-.0023

(continued on next page)

Table 1 (continued)

Sociodemographic variables		n (%)	Depression β	Anxiety β	Health Anxiety β	Loneliness β	Fearful spell OR	Psychosocial distress β	Life-satisfaction β
Subjectively perceived stay-home order									
No		2161 (51.6%)			.016	.053**	1.347**	.043**	-0.040**
Yes		2023 (48.4%)	.060***	.059***					

OR: Odds Ratios from logistic regressions; β: standardized beta coefficient; all logistic and linear regressions were adjusted for age and gender.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

5 and 9), while 26.5% reported moderate to severe psychosocial distress (PHQ stress module ≥ 10). 13.1% of the sample reported having experienced a fearful spell during the last 4 weeks. The mean score of life-satisfaction was 6.42 ($SD = 2.31$).

3.2. Sociodemographic variables

Associations between sociodemographic factors and psychological outcomes are presented in Table 1. Female sex, younger age, a lower educational level, being unemployed, being single, living alone, living without underage children and a current or past psychotherapeutic or psychiatric treatment were associated with higher depressive symptomatology. Female sex, younger age, a lower educational level, being unemployed, living alone, as well as current or past psychotherapeutic or psychiatric treatment were associated with higher anxiety symptomatology. Being unemployed or not working and current or past psychotherapeutic or psychiatric treatment was associated with higher health anxiety. Younger age, lower educational level, being unemployed, living alone and current or past psychotherapeutic or psychiatric treatment were associated with higher loneliness. Female sex, younger age, lower educational level, living together in a relationship, living with underage children and a current or past psychotherapeutic or psychiatric treatment were associated with higher psychosocial distress. Female sex, older age, a higher educational level, being employed, cohabiting with a partner, cohabiting with children, no current or past psychotherapeutic or psychiatric treatment were associated with higher life-satisfaction.

3.3. COVID-19-related variables

Being in self-quarantine was associated with higher health anxiety and with fearful spells. However, being quarantined by a local health authority was not associated with any psychological outcome. Belonging to an officially announced COVID-19 risk group was associated with higher anxiety and depressive symptomatology, health anxiety, fearful spells, higher psychosocial distress, and lower life-satisfaction. Having contact to loved ones that belong to an officially announced COVID-19 risk group was associated with higher health anxiety and lower loneliness. Having a confirmed diagnosis of COVID-19 was associated with higher loneliness, while a confirmed diagnosis of COVID-19 in loved ones was not associated with any outcome measure.

3.3.1. Perceived changes in life and social distancing

A higher level of restriction due to public health measures was associated with higher loneliness, higher psychosocial distress, and lower life-satisfaction. A stronger reduction of social contacts, higher distress due to restrictions of social contacts, stronger perceived changes in life due to the public health measures and a more negative appraisal of these perceived changes were positively associated with higher anxiety and depressive symptomatology, fearful spells, psychosocial distress and lower life-satisfaction. There was no association (except for social distancing related distress) of these predictors with health anxiety.

3.3.2. Effect of perceived and officially announced stay-at-home orders

41.1% of the sample correctly reported that there was no officially announced stay-at-home order in their federal state, while 21.8% of the current sample correctly reported to live in a federal state in which government had announced a stay-at-home order. However, 26.6% of the sample reported that there was an officially announced stay-at-home order in their federal state, despite the fact that there was no governmental imposed prohibition to leave the apartment without reasons. 6.6% of the sample negated that the government has officially announced a stay-at-home order, while their federal state has officially announced a stay-at-home order.

There was no association of officially announced stay-at-home

orders with psychological outcome measures (see Table 1). However, perceived stay-at-home orders were associated with higher anxiety and depressive symptoms, fearful spells, higher psychosocial distress, higher loneliness, and lower life-satisfaction (see Table 1). Perceived stay-at-home orders were unrelated to health anxiety. Moreover, to test whether perceived stay-at-home orders interacted with officially announced stay-at-home orders in predicting scores on psychological outcome measures, an interaction term was included in the regression analysis. The moderation analysis revealed that an officially announced stay-at-home order did not interact with the perceived stay-at-home order in predicting mental health outcomes. That is, participants who believed that government had announced a stay-at-home order reported higher scores on psychological outcome measures whether or not government has officially announced stay-at-home orders in their federal state (officially announced \times subjectively perceived stay-at-home order interaction, $\beta_s = -0.028 - 0.041$, $OR = 1.494$, all $ps > 0.05$). Moreover, negating a stay-at-home order despite the fact that government has announced a stay-at-home order was unrelated to our mental health outcomes ($\beta = -0.015 - 0.010$, $OR = 0.709$, all $ps > 0.05$).

3.4. Multiple regressions on psychological outcomes

Table 2 summarizes the predictors that remained significantly related to the psychological outcomes in multiple regression models. A current or past psychiatric or psychotherapeutic treatment, belonging to a COVID-19 risk group and perceived distress related to the restriction of social contacts were significant predictors in all models (see Table 2 for detailed information on all significant predictors for the respective outcome measure). The overall models significantly explained between 12.2% and 64.1% of variance in psychological outcome measures (see Table 2), all p -values < 0.001 .

4. Discussion

In early 2020, governments worldwide started to implement different forms of public health measures ranging from physical distancing recommendations to stay-at-home orders to prevent further spreading of COVID-19. For the first time, this study investigated socio-demographic and COVID-19 related factors and, specifically, the role of such different types of governmentally imposed lockdown measures for depressive and anxiety symptoms as well as other health outcomes across all federal states of Germany. In the present sample, 31.1% exceeded the cutoff score for a potential depression, 21.2% exceeded the cutoff score for a potential anxiety disorder diagnosis and 13.1% of the sample reported having had a fearful spell during the past 4 weeks. These data are comparable to the prevalence reported in studies conducted in other countries during the COVID-19 pandemic (Luo et al., 2020). Consistent with previous studies from countries around the world (see Luo et al., 2020; Vindegaard and Eriksen Benros, 2020 for a review), we found that belonging to a risk group for a severe course of COVID-19, a current or past treatment due to mental health problems, being unemployed or non-working, a lower educational level and younger age were associated with negative mental health consequences of the COVID-19 public containment measures. Moreover, we revealed that a stronger reduction of social contact, stronger perceived changes in life, and a perceived stay-at-home order were associated with poorer mental health. In multiple regressions, common factors that remained significantly related to all outcome measures included a current or past treatment due to mental health problems, distress related to contact restriction and belonging to a risk group for a severe course of COVID-19.

In the present study, we found that a higher level of restrictions due to lockdown measures was associated with more loneliness, higher psychosocial distress and lower life-satisfaction but was not related to anxiety and depressive symptomatology or fearful spells. Although the level of restriction due to lockdown measures was not associated with

an immediate increase in psychopathological symptoms, more loneliness and higher psychosocial distress might be relevant factors that facilitate or moderate potential negative consequences for mental health. Especially loneliness has been associated with an increased risk for several mental disorders and somatic diseases in general (Beutel et al., 2017; Holt-Lunstad et al., 2015; Valtorta et al., 2018; Luhmann and Hawkey, 2016) and during the current pandemic (Palgi et al., 2020; González-Sanguino et al., 2020; Luchetti et al., 2020). For example, recent studies found that loneliness strongly predicted depressive and anxiety symptoms during COVID-19-related lockdown measures (Palgi et al., 2020; González-Sanguino et al., 2020). Thus, reducing loneliness might be an important target for prevention programs in order to mitigate negative mental health consequences during these challenging times (Holmes et al., 2020).

Moreover, an officially announced stay-at-home order was not related to mental health outcomes. However, about one in four respondents reported to live in a German federal state in which government has imposed a prohibition to leave the apartment without sound reasons (stay-at-home order), while objective data indicated that the respective government had *not* announced such stay-at-home-order. Although there was a stay-at-home order, 6% of the sample negated that there was an officially imposed prohibition to leave the apartment in their federal state. In contrast to the officially announced stay-at-home order, a perceived stay-at-home order was associated with poorer mental health outcomes. The present findings extend preliminary results from a small cross-sectional study in the US (Tull et al., 2020) in demonstrating that a perceived stay-at-home order was related to more severe depressive and anxiety symptomatology, greater reported loneliness, more fearful spells, greater psychosocial distress and lower life-satisfaction irrespective of whether a stay-at-home order was officially announced or not. Importantly, those persons who were affected by a stay-at-home order but took no notice of this order showed no negative mental health consequences. The present finding indicates that misinformation about official stay-at-home orders might have a negative impact on mental health. For example, recent studies found that insufficient information (González-Sanguino et al., 2020) or misinformation ('fake news') on COVID-19 (Wang et al., 2020) was associated with poorer mental health and well-being (Ko et al., 2020; Chao et al., 2020; Gao et al., 2020). In contrast, receiving information from health professionals or other experts was not associated with negative mental health consequences (Ko et al., 2020; Chao et al., 2020). Taken together, this suggests that appropriate risk communication during these challenging times of crisis is particularly crucial. Thus, it seems important to announce timely, coordinated, transparent and definite instructions in plain language to all persons via official information channels to mitigate confusion, uncertainties, and misinformation regarding public health measures, to prevent negative mental health consequences.

The present results should be considered in the light of the following limitations. In the present study, individuals of all ages (18 - 95 years) and from all German federal states were recruited. However, as a result of our recruitment method (i.e., convenience sampling methods) older respondents and men were relatively underrepresented in the current sample which limits the generalization of the present results to the general population of Germany and other countries. Our study exclusively relied on self-report data which might have been subject to memory and recall-biases. Moreover, we only assessed internalizing symptoms like depressive or anxiety symptoms, while externalizing symptoms (e.g., anger, aggression, alcohol abuse) might also be affected by public health measures and restrictions (Brooks et al., 2020).

The present study makes a significant contribution to the identification of potential risk groups and the impact of public health measures for immediate mental health consequences during the COVID-19 pandemic. The current findings suggest that the COVID-19 pandemic causes negative consequences for mental health especially in vulnerable groups (e.g. young adults, individuals with a mental disorder) which

may need special attention and support by implementing interventions or prevention programs to mitigate long-term consequences for mental health (Holmes et al., 2020). Moreover, in our study, there was little evidence that public health measures per se were associated with immediate mental health impairments. Nonetheless, such measures might have unfavorable long-term effects on mental health. For example, lockdown measures have been associated with increased psychological distress and loneliness (Tull et al., 2020). In line with vulnerability-stress models, it is plausible to assume that such unfavorable feelings not necessarily relate to immediate mental health impairments, but may increase the risk to develop psychopathological symptoms and mental disorders in the future. Most importantly, the present data indicate that people's subjective perceptions of public health measures (i.e., the appraisal of perceived changes in life resulting from lockdown measures and the reduction of social contacts as negative or stressful) seem to be associated with increased psychopathological symptoms. This data underscores the need for appropriate risk communication to prevent insecurity, fear, and confusion and thus prevent negative mental health consequences. Moreover, it might be helpful to develop and implement interventions or prevention programs including positive reappraisal or reframing and recommendations to maintain social contacts (e.g., via social media, video calls) in the face of physical distancing and contact restrictions to mitigate the negative effect of public health measures on mental health.

CRediT authorship contribution statement

Christoph Benke: Conceptualization, Methodology, Formal analysis, Investigation, Writing - original draft, Writing - review & editing. **Lara K. Autenrieth:** Conceptualization, Methodology, Formal analysis, Investigation, Writing - review & editing. **Eva Asselmann:** Conceptualization, Methodology, Writing - review & editing. **Christiane A. Pané-Farré:** Conceptualization, Methodology, Writing - review & editing, Supervision, Project administration.

Declaration of Competing Interest

The authors declare no conflict of interest.

Acknowledgement

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. The authors declare no conflict of interest. All authors report no financial relationships with commercial interests.

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