Method Note

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Reminders in Web-Based Data Collection: Increasing Response at the Price of Retention?

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Abstract

Evidence-based insight on the effectiveness of reminders in web-based data collection in online panels is scarce. Thirty-eight studies were conducted in three different online panels to examine the effect of reminders on response rates, retention rates, and two facets of response quality (i.e., item omissions and response nondifferentiation). The studies were summarized using a meta-analytical approach including moderator tests ($N = 246{,}040$). Results indicated that reminders in web-based data collection increase response (i.e., from 49.5% to 65.6%, $ES_{pd} = .152$). However, reminders somewhat reduce retention (i.e., from 98.0% among prereminder respondents to 97.2% among reminded respondents, $ES_{pd} = -.008$), which might be explained by differences in motivation and computer literacy between unreminded and reminded respondents. No differences were found between prereminder respondents and reminded respondents in item omissions and response nondifferentiation.

Keywords

reminder, online panel, web-based data collection, response, retention, response quality

The explosive growth of the Internet (Internet World Stats, 2009) as well as its possibilities such as interactivity makes the Internet a potentially useful medium to collect data for research (Thompson, Surface, Martin, & Sanders, 2003). According to Dillman, Smyth, and Christian (2008), web-based data collection is the next step in survey methodology after telephone interviewing. An important, if not the dominant, form of web-based data collection are online panels (Couper, 2000). An online panel is a pool of people who have agreed to repeatedly take part in web-based surveys (Göritz, Reinhold, & Batinic, 2002). In contrast to ad hoc recruitment of respondents, online panels reduce costs associated with locating appropriate respondents and ensure respondents' immediate availability (Göritz, 2004, 2007b).

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Nonresponse in web-based data collection reduces the effective sample size and can introduce bias, just as in off-line data collection (Armstrong, White, & Saracci, 1995). Because nonresponse can compromise the validity of studies, it is important to utilize techniques that increase response rates in web-based surveys (Cook, Heath, & Thompson, 2000). The response rate is the number of people who call up the first page of a study divided by the number of people who were invited to this study.

A technique that has been proven to be effective in increasing response in off-line data collection is a follow-up contact to remind people to participate if they have failed to heed the initial request for survey participation. A meta-analysis (Edwards et al., 2007) established an odds ratio (OR) of 1.44, meaning that a reminder increases the ratio of respondents to refusers by 44%. Reminders might be effective because the effort a researcher takes to remind potential respondents increases the perceived importance of the study (Wensing, Mainz, Kramme, Jung, & Ribacke, 1999). Moreover, according to ease-of-processing theory (Whittlesea, Jacoby, & Girard, 1990), repeated exposure to a stimulus (i.e., an invitation to participate in a study) leaves traces in long-term memory, and if one is exposed to a similar stimulus again (i.e., through a reminder), this stimulus will be processed more fluently. Thus, ease of processing as a result of receiving a reminder would lead people to be more inclined to participate (Bosnjak, Neubarth, Couper, Bandilla, & Kaczmirek, 2008).

In web-based surveys, reminders are often implemented by sending nonrespondents an e-mail to remind them to participate. This technique is almost cost free when applied in online panels, because e-mail is the method of choice to communicate with panel members. There are no costs, except for the time it takes to prepare and send the reminder. However, a reminder sent via e-mail tends to differ from a reminder sent via postal mail in terms of immediacy, layout, effort of opening and discarding, and often tone. These differences between reminders sent online and off line imply that we cannot simply transfer findings about a reminders' effectiveness from off line to online data collection. Furthermore, when studying the effect of a reminder on response quantity in off line data collection, it is merely useful to analyze the number of returned questionnaires. By contrast, studying the effect of a reminder in online data collection allows a finer distinction into its effect on response as well as retention. The retention rate is the number of people who stay until the last page of a study divided by the number of people who have called up the first page of this study. There are good reasons as well as preliminary evidence to assume that a reminder acts differently on people's willingness to call up the study (i.e., on response) than on respondents' willingness to finish the study (i.e., on retention).

With regard to the effect of a reminder on response, Kongsved, Basnov, Holm-Christensen, and Hjollund (2007) demonstrate the potential of reminders in web-based data collection: The response rate was 17.9% before a reminder and went up to 64.2% after a reminder. In this study, however, reminders were sent through postal mail. Sending regular mail after an initial e-mail invitation has been proven to be less effective compared with other combinations (Converse, Wolfe, Huang, & Oswald, 2008). In Leopold (2004), the prereminder response rate in an online panel was 39.9% and went up to 53.6% after a reminder was sent via e-mail. Moreover, in 68 online panel studies (Batinic & Moser, 2005), the more reminders were used in a study the higher the response rate tended to be: In the 16 surveys without reminder the response was 72%; in the 41 surveys with one reminder, it was 75%; in five surveys with two reminders, it was 79%; and in six surveys with three reminders, it was also 79%. It should be noted that this was a review across studies that either used a reminder or not. Consequently, the studies integrated in this review concurrently differed in characteristics other than the number of reminders.

With regard to the effect of a reminder on retention, there is preliminary evidence that people who participate before a reminder are less likely to drop out of the study than those who participate after a reminder. In other words, the retention rate is higher among panelists who take part before being sent a reminder than among panelists who take part after having been sent a reminder. In Leopold (2004), 2.9% of prereminder respondents abandoned the survey prematurely compared with 8.0% of post-reminder respondents.

To sum up the research that is available to date, reminders seem to augment response, but they seem to reduce retention. Although these figures suggest that reminders may be worthwhile at least with regard to response, one should not draw premature conclusions because systematic studies on the effectiveness of reminders in online panels—as well as other online settings such as intervention studies (Crutzen et al., 2011)—are scarce. Moreover, none of studies conducted so far has examined the effect of a reminder on facets of response quality other than the response or the retention rate. Response quality is a multifaceted construct (Bailar, 1984; De Leeuw, 1992) that is characterized by the absence of both measurement error (e.g., response nondifferentiation) and nonresponse error (e.g., item omissions; Dillman & Bowker, 2001; Groves, 1989; Tourangeau, Rips, & Rasinski, 2000).

We conducted 38 original studies in three different online panels to examine the effects of reminders on response, retention, and two other facets of response quality, namely, item omissions and response nondifferentiation. Five of these studies (Büttner & Göritz, 2008 [#5]; Göritz, 2004 [#2]; 2005 [#1, #6]; 2007a [#3]) have been published for their substantive results. To arrive at more robust conclusions and to be able to test for moderating effects, all studies were summarized using a meta-analytical approach. We examined the following research questions.

1. How much does the response rate increase due to sending a reminder?
2. To what extent does sending a reminder affect retention?
3. To what extent does response quality (i.e., item omissions and response nondifferentiation) differ between prereminder respondents and those who participate after receiving a reminder?
4. Are there moderators of the effect of reminders on retention and response quality, that is, under which circumstances are reminders more or less effective?

Although in view of the scarcity of existing research, these research questions are mainly exploratory; based on ease-of-processing theories, the authors hypothesize that a reminder increases the response rate. Moreover, the final response rate in a study after having deployed a reminder cannot be lower than the response rate that has been achieved until the reminder is sent out.

Method

Thirty-eight studies were conducted in one out of three different online panels. The studies covered a variety of topics such as trustworthiness of online pharmacies and everyday feelings. Table 1 provides an overview of the topics of the studies as well as differences among them (i.e., potential moderators).

Measures

First, we examined the response rate before and after the reminder, which is the number of participants who loaded the first page of a study divided by the number of participants who had been invited to this study. Second, we examined retention before and after the reminder, which is the number of people who reached a study's final page divided by the number of people who loaded the first page of that study. In addition, there were two measures regarding response quality: Number of omitted closed-ended items and response nondifferentiation, which is also called straightlining (i.e., the number of item grids that were answered in a vertical line). The measures pertaining to response quality were only taken into account if applicable, resulting in seven studies (see Table 1: #1, #2, #3, #4, #5, #6, and #9) with respect to the number of omitted closed-ended items and four studies (see Table 1: #1, #2, #3, #6) with respect to response nondifferentiation. The two measures of response quality were dichotomized for two reasons: (a) they were nonnormally distributed and (b) to make it possible to compare them despite differences among studies with

Table 1. Effect of Reminders on Response and Retention

Study	Topic	Type of panel	Year of study	Duration as announced (min)	Survey length (number of items)	Incentive type	Invitations	Response rate (%)		Retention rate (%)			
							T0	T1	T2	Prereminder respondents	Postreminder respondents	ES_{pd}	95% CI
#1	Information overload	C	2001	10	43	L	760	48.7	64.2	95.7	92.4	−.033	[−0.079, 0.013]
#2	Trends and innovations	C	2000	15	87	L+P	6,149	78.1	78.9	95.5	100.0	.045	[−0.012, 0.103]
#3	Evaluating media contents	N	2000	NA	80	L	317	55.8	74.1	98.9	72.4	−.265	[−0.343, −0.186]
#4	Everyday feelings and thinking styles	N	2001	NA	31	L	415	47.0	59.8	95.4	94.3	−.010	[−0.076, 0.055]
#5	Trust in web pharmacies	N	2001	17.5	120	P	810	41.2	55.6	89.8	89.7	−.002	[−0.066, 0.062]
#6	Contacts in professional life	N	2001	NA	51	L	166	58.4	75.9	88.7	86.2	−.025	[−0.159, 0.110]
#7	Cars and quality of life	N	2004	17.5	216	L	1,513	41.0	52.0	73.4	74.3	.009	[−0.067, 0.084]
#8	Knowledge and memory test	N	2008	11	124	L	1,330	68.0	80.2	84.0	74.7	−.093	[−0.156, −0.029]
#9	Emotional reactions	N	2005	10	71	L	753	72.1	84.1	75.7	70.0	−.057	[−0.154, 0.040]
#10	Health	N	2008	NA	205	P	3,830	26.9	42.3	96.4	94.4	−.020	[−0.041, 0.001]
#11	Norms and values	N	2007	NA	160	P	8,236	57.9	78.2	99.2	98.4	−.007	[−0.013, −0.002]
#12	Religion	N	2008	NA	112	P	8,604	58.2	79.4	99.6	99.2	−.004	[−0.008, 0.000]
#13	Leisure activities and Internet use	N	2008	NA	403	P	8,991	52.7	75.7	98.4	95.7	−.027	[−0.035, −0.019]
#14	Family	N	2008	NA	391	P	8,850	65.7	76.3	99.0	98.7	−.003	[−0.010, 0.004]
#15	Education and work	N	2008	NA	495	P	8,814	60.7	71.8	96.1	92.4	−.038	[−0.052, −0.024]
#16	Personal characteristics	N	2008	20	188	P	8,766	62.8	72.6	98.3	97.2	−.012	[−0.021, −0.002]

(continued)

Table 1 (continued)

Study	Topic	Type of panel	Year of study	Duration as announced (min)	Survey length (number of items)	Incentive type	Invitations	Response rate (%)		Retention rate (%)		ES_{pd}	95% CI
							T0	T1	T2	Prereminder respondents	Postreminder respondents		
#17	Personal characteristics	N	2009	20	189	P	8,124	41.8	64.2	99.0	97.9	−.011	[−0.017, −0.004]
#18	Personal characteristics	N	2010	15	190	P	8,574	52.3	65.6	99.4	99.2	−.001	[−0.007, 0.004]
#19	Income	N	2008	NA	305	P	8,735	33.0	57.8	94.7	93.7	−.010	[−0.023, 0.003]
#20	Possessions and loans	N	2008	NA	67	P	8,735	30.9	56.2	99.2	98.5	−.008	[−0.014, −0.002]
#21	Living	N	2008	NA	77	P	4,540	33.1	57.8	98.7	98.0	−.006	[−0.016, 0.003]
#22	Health	N	2008	NA	246	P	8,328	41.0	65.7	98.9	98.8	−.001	[−0.007, 0.005]
#23	Norms and values	N	2008	NA	160	P	8,333	45.5	67.3	99.1	97.6	−.015	[−0.022, −0.009]
#24	Religion	N	2009	25	124	P	8,274	51.5	64.6	98.9	98.4	−.005	[−0.012, 0.003]
#25	Family	N	2009	15	401	P	8,148	43.9	66.2	99.4	99.6	.002	[−0.002, 0.006]
#26	Education and work	N	2009	12.5	494	P	8,138	42.7	64.0	98.2	97.2	−.009	[−0.018, −0.001]
#27	Income	N	2009	NA	303	P	8,082	53.8	60.5	98.1	95.9	−.022	[−0.035, −0.009]
#28	Possessions and loans	N	2009	NA	62	P	8,082	55.6	61.9	99.0	99.0	.001	[−0.009, 0.010]
#29	Living	N	2009	NA	77	P	4,776	58.2	64.5	98.7	98.0	−.006	[−0.020, 0.007]
#30	Health	N	2009	20	246	P	9,340	50.5	60.0	99.3	97.8	−.015	[−0.022, −0.008]
#31	Norms and values	N	2009	NA	160	P	9,448	52.1	60.4	98.6	97.8	−.008	[−0.017, 0.001]
#32	Religion	N	2010	30	112	P	9,510	39.1	59.5	99.8	99.7	.000	[−0.003, 0.003]
#33	Leisure activities	N	2010	20	403	P	9,448	50.9	60.6	98.1	96.3	−.018	[−0.028, −0.008]
#34	Family	N	2010	NA	389	P	9,152	59.3	66.4	99.3	99.7	.004	[−0.003, 0.010]
#35	Education and work	N	2010	12	495	P	8,730	40.3	65.6	97.5	96.9	−.006	[−0.015, 0.003]
#36	Income	N	2010	NA	313	P	8,091	43.2	62.7	95.0	94.9	−.001	[−0.014, 0.012]
#37	Possessions and loans	N	2010	NA	61	P	8,091	42.5	62.5	99.0	99.1	.002	[−0.004, 0.008]
#38	Living	N	2010	NA	77	P	5,057	45.8	65.0	97.8	97.4	−.004	[−0.015, 0.008]
Total							246,040	49.5	65.6	98.0	97.2	−.008	[−0.012, −0.005]

Note: C = commercial; N = noncommercial; NA = duration not announced; L = lottery; P = per capita incentive; T0 = invitation, T1 = before reminder, T2 = after reminder.

regard to the number of items and number of item grids. Therefore, we chose the most conservative approach and dichotomized item omission into "no item omission at all" and "at least one item omitted." The same approach was used with response nondifferentiation, that is, we distinguished the values "no nondifferentiation with any grid" and "nondifferentiation with at least one grid." With item omissions and response nondifferentiation, only retainees were taken into account to prevent confounds with retention (cf. Göritz, 2005).

The meta-analytical approach permitted us to test several potential moderators, which might explain differences in the effect of reminders on the dependent variables across different studies. As potential and available moderators, we examined the type of panel (commercial vs. noncommercial), year of the study (range 2000–2010), whether the duration of participation was announced in the invitation e-mail (yes vs. no), in case the duration was announced the duration of participation as announced to invitees (range 10–30 min), survey length (range 31–495 items in the survey), and the type of incentive (lottery vs. per capita).

Analyses

A meta-analytical approach was used. As effect size measures, we chose the difference between proportions (ES_{pd}): The difference in response rate and retention before and after the reminder. Studies were weighted as described by Lipsey and Wilson (2001) by the inverse of the standard error of the effect (i.e., $\sqrt{(N/(p - q))}$, where N is the sample size, p the proportion, and $q = (1 - p)$). In addition, ORs are reported (Fleiss, 1994; Haddock, Rindskopf, & Shadish, 1998). Whenever primary studies were heterogeneous in their effect sizes, potential moderators (i.e., type of panel, year of study, announcement of duration and duration as announced, survey length, and incentive type) were taken into account using a hierarchical backward procedure to arrive at final models that are parsimonious (i.e., including significant moderators only). Analyses were conducted with SPSS 15.0, using Wilson's macros for meta-analyses (Lipsey & Wilson, 2001).

Results

On average, response rose from 49.5% to 65.6%, that is, by 16.1 percentage points due to sending a reminder (see Table 1, $k = 38$, $Z = 11.41$, $p < .0001$, $ES_{pd} = .152$). Retention is significantly smaller among respondents who participated after receiving a reminder than among prereminder respondents, 98.0% versus 97.2%, $k = 38$, $Z = -5.06$, $p < .0001$, $ES_{pd} = -.008$. In terms of effect size, however, this reduction in retention of 0.8 percentage points is small. Studies incorporated in this meta-analysis were heterogeneous regarding the effect of a reminder on retention, $Q(37) = 186.08$, $p < .0001$, suggesting that we conduct moderator tests. Table 2 shows the correlations between potential moderators and the effect size regarding retention. When potential moderators were taken into account, reduction in retention among respondents who participated after receiving a reminder compared with prereminder respondents was stronger with the type of incentive being a lottery ($k = 7$, $Z = -4.52$, $p < .0001$, $ES_{pd} = -.062$) instead of a per capita incentive ($k = 30$, $Z = -4.83$, $p < .0001$, $ES_{pd} = -.008$).

There was no significant difference in item omissions between prereminder respondents and those who participated after receiving a reminder, OR = .99, 95% CI = [0.96, 1.02], $k = 7$, $Z = -.78$, $p = .44$, $ES_{pd} = -.012$. Studies incorporated in this meta-analysis were homogeneous in this respect, $Q(6) = 9.68$, $p = .14$. Furthermore, there was no significant difference in response nondifferentiation between prereminder respondents and those who participated after a reminder, OR = .98, 95% CI = [0.95, 1.01], $k = 4$, $Z = -1.20$, $p = .23$, $ES_{pd} = -.019$. Primary studies were homogeneous in this respect, $Q(3) = 11.50$, $p = .07$.

Table 2. Correlations Between Potential Moderators and the Effect Size Regarding Retention

Correlations	1	2	3	4	5	6	7
1. ES_{pd}	–	.04	.33	.05	.31	.02	.47
2. Type of panel		–	−.38	.28	−.35	−.27	.05
3. Year of study			–	.06	.36	.37	.44
4. Announcement of duration				–	NA	.14	−.07
5. Duration as announced					–	.12	.48
6. Survey length						–	.37
7. Incentive type							–

Note: NA = not applicable.

Discussion

In 38 studies, a reminder improved the response rate by 16 percentage points, which is a substantial increase. This finding is in line with previous research (Batinic & Moser, 2005; Kongsved et al., 2007; Leopold, 2004). As this work was not geared at clarifying the mechanism by which an increase in response is achieved, we can only make suggestions in this direction. We suggest that reminders might be effective by inducing potential respondents to perceive a study as more important, by inducing potential respondents to reciprocate the effort, and/or by making the survey request more accessible in their memory. Future research is called for to shine a light on these as well as other potential mechanisms.

The positive effect of reminders on response being good news for researchers, this increase in response comes at a small price of retention, which is in line with preliminary results as well (Leopold, 2004). Retention among prereminder respondents (in our studies on average 98.0%) is slightly higher than among reminded respondents (in our studies on average 97.2%). Although a difference of about 1 percentage point is a trivial effect in terms of effect size, its impact is nontrivial, given the large number of people being addressed in web-based data collection (Crutzen, 2010a, 2010b; Rosenthal, 1996). Two mechanisms could explain this difference in retention.

First, respondents who participate after receiving a reminder may have lower motivation compared to prereminder respondents. This lower motivation is probably the reason why they did not take part prior to receiving a reminder. A reminder may convince some mildly motivated invitees to respond after all, but this reminder does not necessarily motivate these people to complete the questionnaire.

A second explanation for lowering retention pertains to respondents' computer literacy. Although members of online panels generally have a comparatively high level of Internet usage, even among online panelists, there is some variation with regard to their frequency of using the Internet. It has been shown that people who read their e-mail less frequently are also less computer literate (Gibbs, 2008). We propose that respondents who participate after a reminder have—on average—lower computer literacy than those who participate before the reminder. People who use the Internet less frequently are less likely to read the initial invitation in time, with the consequence that they are more likely to participate only after the reminder compared with people who use the Internet very often. People who use the Internet only once in a while compared with those who use it daily have increased chances of participating in a study, the longer the study is in the field, while the field time does not matter for people who use the Internet daily (Göritz & Stieger, 2009). A reminder effectively prolongs the field time. That is, in addition to the period until the initial deadline there is an extended deadline after the reminder is sent out. Furthermore, having lower computer literacy is associated with dropping out of a study prematurely for skill reasons (e.g.,

closing the survey window inadvertently). The two mechanisms—one motivational and the other one skill-based—are not mutually exclusive but might operate simultaneously. Future research may elucidate how much each of these mechanisms contributes to bringing about the observed effect of lower retention among reminded respondents.

The meta-analytical approach allowed investigating potential moderators to explain differences across studies regarding the effectiveness of reminders. The type of incentive significantly moderated the influence of a reminder on retention: A reminder lowered retention more strongly, if the incentive was a lottery rather than a per capita incentive. This might be explained by the uncertainty of actually receiving a lottery prize on account of its probabilistic nature. Hence, staging a lottery might motivate respondents less to stay until the end of a study in comparison with a per capita incentive, because a per capita incentive substantially reduces the uncertainty of actually receiving an incentive. Therefore, when using per capita incentives, retention due to a reminder is reduced less than when using a lottery. As this moderator effect of type of incentive was not postulated prior to the research, it should be replicated before it can be considered a robust effect.

Besides response and retention, we also examined to what extent two facets of response quality, namely item omissions and response nondifferentiation, differ between prereminder and postreminder respondents. Overall, no associations were found regarding item omissions and response nondifferentiation.

It needs to be stressed that the meta-analytical approach may have been inappropriate because we combined heterogeneous studies to derive a single estimate of effect (Engels, Schmid, Terrin, Olkin, & Lau, 2000). However, the direction of the effects (i.e., increased response, decreased retention, stable response quality) was present in most studies. Therefore, we can be confident about the existence of these effects, but to a lesser degree about the size of these effects. The strengths of the work at hand are more robust results because 38 studies were conducted in three different panels and the outcomes are consistent with previous research (Batinic & Moser, 2005; Kongsved et al., 2007; Leopold, 2004). Through summarizing several studies, we had the opportunity to investigate potential moderators to explain differences among studies. Furthermore, we respected the multifaceted nature of response quality by addressing item omissions and response nondifferentiation besides response and retention rates.

There is no publication bias, because we conducted 38 original studies whose results were summarized in a meta-analytical fashion. Five of these studies were published for their contribution to substantive research; and this was independent of the methodological research question addressed in this work.

Recommendations for Future Research and Practice

Based on the findings at hand, our recommendation is to deploy reminders in web-based data collection because they markedly increase response rates. Although this gain is somewhat at the price of retention, the response quality of prereminder respondents and those who participated after receiving a reminder does not differ regarding item omissions and response nondifferentiation. In view of the trade-off between increasing response and decreasing retention when deploying a reminder, each researcher needs to weigh what is more desirable in the project at hand: Is it more important to exhaust a sample as far as possible, or is it more important to have complete data sets of all people who started participating in the study? Unless a researcher puts a high premium on completed data sets, the larger size of the increase in response than the decrease in retention makes employing reminders a useful measure for most web-based surveys.

As an outlook on future research, it would be interesting to investigate techniques that can enhance motivation during the process of filling out the questionnaire. For example, indicating progress through the questionnaire by including a progress bar might promote retention (Brouwer et al.,

2008; Crutzen, et al., 2008). Koo and Fishbach (2008) have found that representing a goal in terms of what is achieved or what is left to go makes people focus on different aspects of that goal that can increase or decrease motivation to pursue the goal (e.g., completing the questionnaire). In a similar vein, Dillman et al. (2008) discuss the importance of giving reminders even at the point of invitation and thereby influencing response rates and effectiveness of subsequent reminders.

Furthermore, studying whether the effects of reminders remain stable when they are deployed repeatedly with the same people or when more than one reminder is sent per study would provide more comprehensive insight into the usefulness of reminders in web-based data collection. Because reminders are intrusive—as long as there are no probative data that urge a different approach—it is prudent to use them sparingly to maintain panelists' long-term willingness to participate. We assume that an inflationary use of reminders in online panels might nullify their effect on response or even reduce response in the long run because the reminders might be perceived as bothersome.

Besides item omissions and response nondifferentiation, further research might take into account other facets of response quality (e.g., the length of answers to open-ended questions). Moreover, if even more primary studies become available, researchers might take into account moderator variables other than the ones examined here such as type of sample in terms of demographics and personality. Finally, insights into possibilities for further improvement of deploying reminders might be gained by a fine-grained examination regarding the wording and content of the reminder e-mail, as these factors have been proven to influence response rates (Crutzen, et al., 2009).

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