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Modelling and suicide: A test of the Werther effect

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The present study investigates whether news about suicides of prominent persons evokes an imitative effect. To this end, daily overall suicide frequencies of a German federal state, Baden-Württemberg, were examined for the years 1968 to 1980 and were related to prominent suicides that were publicized in major newspapers. Data were analysed quasi-experimentally and by means of a time series regression analysis. These methods yielded significant or marginally significant increases, respectively, for the week following the news. Alternative social psychological explanations were examined, and possible statistical artifacts were taken into account. The results are on the whole consistent with the assumption of an imitative effect.

Goethe's novel *Die Leiden des jungen Werthers* (*The Sorrows of the Young Werther*), which closes with the suicide of its protagonist, is said to have brought about a wave of imitative suicides after its first publication in 1774 (cf. Phillips, 1985). Referring to this historical incident, Phillips (1974) coined the term 'Werther effect', which has come to denote the imitative impact of media depictions of authentic as well as fictional suicides (Phillips, 1974, 1979; Schmidtke & Häfner, 1988). Yet the suicidal impact of Goethe's novel was never conclusively demonstrated (Phillips, 1985). Only more recently have scientific endeavours been undertaken to examine the existence of a possible Werther effect (e.g. Phillips, 1974; Phillips & Carstensen, 1986, 1988; Schmidtke & Häfner, 1988).

The majority of the relevant studies investigated a possible Werther effect after media reports concerning *authentic* suicides. Utilizing a quasi-experimental methodology and analysing monthly suicide data, Phillips (1974) found a significant increase in the national suicide level of the USA after front-page suicide stories in the newspapers. This result was obtained after correcting for seasonal effects as well as a linear increase in suicide frequency. Consistent with predictions, the increase in suicides following a story was restricted mainly to the geographical area in which the story was publicized. Employing a time series analysis, in a reexamination of Phillips' findings, Wasserman (1984) showed that the increase in national suicide level after front-page suicide stories was restricted to reports on *celebrity* suicides. Similarly, Stack (1987) found that the effect held only for American entertainers and political celebrities. However, in a more detailed comparison of the effects of celebrity and non-celebrity suicides, Stack (1990) found significant increases after both types of stories, but a larger increase after celebrity suicides.

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Whereas the studies by Phillips (1974), Wasserman (1984) and Stack (1987, 1990) used monthly data that were not further subdivided by demographic variables, Phillips & Carstensen (1986, 1988) analysed the daily fluctuations of suicides among demographic subgroups. They demonstrated that for various demographic groups (classified by sex, age, marital status and other variables) suicides increased significantly in the week following television news stories on suicides. The increase among teenagers was especially large (cf. also Phillips & Sanzone, 1988). However, in a critical reanalysis of Phillips & Carstensen's (1986) study, Kessler, Downey, Milavsky & Stipp (1988) found that the association between television suicide stories and the rise in teenage suicides was restricted to stories about celebrity suicides.

Whereas the studies mentioned so far examined the possible impact of reports about authentic suicides, several other studies investigated the impact of media depictions of *fictional* suicides (e.g. Berman, 1988; Platt, 1987; Schmidtke & Häfner, 1988). The results of these studies corroborate the evidence for the Werther effect found with real suicides. In addition, these studies suggest that the imitative effect may be specific to certain subgroups of the population or to certain suicide methods. For example, Schmidtke & Häfner (1988) found a reliable increase in suicides by throwing oneself in the path of a train after a German TV series showed such a suicide by a male adolescent. This increase was most clearly observable in subgroups that were closest in sex and age to those of the model.

The theoretical explanation of the Werther effect is not well developed (see Baron & Reiss, 1985). In addition, a stringent test of theoretical predictions is severely compromised, given that suicide victims are not available for interviews after their death. Furthermore, available statistical information on the victims is typically limited to a few demographical variables such as age or sex and does not comprise information on psychological processes. Nonetheless, the existing evidence seems *at least compatible* with the assumption of a *disinhibition* of suicidal tendencies (cf. Phillips, 1985, 1989), an explanation that is based on Bandura's (1986) social cognitive theory. In the following exposition, the disinhibition hypothesis will be delineated, and then several competing hypotheses will be discussed.

By disinhibition Bandura (1986) refers to modelling influences which consist of the strengthening of behaviour that has been previously learned but was not carried out due to 'behavioural restraints'. Learning that the model's performance of the respective behaviour does not lead to punishment or even leads to reward lowers such restraints in the observer. In applying the disinhibition hypothesis to the Werther effect, Phillips (1985, 1989) argued that persons who decide to commit suicide have been contemplating the possibility for some time but may have been reluctant to follow through because the act is 'frowned upon' by others. Suicides who have received public attention may then 'trigger' imitative suicides among these suicide-prone observers by increasing their expectation that their suicide will also yield posthumous attention, pity, or increased social standing. Such disinhibition may also be triggered by realistic depictions of fictional suicides which focus on suicides' consequences such as acquaintances' or parents' dismay (e.g. Schmidtke & Häfner, 1988).

Bandura's (1986) formulation of the disinhibition hypothesis implies that the respective behaviour must have been 'previously learned'. Consistent with this reasoning, the modelling influence underlying the results of the above-mentioned studies may not be due to the transmission of information on how to commit a successful suicide. Whereas

such influences may be consequential in some media descriptions of suicides, those examined in research such as the Phillips' (1974) study are seldom unusual, new, or difficult to carry out, nor do news reports often dwell on details of the suicide method.

Findings that the increase in suicides is higher after celebrity suicides (Kessler *et al.*, 1988; Stack, 1987, 1990; Wasserman, 1984) are consistent with the disinhibition hypothesis since celebrity suicides should be more widely publicized than non-celebrity suicides and be received by a higher percentage of suicide-prone recipients. Nonetheless, the disinhibition hypothesis has to be considered as somewhat speculative given the lack of empirical information to investigate the psychological processes which it assumes. However, the disinhibition assumption is at least compatible with the above results, whereas there is no empirical support for any of several competing explanations, which are discussed below.

Among the alternative explanations is a 'coroner effect' (Phillips, 1986) by which the rise in suicides is not due to imitation but to misclassification by suggestible coroners. The cognitive accessibility of suicide may be high among coroners in the days after media depictions of suicides and may lead them to misclassify ambiguous deaths as suicides. If this explanation is correct, the increase in the number of suicides should be accompanied by an equivalent decrease in death categories such as accidents, murders or undetermined deaths because coroners would shift deaths from these categories into the category of suicides. However, no evidence for such a pattern of classification was found by Phillips (1974) or Phillips & Carstensen (1986), who addressed the coroner hypothesis explicitly.

Another alternative explanation assumes that the depiction of suicides by mass media merely serves to precipitate suicides which would have occurred anyway, even in the absence of stories about authentic or fictional suicide (cf. Phillips, 1986; Phillips & Carstensen, 1986). The precipitation hypothesis may appear similar to the disinhibition hypothesis in that it also assumes that suggestible observers must have had suicidal tendencies before exposure to publicity about a suicide. However, whereas the precipitation hypothesis assumes that each of the precipitated suicides would have occurred anyway, the disinhibition hypothesis assumes that some suicide-prone observers may never commit suicide (given that the expectation of positive consequences of a suicide never comes to outweigh the restraints).

The precipitation hypothesis can be tested by examining whether the initial increase in suicides is counterbalanced by an equally large drop occurring somewhat after the increase. The long-term suicide rate should remain unaltered. However, several studies failed to support this prediction (e.g. Phillips, 1974; Phillips & Carstensen, 1986; Schmidtke & Häfner, 1988). Instead, the evidence obtained in these studies is more compatible with the assumption that the media depiction evokes additional suicides.

According to another competing hypothesis the publicized suicide elicits grief rather than imitation. Some people may become so saddened by the death of an admired celebrity that they commit suicide out of grief (cf. Phillips, 1986). However, this hypothesis cannot account for the increase in suicides which was observed after depictions of fictional suicides (e.g. Schmidtke & Häfner, 1988). Furthermore, this hypothesis is inconsistent with findings that well-publicized deaths of celebrities who died of some cause other than suicide did not lead to a rise in suicides (Phillips, 1974; Phillips & Carstensen, 1986). Moreover, as Stack (1990) showed, not only suicides of celebrities but also well-publicized non-celebrity suicides can increase the suicide frequency.

Another competing explanation acknowledges that suicide stories may be connected with an increase in suicides. However, according to this 'prior condition hypothesis' (cf Phillips, 1986) confounded variables may increase the probability of suicide stories at the same time as they increase the national suicide frequency. For example, a severe economic crisis may increase depressive tendencies in both ordinary as well as prominent people. However, this explanation cannot account for the rise in suicides after depictions of fictional suicides. Moreover, this hypothesis cannot convincingly explain findings showing that the publicized suicides consistently occurred *before* the increase (Phillips, 1974; Phillips & Carstensen, 1986).

On cursory inspection, the evidence from the above studies may suggest that the rise in suicides after media depictions of suicides is widely replicated. However, several of these studies cannot be considered independent replications. For example, each of the studies by Phillips (1974), Wasserman (1984), and Stack (1987, 1990) analysed the overall US national monthly suicide rate beginning in 1948. Although the more recent of these studies extended the period of years under investigation, it is obvious that the degree of overlapping data between these different studies is considerable. Thus, each of the possibly unique aspects of this data set (including random fluctuations, confounded variables) would have affected each of these studies similarly.

To increase confidence in the Werther effect and its generalizability, independent replications in different populations and cultures are needed. Whereas the German study by Schmidtke & Häfner (1988) found evidence for a rise in suicides after depictions of fictional suicides, no study has successfully replicated the imitative impact of suicide news stories outside the USA. In fact, a study conducted in the Netherlands that yielded inconclusive results (Ganzeboom & de Haan, 1982) raised doubts concerning the phenomenon in European countries. Therefore, the present study investigates whether the Werther effect after news about authentic suicides is replicated in a different country, namely, Germany. In view of the results of Kessler *et al.* (1988), Stack (1987, 1990) and Wasserman (1984), the present analysis is confined to news about suicides of prominent persons ('celebrities') since such news should be highly publicized and should reach a maximum number of persons who have already had suicidal thoughts themselves.

Method

Database

The analysis is based on the suicide statistics of Baden-Württemberg, a German federal state. In contrast to national suicide statistics, statistics for this state are available on a daily basis. Obviously, for methodological reasons, a division in small time units is preferable to larger units. Statistics based on individual days allow an examination of whether the predicted rise in suicides occurs only *after* the publicized story. As in most of the studies reported in the introduction, the analysis had to be restricted to *completed* suicides. Attempted suicides are not recorded on a nation- or state-wide level in Germany.

Baden-Württemberg's suicide statistics are close to the West German average. For example, in 1968 and 1978 the suicide rates (number of suicides per 100 000 inhabitants) were 18.4 and 21.8, respectively, whereas the West German averages were 20.5 and 22.2, respectively (Statistisches Bundesamt, 1980).

Upon request, the Statistisches Landesamt (Statistical Office) of Baden-Württemberg provided daily absolute frequencies of completed suicides for the period from 1 January 1968 to 31 December 1980. Among the reasons that the statistical analysis had to be restricted to this time frame is the fact that the year 1968 is the first year for which computerized daily suicide frequencies are available. The year 1980 was chosen as the

latest year of the period under study because the Statistical Office changed its policy of recording suicides at the beginning of the 1980s. Prior to 1 January 1981, the date recorded was always the *death* date. Unfortunately, later on, for suicides which required a disproportionately long period of time (e.g. several months) before the cause of death could be ascertained, the recorded date is the *date of entry into the computer file.* For administrative reasons these suicides were not antedated and are no longer distinguishable from the other suicides. Since the amount of error introduced by this policy of recording is difficult to determine, the present analysis was restricted to suicides which occurred before 1 January 1981.

The suicides are classified according to the *International Classification of Diseases,* 8th and 9th revision, respectively. The data represent *overall* suicide frequencies; for the purposes of the present study it was not possible to obtain data differentiated according to sex, age, or suicide method. To avoid inaccuracy, absolute frequencies were *not* converted to *rates.* Indeed, monthly population estimates *are* available, but reveal some discrepancy with data from a census taken in 1970 (source: Statistisches Landesamt Baden-Württemberg).

In January 1968 Baden-Württemberg had a population of 8.57 million inhabitants, in December 1980 9.23 million (source: Statistisches Landesamt). The mean daily suicide frequency between 1968 and 1980 was 5.02 (SD = 2.37, range 0–16).

Sources for list of prominent suicides

The following institutions were requested to provide archival information (names and dates) relating to the keyword 'suicides of prominent persons' (figures referring to circulation of newspapers and periodicals are quoted from *STAMM* 1969, 1978, 1981):

(1) the magazine *Bunte* (total circulation in 1980: 1.65 million); (2) the Deutsche Presse-Agentur (German Press Agency); (3) the publishers Gruner & Jahr who publish several German magazines; and (4) the Munzinger-Archiv, a record office that provides a monthly register, *Deaths of the Month.* This register is compiled on the basis of a continuous scanning of major German newspapers and comprises all deceased persons regarded as prominent by the office. In some cases (unsystematically) the list contains the entry *suicide.*

In addition, the material from these sources was supplemented by our own inspections. For the time period under investigation, (5) the obituary column in the newsmagazine *Der Spiegel* (total weekly circulation in 1980: 1.17 million) was scrutinized for reports of suicides; (6) for every day from 1968 to 1980 the front page of the newspaper *Süddeutsche Zeitung* was searched for suicide stories (the *SZ* is a national newspaper with a total daily circulation of 362 100 in 1980; a major proportion of its circulation is read by readers from southern Germany); (7) the newspaper with the highest circulation in Baden-Württemberg, *Bild-Zeitung* (daily circulation in Baden-Württemberg in 1980: 630 300) was checked for cases of suicides; for each day the whole issue was examined, and every case that could possibly be regarded as the suicide of a prominent person was noted.

In a preliminary list all cases mentioned by at least one of these sources were included (192 cases; some of them concerning the deaths of two or more persons). Provisionally, deaths that were *suspected* to be suicides also were included.

Final list of prominent suicides

To select the most prominent persons in a non-subjective manner, the name of each person on the preliminary list was searched for in the yearly index of the news magazine *Der Spiegel* for the five-year period prior to his/her suicide. This 'prominence criterion' was met by 57 cases. To restrict the analysis to those cases in which the suicide received high publicity, of these 57 cases only those were included that were reported in at least two major newspapers of Baden-Württemberg. This 'publicity criterion' was operationalized by scanning the following newspapers (figures in parentheses refer to daily circulation in Baden-Württemberg):

(1) *Bild-Zeitung,* whose Baden-Württemberg-issue in 1968 (530 300) and 1980 (630 300) has the largest circulation of all newspapers in the federal state; (2) *Südwest Presse,* which was the second largest newspaper in the state in 1968 (178 800) and 1980 (359 600); (3) *Stuttgarter Zeitung,* fourth largest in 1968 (164 400), fifth largest in 1977 (171 800; no figure for 1980 available).

For each of the 57 cases meeting the prominence criterion, the three newspapers were scanned for reports of the respective death. If necessary, a time interval of several weeks around the date under consideration was scanned. If a report could not be found, a second person repeated the search. Fifty-five cases could be retrieved in at least one newspaper. To be included in the final list, deaths had not only to be reported but had to be

reported *as suicide* in at least two newspapers. Two judges independently assessed whether the report raised doubts about suicide as the cause of death. In cases that were reported over several days, only the first report was judged. Inter-rater reliability was 96 per cent. Cases of disagreement were resolved by discussion. The final list in Table 1 contains the 32 cases that meet the prominence and the publicity criterion.

In earlier work there was some debate whether to include Allende's death. Stack (1987) included it, but Wasserman (1984) omitted it, because Allende was possibly murdered. In the present study the case was included because it was reported as suicide in two of the three newspapers (also in the Munzinger register).

Seventeen of the 32 cases in Table 1 also appear in the Munzinger register (not all of them explicitly noted as suicides). Cases belonging to this subset are obviously prominent in a stricter sense.

Statistical analysis

In line with earlier research on the Werther effect, two methods of data analysis were employed: A quasi-experimental method and a time series regression analysis (Ostrom, 1990). The quasi-experimental method was adapted from Phillips' work (e.g. Phillips, 1974, 1979). The frequency of suicides in an 'experimental' time period after the publication of the suicide was compared with the frequency in control periods. As in Phillips' (1979) study, a one-week duration of the impact of a story was assumed. For each of the cases the experimental period comprised the first day on which this case was reported in one of the newspapers and the six days thereafter. To correct for seasonal effects as well as linear trend, the control periods were chosen from the two adjacent years and comprised exactly the same days in these years. The average of the suicide frequencies of the two control periods represented the expected frequency (see Table 1). If the respective periods from adjacent years themselves contained a suicide story, control periods were shifted by two (or more) antecedent and subsequent years.

In the time series regression analysis the dependent variable was daily suicide frequency. The experimental period was defined as in the quasi-experimental analysis. A dummy variable named 'STORY' was used to represent days in the experimental period. Each day within the experimental period was coded by 1, the other days by 0. To deseasonalize the data, dummy variables were included that represented the respective months of the year. In addition, to capture a possible linear trend in suicide frequency, a variable ('YEAR') representing the successive years was included in the equation.

A methodological problem often encountered in time series analysis is the correlation between successive error terms (autocorrelation). As can be shown (Ostrom, 1990), in the case of positive autocorrelation between an error term and the error term(s) of the preceding observation(s) the error variance of the observations is underestimated. Since the estimated error variance is used for the computation of t ratios for the variables in the regression equation, in the case of positively correlated errors ordinary least squares (OLS) regression overestimates t ratios. The Durbin–Watson d statistic (cf. Ostrom, 1990) allows a test for first-order autocorrelation, i.e. serial correlation with lag 1. If autocorrelation is present, the Cochrane–Orcutt method (Ostrom, 1990) can be used to estimate the degree of autocorrelation and to obtain corrected t values. In the case of positive autocorrelation, corrected t values will be lower than the corresponding OLS estimates.

In time series analysis of suicide data another problem is posed by heteroscedasticity, i.e. heterogeneity of variances (Baron & Reiss, 1985; Phillips & Bollen, 1985). Since suicide frequencies have a lower boundary (i.e. zero) but no upper boundary, months with higher mean suicide frequency should show higher variances and, thus, the assumption of homogeneous variances underlying OLS regression will be violated. Heteroscedasticity can be removed by a square root transformation of the dependent variable (cf. Lienert, 1973).

Since the Werther effect hypothesis predicts an *increase* in suicides, one-tailed tests were used with each of the above two methods (sign test, time series analysis).

Results

A sign test for the cases from Table 1 yielded a significant result, $p\ (x \geqslant 19\ ;\ N = 28) = .045$. (The total N of 32 is reduced for the reasons detailed in Table 1.) A sign test for the subset of cases that are mentioned in the Munzinger register yielded the non-significant p value of .13, $(x \geqslant 9\ ;\ N = 13)$.

Table 1. Rise in number of suicides in Baden-Württemberg after stories about suicides of prominent persons

	Name of publicized suicide	Date of suicide story	Observed number of suicides in week after story	Expected number of suicides	Rise in suicides: Observed minus expected
	Schrems, choir-master	11–10–69	43	31	12
	Bachmann, would-be assassin	2–25–70	21	32.5	−11.5
M[a]	Celan, poet	5–06–70	45	42	3
M	Schmidt-Horix, diplomat	12–01–70	32	30	2
	Hirsch, theater manager	12–21–70	33	29.5	3.5
	Burger, lawyer	3–30–71	32	41	−9
	Poddine, theater manager	2–14–72	35	34.5	0.5
M	Kawabata, Japanese novelist	4–17–72	34	32	2
M	Sanders, British actor	4–27–72	39	30.5	8.5
M	de Montherlant, French novelist	9–23–72	49	25.5	23.5
	Mills, US-representative	5–25–73	33	28	5
M	Allende, president of Chile	9–13–73	37	31	6
	Plappert, industrialist	4–01–74	42	38.5	3.5
M	Wulf, author	10–11–74	40	28	12
M	Schwanzer, Austrian architect	8–21–75	40	40	0.0
M	Lutz, former secretary of state	12–06–75	25	33.5	−8.5
M	Meinhof, terrorist	5–10–76	52	43	9
	de Hory, artist	12–13–76	28	35	−7
M	Ofer, Israeli minister	1–04–77	30	41	−11
	Leiner, kidnapper	3–02–77	47	40.5	6.5
	Barzel, daughter of politician	3–29–77	31	37	−6
	Baader, Ensslin, Raspe; terrorists	10–19–77	27	38.5	−11.5
	Schubert, terrorist	11–14–77	39	31	8
	Gründler, nuclear power critic	11–22–77	31	26	5
	Chevtchenko, wife of Russian UN-delegate	5–11–78	47	43.5	3.5
M	Amery, author	10–19–78	35	37.5	−2.5
	von Halem, banker	12–27–78	46	42.5	3.5
M	Seberg, US-actress	9–10–79	48	34.5	13.5
M	Boulin, French minister	10–31–79	33	34	−1
M	Assmann, actor	12–01–79	32	—[b]	—
M	Springer Jr, journalist	1–04–80	46	—[c]	—
M	Gary, French novelist	12–04–80	33	—[c]	—
					62.5

[a] Prominent persons mentioned in Munzinger register are marked by an M.
[b] No expected number available because control period in 1980 contains suicide story.
[c] No expected number available because data from 1981 not available.

Table 2 presents the regression weights of the predictors in the time series analyses. The ordinary least squares estimation showed a marginally significant p value for the dummy variable STORY, representing the week after each of the 32 stories about a prominent suicide (t (4735) = 1.63, p = .052). A significant Durbin–Watson d indicated positive autocorrelation of the error term (d = 1.91, p < .01). The Cochrane–Orcutt method was used to adjust for autocorrelation. The estimate of first-order autocorrelation was r = .043. Adjusting for autocorrelation increased the p value for STORY to p = .062. An analogous time series analysis for the subset of 17 cases being mentioned in the Munzinger register yielded a significant p value for STORY (t (4735) = 2.04, p < .05, adjusted for autocorrelation).

To examine whether heteroscedasticity is responsible for the low p value of STORY, suicide frequencies were transformed by $y' = \sqrt{y + 0.5}$ (cf. Lienert, 1973). The time

Table 2. Partial regression coefficients for predictors in time series analyses

	Prominence criterion			
	Comprising the 32 cases mentioned in Spiegel index		Restricted to subset of 17 cases mentioned in Munzinger register	
Predictors	OLS	(C–O)	OLS	(C–O)
STORY	.27†	(.26†)	.45*	
YEAR	.07**		.07**	
JAN	.08	(.07)	.07	
FEB	.16		.16	(.17)
MAR	.71**	(.70**)	.72**	(.71**)
APR	.64**		.64**	
MAY	.90**		.91**	(.90**)
JUN	.80**		.80**	
JUL	.54**		.54**	
AUG	.30		.30	
SEP	.36*		.35*	
OCT	.32		.32	
NOV	.34*	(.35*)	.36*	
(Constant)	−.74	(−.70)	−.72	(−.68)
F(13, 4735)	10.1††	(9.27††)	10.26††	(9.39††)
R^2	.03††		.03††	
Durbin–Watson d	1.91**	(2.00)	1.91**	(2.00)
Autocorrelation r	.04**	(.00)	.04**	(.00)

Note. Dependent variable is daily suicide frequency. Statistical indices from estimation by Cochrane–Orcutt (C–O) technique are shown in parentheses only if different from ordinary least squares (OLS) estimation.
*p < .05, two -tailed, **p < .01, two-tailed.
†p < .062, one-tailed, ††p < .001.

series analyses for the whole set of 32 cases and for the subset of 17 cases were repeated with the transformed frequencies and yielded a p value of $p = .127$ and $p = .056$ for STORY, respectively (both values adjusted for autocorrelation).

By investigating the fluctuations in suicide frequency before and after the experimental week, two alternative explanations of the Werther effect can be examined, the prior condition hypothesis and the precipitation hypothesis (see introduction). To test these assumptions, expected frequencies for the week before and the four weeks after the experimental week were calculated quasi-experimentally and compared with observed frequencies. Together with the experimental week this period comprises a six-week interval. In the analysis only those cases from Table 1 whose six-week intervals could be controlled quasi-experimentally without mutually overlapping experimental and control periods were included ($N = 12$). The results yielded no evidence of a rise before the stories. The average difference between observed and expected frequency in the week prior to the experimental week ($M = -1.0$) was even somewhat below the expected value (0.0). The average difference between observed and expected frequency for the four-week period after the experimental week ($M = +0.2$) was not below expectation. This result is not compatible with the precipitation hypothesis, according to which the increase in suicides would be compensated by an equally large dip thereafter.

To test the alternative explanation that the increase in suicide frequency was due to grief over the news of the death of prominent persons (see introduction), the Munzinger register was searched for prominent persons who died an unexpected non-natural death other than suicide in the period under investigation. This criterion was met by the assassinations of Martin Luther King (4–4–68), Robert F. Kennedy (6–6–68) and John Lennon (12–8–80); these prominent persons were well liked by many Germans. In addition to being mentioned in the Munzinger register, all of them are mentioned in the five years before their deaths in the yearly index of the *Spiegel*. Each of the three newspapers reported the three deaths. Standardized residuals from a time series analysis with months and YEAR as predictors were computed for the experimental period after the first report of the death. The experimental period was defined as described above. Mean z scores after the reports of the deaths of King, Kennedy and Lennon were -0.52, -0.34 and -0.34, respectively. None of the $3 \times 7 = 21$ single z scores was above the critical $z = 1.65$ (5 per cent level, one-tailed).

Discussion

Several aspects of the results are consistent with the predictions: Each of two different statistical methods (sign test, time series analysis) revealed an increase in suicide frequency after news about suicides of prominent persons. No evidence was found for the competing hypotheses of grief, prior conditions and precipitation; results were corrected for seasonal effects and linear trend.

However, precautions to protect results against statistical artifacts revealed that only in the time series analysis which was restricted to the subset of persons mentioned in the Munzinger register did the p value for STORY remain (marginally) significant after correcting for autocorrelation and heteroscedasticity ($p = .056$). Statistical significance, although predicted, was not obtained after this transformation in the analysis employing the whole set of 32 cases.

Still, taken together, the results can be regarded as supporting the predicted Werther effect and its replicability outside the USA. First, neither autocorrelation nor heteroscedasticity could influence the significant result of the non-parametric sign test. Second, it is plausible to assume that by restricting the analysis to persons mentioned in the Munzinger register, the excluded cases are less renowned than those in the Munzinger subset. Suicides of these less renowned persons should receive less news coverage and thereby lower the Werther effect associated with these cases. Of course, whereas it appears plausible to assume that the Munzinger cases received more news coverage, this assumption is somewhat speculative. Testing it would require information regarding the amount of publicity each of the cases received in additional newspapers, on television and in radio broadcasts. Such comprehensive information was not available in the present investigation.

Whereas the time series analysis of the Munzinger cases yielded a (marginally) significant increase in the number of suicides, the analysis of these cases by means of the sign test did not. In explaining this discrepancy, the low statistical power of the sign test should be taken into account (cf. Lienert, 1973). In general, a parametric test such as the time series analysis has higher statistical power. In addition, due to a lack of control periods for the last three cases and due to a tie (see Table 1), the sign test could be applied to only 13 Munzinger cases, a limitation that reduced its power even further.

Of course, the present study did not highlight the psychological processes underlying the Werther effect. For example, it was assumed here that the prominent status of a celebrity affects the size of the increase mainly by the greater publicity it evokes. It could be argued, however, that it is not so much the greater publicity given to suicides of celebrities that is related to the increase but their higher social status which causes them to be chosen as models (cf. Stack, 1987, 1990). This assumption would be consistent with Bandura's (1986) research on modelling, which points to the importance of model characteristics.

Another direction for future investigations would be to examine whether the effect is larger if observers and recipients are similar (with respect to sex, age or other characteristics). This hypothesis is favoured by Schmidtke & Häfner (1988), who found support for it in their study of the effects of a TV serial which depicted the fictional suicide of a male adolescent. Yet, Schmidtke & Häfner do not present a theoretical explanation for the mediational role of similarity. In addition, basic research on modelling does not provide strong support for similarity *per se* as a mediator of modelling processes (see Bandura, 1986).

Whereas the present results are tentatively consistent with the predictions, in order to permit an even more stringent test of the Werther effect, subsequent studies should have several methodological features. First, they should take into account data on the amount of publicity each of the cases received. The publicity given to suicide stories should correlate with the increase in suicides if the assumption is correct that higher publicity increases the percentage of suicide-prone individuals who receive the news and are influenced by it. Second, as already suggested by Phillips' (1974) research, data from different geographical regions are desirable to test whether the rise in suicides is restricted to the areas in which the stories are heavily publicized. These different areas could be employed as mutual control areas. Rather distant areas should be chosen (e.g. areas in different European countries). The overlap of reported suicides in newspapers of different regions of one country may be too high to afford independent mutual control measures.

In addition, the present study points to the necessity of appropriate methodological precautions against statistical artifacts. Not only trends and seasonal variations, but also heteroscedasticity and autocorrelation have to be taken into account. Whereas the degree of autocorrelation was relatively slight in the present data (see results), Ostrom (1990) shows that with higher degrees of positive autocorrelation the artificial inflation of t values is even more drastic.

However, statistical artifacts *were* controlled for in the present study and, therefore, its evidence for the Werther effect deserves attention. In addition, the results provide some hints concerning the *size* of the Werther effect. Considering the frequencies in Table 1 it can be estimated that, on average, each of the reported cases is associated with 2.2 additional suicides during the week after the report. This figure may appear low in terms of overall suicidal variance, but it deserves attention considering that lives are involved. Furthermore, this figure is derived from the suicide statistics of only one federal state. Presumably many of the suicide cases from Table 1 were reported in other federal states and other countries as well. Thus, considering these additional areas, the actual number of excess suicides was probably larger.

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