

Effects of Future Writing and Optimism on Health Behaviors in HIV-Infected Women

Traci Mann, Ph.D.

University of California, Los Angeles

ABSTRACT

Optimists (people who have positive expectations about the future) have been shown to perform more health-promoting behaviors than pessimists. This study attempts to alter individuals' levels of optimism, and thereby their health behaviors, by having them write about a positive future. HIV-infected women (N = 40) on combination therapies were randomly assigned to write about a positive future or assigned to a no-writing control group. Among participants who were low in optimism, the writing intervention led to increased optimism, a trend toward increased self-reported adherence to medications, and decreased distress from medication side effects, compared to controls who did not write. Participants who were high in optimism showed the opposite effects after writing about the future. Results suggest that a future-oriented writing intervention may be a promising technique to increase medication adherence and decrease symptom distress in pessimistic individuals.

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INTRODUCTION

When faced with the threat of illness, it is often the case that individuals must alter their behaviors to protect their health. Some individuals succeed at maintaining a variety of behavioral changes, whereas others are unable to do so. Optimists, defined as people who have positive expectations about the future, display specific advantages over pessimists (people who do not have these positive expectations) when confronting these threats (1). Optimists are more likely to use active coping techniques instead of avoidant coping techniques when dealing with life stressors (2). They are also less likely to feel physical discomfort or psychological distress because of their physical symptoms (3). In addition, studies with heart surgery patients (4) and men at risk for HIV (5) show that optimists perform more health-promoting behaviors, such as exercise and condom use, than pessimists.

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Reprint Address: T. Mann, Ph.D., UCLA Department of Psychology, Franz Hall Box 951563, Los Angeles, CA 90095-1563.

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Given the many health advantages shown by optimists, the ability to induce optimism in pessimistic individuals could have powerful implications for the mental and physical functioning of people managing the ongoing stress of a chronic illness. Much research suggests that optimism is a stable personality trait (3), so efforts to induce optimism in pessimistic individuals have been infrequent. In one study, however, adult survivors of childhood cancer who wrote about the future, but not the past or present, showed significant increases in optimism (6). These effects were particularly pronounced among pessimists. Another study found that the optimism level of college students increased after participation in "optimism training" (7). The students were taught to replace negative beliefs about the future with positive ones, to engage in positive visualizations about the future, and to locate one positive element in otherwise unpleasant situations. In a study of a similar intervention with children, participants showed increases in optimism, which in turn led to decreases in depression (8). Similarly, depressed adults who had completed cognitive therapy showed increases in optimism (9). In these studies (7–9), however, as well as in other work on learned optimism (10), optimism was conceptualized as an explanatory style—a particular way of making attributions for the causes of past events—rather than as a way of looking at the future. It is as yet unknown whether it is possible to alter the ways in which people think about the future. It may be the case that it is easier to alter explanatory styles than it is to alter dispositional optimism.

WRITING AS AN INTERVENTION

A frequently used approach to altering individuals' moods, feelings, or expectations involves writing. Writing about past stressful events, for example, has been shown to lead to a variety of positive outcomes, presumably by facilitating cognitive changes in the way individuals think about these events, helping people to integrate them into their lives, and find meaning in them (11). In numerous studies, healthy participants who wrote about their deepest thoughts and feelings regarding past stressful or emotional issues had reduced visits to physicians (12), improved immune function (13), and fewer self-reported physical symptoms (12). In a study of patients with rheumatoid arthritis or asthma, writing about stressful life events led to improvements in clinical markers of disease activity (14).

It has been argued, however, that when simply told to write about a stressful event, some people will be able to make sense of their experiences, but others might ruminate about the problem, never integrating it into their lives or developing useful coping strategies for it. In one study, researchers found that writing about a past stressful event was only helpful to optimistic participants (15). Pessimistic participants who wrote about the

past were not helped by the writing task, suggesting that writing tasks may be differentially helpful for optimists and pessimists.

Because writing tasks have been shown to be powerful in affecting people's emotions, cognitions, and behaviors, it seemed plausible that a writing task that focused individuals on a positive future might be a powerful way to modify individuals' optimism as well as the health behaviors associated with optimism. In this study, effects of writing about a positive future on optimism and reported health behaviors were assessed in a sample of patients coping with HIV infection.

ADHERENCE TO HIV TREATMENT REGIMENS

HIV-infected individuals undergoing combination therapy must contend with a particularly complicated health behavior—namely, treatment adherence. Treatment regimens for HIV require patients to take a large number of pills each day under complicated time schedules and specific dietary conditions. The medications may also lead to a large number of significant and unpredictable side effects, and patients must adjust to the possibility that they will have to take these medications for the rest of their lives. All of these factors make adherence to these complex regimens difficult, but if adherence is inconsistent, combination therapies may not effectively stop the replication and mutation of the virus. Even a small number of missed doses could result in the creation of strains of virus that are resistant to treatment. Reports on levels of adherence to these medications are not encouraging. In a study in which patients' pills were counted each day, it was found that only one half of the patients took as much as 80% of their medications (16).

The focus of this study is on increasing treatment adherence among women of low socioeconomic status (SES). Only a handful of interventions to promote treatment adherence have been designed specifically for women (17), despite at least one study suggesting that women do not adhere to medications as well as men (18). In addition, HIV-infected women, who are predominantly ethnic minorities of low SES, may not be able to afford some of the higher cost devices that are designed to aid adherence (e.g., beepers and electronic pill boxes). Adherence also tends to suffer among people who live with children (18). It may be difficult for women who have children to leave their homes to attend support groups or other psychosocial interventions designed to aid adherence. A writing intervention that increases optimism might be ideal for low SES women trying to adhere to combination therapies. Writing interventions can be done in the home even when there are children present, and they are inexpensive.

In this study, we assess whether writing about a positive future leads not only to changes in optimism, but also to changes in self-reports of behaviors associated with optimism. We compare individuals who participate in a future writing intervention to those in a no-writing control group. We hypothesize that writing about the future will increase optimism in participants who are low in optimism. We do not expect participants who are higher in optimism to show these changes. We also hypothesize that participants who are low in optimism and who write about

the future will show changes in self-reported adherence and side effects that correspond to their changes in optimism.

METHOD

Participants

Women being treated for HIV who were 18 years of age or older ($M = 38.5$, $SD = 8.2$) and using a combination therapy were recruited into the study and randomly assigned to the future writing group or the no-writing control group. Of 47 patients approached, 44 patients (94%) agreed to participate. Of the 44 patients who participated, 21 were randomly assigned to the writing intervention and 23 were randomly assigned to the no-writing control group. Three participants from the control group and 1 participant from the intervention group were lost to follow up (9%), resulting in a final sample of 40 participants (with 20 participants in each group). Participants were African American (40%), Hispanic (35%), and White (25%), and this ethnic breakdown was similar to the breakdown at the clinic from which they were sampled. Sixty percent of the participants in the study had been diagnosed with AIDS.

Procedure

Potential participants were approached by a researcher and were invited to participate in the study. Participants gave consent according to institutional and American Psychological Association guidelines. They were randomly assigned to experimental conditions and then completed the baseline assessments. After completing the assessments, participants in the writing intervention selected a blank journal from a variety of different journals. Because HIV patients are likely facing serious illness in the future, to avoid inadvertently causing them to focus exclusively on a negative future, participants were instructed to write about a somewhat positive future. They were given the following instructions regarding what to write about:

You should write about a future in which you only have to take one pill each day for your HIV. When you sit down to write in the journal, I want you to think very hard about that future. What will that future be like? In what ways will that time be different than now? Think very hard about that future time, which is probably not so very far off. And then write about that time. Every day you can write about different aspects of that time. Or you can even repeat things if you need to. The important thing is that when you sit down for your ten minutes of writing, you should think for a little while about that time, so that it is clear in your head and fresh in your mind. And then write.

It should be noted that a future in which HIV-infected individuals would only have to take one pill per day is not an outrageous expectation. A single medication combining two nucleoside analogues (AZT and 3TC) already exists (Combivir), and a combination therapy regimen involving that medication currently only requires four pills per day. Of course,

the fewer pills per day a regimen requires, the more important complete adherence becomes.

The writing instructions (presented in bullet form) were also pasted inside the front cover of every journal, and participants were encouraged to consult them every time they wrote. Participants were told to write two times each week for 4 weeks, for at least 10 min each time. They were told that they should not worry about grammar and spelling and that they should write in any form they liked (e.g., lists, stories, poems) and in any language they chose. In addition, they were informed that the researchers would keep a copy of their writing (separated from their name and other identifying information). Participants were paid \$5 for each journal entry, up to a maximum of eight entries, and were sent five postcards (evenly spaced throughout the 4 weeks) reminding them to write in their journals. The postcards each contained the standard message, "Please remember to write in your journal."

After explaining these instructions, the researcher asked each participant to write her first journal entry at the clinic and then left each participant alone to write. This technique was used to help make participants feel comfortable writing by "breaking the ice" and to illustrate how easy it was to write for 10 min.

Participants in the control group neither were asked to write in journals nor were told to imagine an optimistic future in which they would only have to take one pill per day for HIV. However, efforts were made to equalize the amount of time that researchers spent with participants in the two conditions. Because participants in the writing condition were alone during the 10 min of writing, the only time discrepancy resulted from the 1 to 2 min of additional instructions those participants received. Efforts were made to spend an additional 1 to 2 min with control participants by going over the instructions and consent materials with them at a slightly slower pace.

At the end of their first session, all participants made a follow-up appointment for 1 month later and then were sent a reminder postcard about that session. To separate the intervention from the assessment, the follow-up session was scheduled for 3 days after participants received their final reminder postcard, and hence, each participant's final journal entry should have been written approximately 3 days before the follow-up session. At the follow-up appointment, all participants completed the assessments again, and journals were photocopied. All participants were reminded of the importance of adhering to their current medications and were urged to make adherence a priority in their treatment. Participants were then paid for their participation.

Measures

Demographic and illness variables. At baseline, participants reported their age, ethnic group, and education level. They also reported when they were diagnosed with HIV and if they were diagnosed with AIDS, and they gave detailed descriptions of their treatment regimen.

Optimism. Optimism was measured with the Life Orientation Test (LOT) (1), which assesses generalized positive out-

come expectancies. The scale consists of eight items (and four filler items). Respondents indicate the extent to which they agree with each statement on 5-point Likert scales ranging from 1 (*strongly agree*) to 5 (*strongly disagree*). The items are summed to create a score ranging from 8 to 40, with higher numbers indicating more optimism. This measure had satisfactory internal consistency (Cronbach's $\alpha = .73$) in this sample, as measured at the first administration (prior to the intervention).

Adherence. Adherence was measured using the general measure of adherence from the RAND Medical Outcomes Study (19). The measure consists of five items that patients respond to on 6-point Likert scales ranging from 1 (*none of the time*) to 6 (*all of the time*). The items (e.g., "How often during the last month were you able to do what the doctor told you to do?") assess whether patients followed their doctors' treatment plan over the past month. In addition, because HIV medications must be taken in a strict fashion at particular times of the day, with particular foods (or with no food), three items were added to the measure to assess those specific behaviors. The eight items were averaged to form a measure of adherence (Cronbach's $\alpha = .87$ in this sample), with higher numbers indicating better adherence. To ensure that participants had an accurate understanding of their physicians' instructions, participants' descriptions of their treatment regimens were compared with the regimen information on their medical charts. Thus, there is no fear that participants described close adherence to an incorrect regimen.

Treatment side effects. Levels of distress from side effects of HIV medications were measured with a revised version of the Cohen-Hoberman Inventory of Physical Symptoms (CHIPS) (20). The CHIPS is a list of 39 common physical symptoms. Participants rate each item for how much that problem bothered or distressed them in the past month on a 6-point Likert scale ranging from 0 (*didn't have the side effect*) to 1 (*had it but it didn't bother me at all*) to 5 (*bothered me extremely*). The scale was revised to focus exclusively on common side effects from HIV medications (e.g., nausea, fatigue, kidney stones, dry mouth, etc.), according to package inserts accompanying the medications and interviews with HIV patients and nurses.

Journal content. Journals were transcribed and coded by a research assistant who was blind to the study's hypotheses and to the writing instructions that participants were given. A post-doctoral scholar with a focus on qualitative data analysis used line-by-line open coding to identify major ideas or themes that emerged from the participants' journals. Frequently mentioned ideas were grouped into coding categories (e.g., adherence barriers). A description of the themes that emerged is available elsewhere (21).

Analytic Approach

To assess whether writing about the future and Time 1 optimism interact to predict Time 2 optimism, a multiple regression was conducted predicting Time 2 optimism from Time 1 opti-

mism, writing condition, and the interaction of Time 1 optimism and writing condition. Significant interactions were graphed by inserting the dummy variable representing writing condition into the regression equation for the interaction term and then graphing the two resulting lines (22). Finally, for significant interactions, the difference between the two nonparallel regression lines was tested at (a) a point representing low Time 1 optimism and (b) a point representing high Time 1 optimism. The test statistic used in these analyses is the difference between the points divided by the standard error of the difference, which results in a simple *t* statistic (23). A similar approach was used to analyze self-reported adherence and distress from side effects at Time 2, controlling for adherence and side effects at Time 1. All variables in the regression analyses were centered before being entered into the equations.

RESULTS

Demographic Variables

There were marginal trends for the intervention condition to include more Hispanic participants, $\chi^2(2, N = 40) = 4.4, p = .11$; fewer married participants (Fischer's exact test, $p = .13$); and fewer participants with children, $\chi^2(1, N = 40) = 2.13, p = .14$. There were no other marginal or significant differences between intervention and control participants on the demographic variables, illness variables, or psychological variables (including dispositional optimism) at Time 1 (all $ps > .21$).

Table 1 includes these descriptive data as well as the means and standard errors for optimism, adherence, and side effects at Time 1 and Time 2. Relations between Time 1 optimism and all variables were examined with correlations (for continuous variables) or analyses of variance (for discrete variables). There were no significant relationships between optimism and ethnicity, age, marital status, motherhood status, whether the participant had been diagnosed with AIDS, or the number of pills in

the participant's drug regimen (all $ps > .50$). Time 1 optimism was marginally correlated with Time 1 adherence ($n = 40, r = .26, p = .10$) and Time 1 side effects ($n = 40, r = -.25, p = .11$).

Journal Entries

The 20 participants in the writing condition wrote an average of 9.4 ($SD = 4.0$) journal entries during the 1-month span of the study, although they were only asked to write 8 entries. All handwriting of journal entries matched the handwriting of the first entry, which was written in the clinic, so it is certain that participants wrote their own entries. Participants were asked to date their entries, but there was no way to ensure that participants actually wrote the entries on the day they reported writing them. The content of the writing suggests that participants did write when they said they wrote, and there is no clear reason to doubt this. The most common topic in the journals, according to both coders, was a comparison of the current drug regimen to the future one. Participants who were low in optimism at baseline did not differ from participants who were high in optimism at baseline on the average number of entries written, the number of words per entry, or the content areas they wrote about (all $ts < 1.5$).

Effects of Writing and Time 1 Optimism on Time 2 Optimism

To examine whether the writing intervention and Time 1 optimism interacted in predicting Time 2 optimism, Time 2 LOT scores were regressed on Time 1 LOT scores, writing condition, and the interaction of writing condition and Time 1 LOT score. The model was a significant predictor of Time 2 LOT scores, $F(3, 36) = 11.64, p < .001$. In addition, there was a significant main effect of Time 1 LOT score, $\beta = .71, B = .62, t(36) = 5.75, p < .001$; and a significant interaction between Time 1 LOT score and writing condition, $\beta = -.26, B = -.47, t(36) = -2.15, p < .05$. Time 1 LOT score explained 42% of the variance in Time 2 LOT score, whereas the interaction term explained an additional 7% of the variance. The interaction is graphed in Figure 1.

The difference between the regression line representing the control group and the regression line representing the intervention group was computed at (a) a point representing low Time 1 optimism ($X = 13$) and (b) a point representing high Time 1 optimism ($X = 36$). At the point representing low Time 1 optimism, the two regression lines were significantly different from each other, $t(36) = 1.94, p < .05$, with intervention participants reporting significantly more optimism at Time 2 ($M = 22.26$) than control participants ($M = 16.09$). At the point representing high Time 1 optimism, intervention participants were significantly less optimistic at Time 2 ($M = 31.25$) than control participants ($M = 35.80$), $t(36) = 2.02, p < .05$. Additional analyses confirm that an interaction of Time 1 optimism and experimental condition does not predict Time 1 optimism levels, suggesting that the pattern of results found with the Time 2 outcomes does not parallel a pattern that existed in the sample at Time 1.

Effects of Writing and Optimism on Adherence

Time 2 adherence was regressed on Time 1 adherence, Time 1 LOT score, writing condition, and the interaction of

TABLE 1
Percentages or Means (Standard Error) for Demographic Data and Psychological Variables by Experimental Condition

	Intervention ^a	Control ^b
Ethnicity		
Hispanic	50%	20%
African American	35%	45%
White	15%	35%
Married	10%	35%
Have children	65%	85%
Been diagnosed with AIDS	65%	60%
Age	38.44 (1.93)	38.69 (1.80)
Number of pills per day	13.9 (0.98)	14.4 (1.15)
Optimism Time 1	28.05 (1.20)	26.00 (1.01)
Optimism Time 2	28.13 (0.90)	27.23 (1.10)
Adherence Time 1	4.54 (0.28)	4.93 (0.22)
Adherence Time 2	4.12 (0.31)	4.82 (0.16)
Side effects Time 1	38.65 (6.15)	34.70 (4.50)
Side effects Time 2	37.70 (5.71)	35.85 (4.76)

^a $n = 20$. ^b $n = 20$.

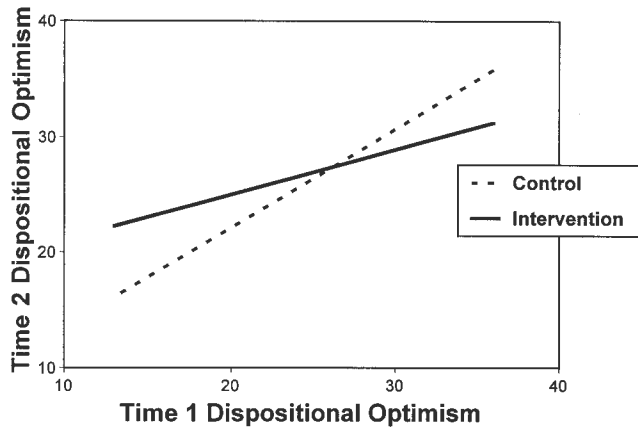


FIGURE 1 Regression lines predicting Time 2 optimism from writing condition and Time 1 optimism. Among participants low in optimism at Time 1, writing participants are significantly more optimistic at Time 2 than control participants ($p < .05$). Among participants high in optimism at Time 1, writing participants are significantly less optimistic at Time 2 than control participants ($p < .05$).

Time 1 LOT score and writing condition. The model (see Table 2) was a significant predictor of Time 2 adherence scores, $F(4, 35) = 3.60$, $p < .05$. Both Time 1 adherence and the interaction were significant predictors of Time 2 adherence. Time 1 adherence explained 20% of the variance in Time 2 adherence, whereas the interaction term explained an additional 9% of the variance. The interaction between writing condition and dispositional optimism is illustrated in Figure 2, controlling for Time 1 adherence.

Differences in Time 2 adherence between intervention and control participants were tested at a high and a low optimism level. Among participants who were low in optimism at Time 1, there was a trend for intervention participants to be more adherent at Time 2 ($M = 5.33$) than control participants ($M = 3.83$), $t(36) = 1.53$, $p = .07$. For participants who were high in optimism at Time 1, intervention participants were significantly less adherent at Time 2 ($M = 3.60$) than control participants ($M = 5.39$), $t(36) = 2.56$, $p < .05$.

Effects of Writing and Optimism on Side Effects

Time 2 side effects were regressed on Time 1 side effects, Time 1 optimism, writing condition, and the interaction of Time 1 optimism and writing condition. The model (Table 3) was a significant predictor of Time 2 side effects, $F(4, 35) = 15.39$, $p < .001$. Time 1 side effects and the interaction were significant predictors of Time 2 side effects. Time 1 side effects explained 60% of the variance in Time 2 side effects, whereas the interaction term explained an additional 4% of the variance. The interaction between optimism and writing condition is illustrated in Figure 3, controlling for Time 1 side effects.

For participants who were low in optimism at Time 1, intervention participants reported significantly fewer side effects at Time 2 ($M = 32.06$) than control participants ($M = 58.95$), $t(36)$

TABLE 2
Standardized β s, Bs, Standard Errors of Bs, and t Statistics for Multiple Regression Predicting Time 2 Adherence

Variable	β	B	SE B	t
Time 1 adherence	.35	.36	.16	2.31*
Time 1 optimism	-.03	-.01	.04	-0.18
Writing condition	-.24	-.54	.34	-1.59
Time 1 Optimism \times Writing Condition	-.30	-.14	.07	-2.06*

* $p < .05$.

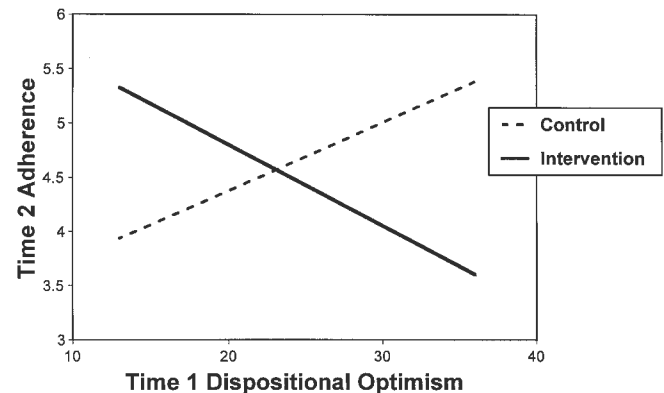


FIGURE 2 Regression lines predicting Time 2 adherence from Time 1 optimism and writing condition, controlling for Time 1 adherence. Among participants low in optimism at Time 1, writing participants report marginally more adherence at Time 2 than control participants ($p = .07$). Among participants high in optimism at Time 1, writing participants report significantly less adherence at Time 2 than control participants ($p < .05$).

TABLE 3
Standardized β s, Bs, Standard Errors of Bs, and t Statistics for Multiple Regression Predicting Time 2 Distress From Side Effects

Variable	β	B	SE B	t
Time 1 side effects	.71	.69	.10	6.59**
Time 1 optimism	-.15	-.70	.51	-1.37
Writing condition	.01	.55	4.82	.11
Time 1 Optimism \times Writing Condition	.21	1.96	.98	2.00*

* $p \leq .05$. ** $p < .005$.

$= 1.89$, $p < .05$. Among participants who were high in optimism at Time 1, intervention participants reported significantly more side effects at Time 2 ($M = 38.57$) than control participants ($M = 20.47$), $t(36) = 1.80$, $p < .05$.

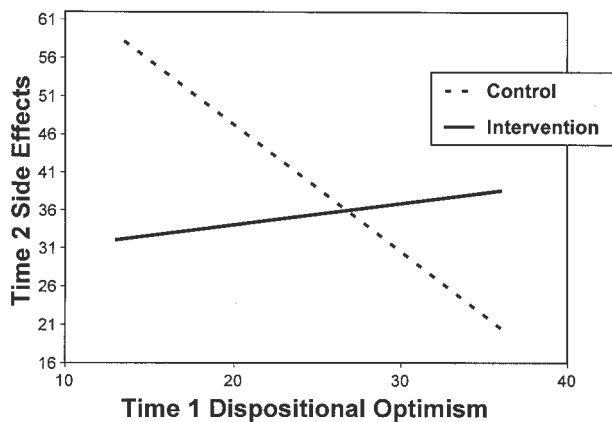


FIGURE 3 Time 2 side effects by Time 1 optimism and writing condition, controlling for Time 1 side effects. Among participants low in optimism at Time 1, writing participants report significantly less distress from side effects at Time 2 than control participants ($p < .05$). Among participants high in optimism at Time 1, writing participants report significantly more distress from side effects at Time 2 than control participants ($p < .05$).

DISCUSSION

These results suggest that dispositional optimism can be altered in a small but meaningful way. HIV-infected women who wrote about the future showed increased optimism, if they were low in optimism at Time 1, or decreased optimism, if they were high in optimism at Time 1, compared to control participants who did not write. Furthermore, compared to control participants, participants in the writing intervention showed changes in their reports of behaviors associated with optimism. Individuals in the writing condition who were low in optimism showed a trend toward increased self-reported medication adherence as well as less distress from medication side effects. Individuals in the writing condition who were high in optimism reported decreased medication adherence and more distress from side effects. Because control participants who were high or low in optimism did not report similar changes in optimism, adherence, and side effects, changes in the intervention group can be attributed to the writing intervention and not to regression to the mean. Regression to the mean, if it had occurred, would have affected both intervention and control participants.

Although these changes were small, these findings suggest the possibility that future writing interventions, much like trauma writing interventions, may lead to changes in self-reported health behaviors and outcomes. However, although all trauma writing studies except one (14) have been conducted with healthy college students or adult populations, this study showed a significant effect of future writing with a patient population.

One patient population that may benefit from a future writing intervention is HIV-infected pregnant women (specifically those who are low in optimism). HIV-infected pregnant women are typically prescribed antiretroviral therapy to prevent the transmission of HIV from mother to baby. In one recent study, however, only 34% of a large sample of pregnant women

showed at least 80% adherence to these medications (24). If future writing can increase the treatment adherence of pregnant women who are low in optimism, it may help prevent new cases of HIV.

The completion rate of this study was nearly perfect. Ninety-four percent of the patients approached for the study agreed to participate, and only 1 participant in the writing intervention was lost to follow up, suggesting that the intervention was appropriate for the population. In addition, one half of the participants in the writing condition wrote more often than they were asked to write, and at the completion of the study, all participants reported enjoying writing in their journals.

Future Writing and Dispositional Optimism

This research suggests that trait optimism, a powerful and important predictor of behaviors and psychological states, can be altered, at least for a short time, with a focused writing intervention. Writing interventions have been shown to alter such things as individuals' immune responses (13) and levels of illness (14), so it is not inconceivable that they may also alter the normally stable way in which an individual thinks about the future. Indeed, it has been suggested that altering traits is "a major aim of extended psychotherapy" (9).

The writing intervention used in this study apparently made individuals who were high in optimism worse off than if they had no intervention. One possible explanation for this unexpected effect is that optimistic participants had cognitive illusions about the future (25). For example, prior to the study, optimists may have been imagining a future in which they would be cured of HIV. Having them write about a future in which they still needed medication for HIV might then have caused them to focus on a less ideal future than they had been expecting. This contrast effect could have led to the decrease in optimism among these individuals.

This explanation may also explain how future writing helped participants who were low in optimism. First, perhaps these individuals thought they would not be alive for much of the future. If that is the case, writing about a specific future may have made the very possibility of being around for the future more salient to them. In addition, participants who were low in optimism may have rarely considered the notion of a positive outcome for their situation in the future. For them, writing concretely about a positive future may have forced them to reconsider their negative notions and consider the possibility of positive outcomes as well. Thus, writing about the future may have quite logically increased their optimism.

This explanation suggests that the different effects of writing about the future on optimists and pessimists were not a result of optimists and pessimists writing about different things in different ways, but rather were due to the contrast between what they wrote about and their prior expectations. For optimists, perhaps the future they were asked to discuss was a worse outcome than they had been hoping for, whereas for pessimists, that same future may have been better than they had dared to dream of.

Content analyses of the writing samples do not resolve this issue. There were only 4 participants (of the 20 participants in

the writing condition) whose writing reflected this sort of contrast effect (although the writing need not reflect it for it to occur). In the journals of 2 optimistic participants, a negative aspect of a future with one pill per day was detected. One optimist mentioned that zero pills per day would be preferable, and another optimist mentioned that the topic made her sad because it reminded her of happier times in the past. Two pessimistic participants mentioned that this sort of future was better than they had considered. One said that it was hard to even imagine such a wonderful situation, and another said that it was nice to not worry about whether she had a future at all. The majority of participants, however, wrote about a future with only one pill per day as if it were a positive future, never mentioning it if they had been hoping for more, or if it was more positive than they had ever allowed themselves to consider before. Additional research is necessary to assess whether this sort of contrast effect is the mechanism through which future writing leads to decreases or increases in optimism among optimistic and pessimistic individuals, respectively. If a contrast effect does explain the different responses of optimists and pessimists to this intervention, future interventions may be able to lead to positive change for both optimists and pessimists by encouraging participants to write about their own version of a highly positive future.

Future Writing, Reported Adherence, and Side Effects

The findings from this study suggest that writing about the future can alter participants' self-reported adherence to medications as well as the distress they report feeling from the side effects of those medications. The mechanisms through which future writing affects these reported behaviors are not clear from this study. One contender as a mechanism is clearly dispositional optimism. Health behaviors and side effects have both been found to be related to dispositional optimism in past research (3–5), and in this study, both changed along with optimism. Future studies with larger samples should consider directly testing the mediational role of optimism in altering self-reported adherence and side effects.

Other possibilities for mechanisms come from the trauma writing literature. In those studies, optimism is not considered a possible mechanism for change. Instead, potential mechanisms include the positive psychological and physical benefits of disclosure of one's private thoughts or the absence of the harmful effects of inhibiting information about oneself (11). These mechanisms do not seem plausible for participants who write about the future, as imagining what the future will be like does not necessarily involve disclosure or inhibition. The other mechanism considered in the trauma writing literature is cognitive changes associated with writing (26). It is thought that by putting one's experiences into words, one might make better sense of those experiences, understand them more, and find meaning in them, which could lead to better health outcomes. Writing about the future could lead to these same cognitive changes. Cognitive changes are not thought to alter individuals' health behaviors but rather are thought to have direct physiological effects (26). If so, these changes might lead to fewer side effects

and perhaps alter adherence as a result of the decreased side effects. It is not clear why either of these mechanisms would operate differently in optimists and pessimists. Mechanisms through which future writing alters self-reported adherence and side effects warrant future research.

Limitations of This Study

The primary limitation of this study is the reliance on self-report measures of both adherence and symptoms. Self-report measures are susceptible to demand effects, although it is not clear why participants who were high in optimism would feel a demand to report lower adherence and increases in side effects after writing about the future for 4 weeks. Using self-reported measures of medication adherence tends to lead to slight overestimates of adherence, but it is considered more reliable than electronic pill monitoring and less intrusive than daily pill counts (16). Using self-report measures of symptoms can lead to reporting biases in which individuals high in trait negative affectivity report more symptoms (27). Controlling for trait negative affectivity in analyses helps to rule out this potential confound (28). Although trait negative affectivity was not measured in this study, controlling for negative affective state in the model predicting side effects (using the negative affect subscale of the Positive and Negative Affect Scale) (29) does not alter the results in a significant way.

An additional limitation of this study is the use of a no-writing control group instead of a control group in which participants wrote about neutral topics. Because a no-writing control group was used, several alternative explanations for these results remain. For example, it is possible that simply being asked to write, or knowing that somebody is going to read one's writing, leads to changes in optimism and health behaviors. It is also possible that something about the act of writing other than the topic of the writing led to the changes observed in this study. Studies that use neutral topics writing conditions, however, do not find reduced physician visits (12), fewer self-reported symptoms (12), improved immune function (13), or improvements in clinical markers of disease activity (14) among participants in those conditions. Finally, it is also possible that participants in the writing condition were affected by the reminder postcards they were sent or by the additional money that they were paid for participating in the writing intervention. It is hard to imagine how these explanations could account for the opposite effects shown by optimists and pessimists.

To get a better sense of the mechanism responsible for the effects shown in this study, future studies should separate the optimistic information that participants are given (that there may be a future in which only one pill per day is needed for HIV) from the actual writing about that information. It seems unlikely that information alone would lead to changes in self-reported behaviors and side effects, but the possibility bears formal evaluation.

CONCLUDING REMARKS

The results of this study suggest that changing optimism by focusing on a positive future shows promise as a potentially use-

ful approach in interventions to change pessimists' health behaviors. Among pessimists, writing about the future led to increased optimism, and these changes were associated with a trend toward a change in self-reported medication adherence as well as a change in participants' disturbance from treatment side effects. The belief that optimism is a stable characteristic has prevented researchers from making serious attempts to alter pessimistic individuals' levels of optimism. Instead, all researchers could do was document the many ways in which optimists were advantaged when it came to coping with stressful events. This study suggests, however, that the pessimists among us may finally be able to make up for these disadvantages by putting the future in a positive perspective.

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