Effect of Written Emotional Expression on Immune Function in Patients With Human Immunodeficiency Virus Infection: A Randomized Trial

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Objectives: To determine whether writing about emotional topics compared with writing about neutral topics could affect $CD4^+$ lymphocyte count and human immunodeficiency virus (HIV) viral load among HIV-infected patients. **Methods:** Thirty-seven HIV-infected patients were randomly allocated to 2 writing conditions focusing on emotional or control topics. Participants wrote for 4 days, 30 minutes per day. The $CD4^+$ lymphocyte count and HIV viral load were measured at baseline and at 2 weeks, 3 months, and 6 months after writing. **Results:** The emotional writing participants rated their essays as more personal, valuable, and emotional than those in the control condition. Relative to the drop in HIV viral load, $CD4^+$ lymphocyte counts increased after the intervention for participants in the emotional writing condition compared with control writing participants. **Conclusions:** The results are consistent with those of previous studies using emotional writing in other patient groups. Based on the self-reports of the value of writing and the preliminary laboratory findings, the results suggest that emotional writing may provide benefit for patients with HIV infection. **Key words:** HIV infection, disclosure, emotional writing, HIV viral load, $CD4^+$ lymphocyte count.

HIV = human immunodeficiency virus; **AIDS** = acquired immune deficiency syndrome; **ANOVA** = analysis of variance.

INTRODUCTION

Emotional disclosure through writing has recently been investigated as an intervention for improving health. Controlled studies have shown that emotional disclosure produces changes in immune functioning including increased proliferation of T-helper cells in response to blastogenic stimulation (1), reduction in titers of serum antibody to Epstein-Barr virus (2), and improved responses to hepatitis B vaccination (3). Clinical trials have also shown improvements in lung function in patients with asthma and improvement in physical functioning and a reduction of disease activity in patients with rheumatoid arthritis (4, 5). A recent study of patients with early-stage breast cancer showed a reduction in physical symptoms and fewer medical appointments for cancer-related morbidities in women randomized to written emotional disclosure compared with controls (6). A meta-analysis of studies conducted in this area has shown consistent and significant improvements in health outcomes after written emotional expression (7).

An emotional disclosure writing intervention has not yet been investigated in patients with human immunodeficiency virus (HIV) infection. Such an intervention would appear suitable because of the high rates of psychological distress, stigma, and history of traumatic experiences reported by these patients (8–11). Furthermore, previous research has shown that high rates of stress and psychological distress in HIV-infected people are associated with a more rapid loss of $CD4^+$ T-cells and a faster disease progression to acquired immune deficiency syndrome (AIDS; 12–14). The finding that successful coping with stressful events can slow disease progression in patients with HIV infection suggests that a strategy designed to relieve stress resulting from past events may have clinical benefits (15, 16). Furthermore, the availability of 2 well-validated measures of disease activity provides the opportunity to evaluate objectively the health benefits of an emotional writing intervention.

In this study, we investigated whether written emotional disclosure affected HIV viral load and $CD4^+$ lymphocyte count in HIV-infected patients attending a hospital outpatient clinic. We hypothesized that there would be a significant reduction in HIV viral load and an increase in $CD4^+$ lymphocyte count during the 6 months after the intervention.

METHODS

Participants

Participants were 37 adult volunteers (35 men, 2 women) recruited from the adult infectious disease clinic at Auckland Hospital, New Zealand. Thirty-one of the sample identified themselves as European and 3 as being Maori or Pacific Islanders, and 3 were from other ethnic groups. Patients were recruited through posters in the infectious disease clinic and through physician referrals at Auckland Hospital. People were eligible for the study if they had documented HIV infection, had been regularly attending the infectious diseases clinic at Auckland Hospital for at least 2 years, had not had their antiretroviral drug regimen changed in the previous 12 months, and had no change in the treatment regimen anticipated by their physician in the subsequent 12 months. Participants had a mean age of 45 years (range, 23–67 years). One additional participant, whose data are not included, withdrew from the study after the first writing session. A meta-analysis of previous emotional writing studies suggests that the average effect size for this sort of intervention in healthy subjects is $d = 0.47$ (7), although the effect size in clinical samples appears to be much higher ($d = 0.68$; 5). Because the main effect in our study was evaluated using an analysis of variance (ANOVA) test, a power analysis for a balanced design based on the more conservative ($d = 0.47$) effect size indicated that our sample size of 38 could detect ANOVA main effects with 80% power and an alpha of 0.05.

Design and Procedure

With informed consent and ethics committee approval, participants were randomly assigned to the intervention or control group using a list generated from a random number table. Randomization was conducted by the study administrator, who provided group assignment in opaque envelopes to the researcher enrolling participants in the study. Infectious diseases clinic doctors were blind to group assignment. Twenty participants were randomized to the experimental (emotional writing) group and 17 to the control group. The study was completed between March and December 2000.

All participants, who were assessed individually, wrote for 30 minutes on 4 consecutive days using a desktop computer in a small, private, dimly lit

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room. All writing was anonymous, and participants identified themselves by a self-generated 4-digit alphanumeric code. Using a protocol similar to that of other written disclosure trials (1, 3, 5), the intervention group was asked to write about the most traumatic and emotional experiences of their lives. They were encouraged to explore their deepest thoughts and feelings about an event that they had not previously discussed with others. Subjects were told that they could write about HIV-related topics or any other issues of emotional importance to them. In their 4 writing sessions, the control group participants were instructed to write about how they used their time, but with slightly different orientations each day: what they had done in the previous 24 hours, and what their plans were for the next 24 hours, the next week, and the next 12 months. They were encouraged to write in a purely descriptive and objective way with minimum expression of emotions.

Assessments

Before starting the study, participants completed the 14-item Perceived Stress Scale (17). This measure was used to assess the degree to which participants found their daily lives over the period of the past 4 weeks to be unpredictable, uncontrollable, and overloading. Subjects rated their responses from "never," 1, to "very often," 5. The Cronbach alpha for the scale was 0.94. Participants also competed the following self-rated health item before the study began: "Compared with the person in excellent health, how would you rate your health at the present time?" This item was rated on a 7-point scale from "terrible," 1, to "excellent," 7.

After each writing session, participants rated their day's writing to the extent that it was meaningful and revealing of their emotions, and how much they had held back from previously discussing this material with others, using a 7-point scale from "not at all" to "a great deal."

The patient's HIV viral load and $CD4^+$ lymphocyte counts during the 2 years before study recruitment were obtained from the patients' clinical records. HIV viral load was determined using a quantitative reverse-transcriptase polymerase chain reaction assay (Amplicor HIV-1 Monitor, Roche Diagnostic Systems), whereas $CD4^+$ lymphocyte count was determined by flow cytometry. These measures were repeated at 2 weeks, 3 months, and 6 months after writing. Physicians caring for patients in the trial were blind to participant group assignment.

Data Analyses

After writing each day, participants completed a brief questionnaire assessing various features of their writing. The daily ratings were collapsed across the 4 days of writing and compared using simple ANOVAs.

Because the participants had been cared for by the infectious disease clinic for varying durations, participants differed with regard to the timing and number of baseline laboratory results. In the 2 years before the intervention, participants potentially had as many as 7 HIV viral load and $CD4^+$ lymphocyte count results. The mean number of baseline measures for $CD4^+$ lymphocyte count was 5.49 and for HIV viral load was 5.89. All participants had at least 2 baseline data points for both measures. In the postwriting assessments, 6 participants missed at least 1 clinic appointment (none missed the 2-week assessment, 4 missed the 6-month assessment, and 2 missed both the 3-month and the 6-month assessment).

A square root transformation was used on the $CD4^+$ lymphocyte counts to give an approximately normal distribution. Data were analyzed as a multivariate hierarchical model using the hierarchical linear modeling program HLM 5.04 (18). The effect of group at level 2 on a joint test of the contrasts comparing postvalues with preintervention scores at level 1 was evaluated. The level 2 effect of group can be interpreted similarly to the group by pre-post interaction in a standard repeated-measures ANOVA, but the overall maximum likelihood fit of the model is relatively insensitive to missing data. That is, subjects with missing data are not discarded, nor are missing scores explicitly imputed. Instead, the overall model is evaluated using all of the available information.

RESULTS

The writing of the emotional disclosure group was examined for the types of emotional issues contained in the writing. Issues dealing with sexual identity accounted for 36% of the writing, followed by relationship problems (31%), disease worries (16%), family problems (11%), and concerns about death (6%). Compared with control group participants, those in the emotional writing group rated their writing as more meaningful (experimental mean = 6.0, SD = 0.7; control mean = 4.4, SD = 1.5, $F[1,35] = 19.1$, $p < .001$), as covering topics that they had held back from discussing with others (experimental mean = 4.5, SD = 0.7; control mean = 2.8, SD = 1.6, $F[1,35] = 13.7$, $p < .001$), and as more revealing of emotions (experimental mean = 5.4, SD = 0.9; control mean = 2.5, SD = 1.4, $F[1,35] = 57.8$, $p < .001$).

There were no differences between experimental and control groups for age (experimental mean = 45.3, SD = 10.4; control mean = 44.65, SD = 11.6, $t[35] = 0.17$, $p = .87$), time since HIV infection diagnosis (experimental mean = 8.5, SD = 5.3; control mean = 8.6, SD = 4.8, $t[35] = -0.08$, $p = .94$), or ethnicity (categorized into European or other ethnic group, $\chi^2[1, N = 37] = 0.47$, $p = .83$). The 2 female participants were randomized to the experimental group. There were no differences at baseline for score on the Perceived Stress Scale (experimental mean = 37.2, SD = 9.0; control mean = 34.6, SD = 9.1, $t[28] = 0.78$, $p = .44$) or self-rated health item (experimental mean = 5.2, SD = 0.9; control mean = 5.2, SD = 1.1, $t[30] = -0.14$, $p = .89$). Further analyses indicated no differences at baseline between the 2 groups for $CD4^+$ lymphocyte count (experimental mean = 19.2, SD = 5.1; control mean = 20.8, SD = 4.2, $p = .33$) or HIV viral load (experimental mean = 3.29, SD = 0.48; control mean = 3.28, SD = 0.62, $p = .93$).

Results from an omnibus 2 (group) by 2 (measure) by 4 (time) between-within ANOVA revealed a significant 3-way interaction ($F[3,105] = 2.71$, $p = .05$) and a marginal condition by time interaction ($F[3,105] = 2.20$, $p = .08$). Using the HLM procedure for both the $CD4^+$ and the viral load data, the treatment effect on the pre-post contrast was significant ($CD4^+$: $t = 2.25$, $df = 136$, $p = .024$; viral load: $t = 2.108$, $df = 136$, $p = .035$). A further test of the group effect on the linear dependent variable vs. time function was highly significant for $CD4^+$ ($t = 2.68$, $df = 136$, $p = .008$), but not for viral load ($t = 0.893$, $df = 136$, $p = .372$). These results are consistent with a continuing improvement in the $CD4^+$ scores, whereas viral load scores improved overall between preintervention and postintervention without showing a systematic continued increase across the postintervention period.

As can be seen in Figure 1, the HIV viral load dropped immediately after the intervention in the experimental group and increased slightly in the control group. The $CD4^+$ lymphocyte counts of the experimental group gradually and continuously increased during the 6-month follow-up after the intervention, whereas the $CD4^+$ lymphocyte counts of the control group increased slightly from the baseline and then remained stable. These patterns are consistent with the finding that treatment-induced reductions in HIV viral load are generally followed by increases in $CD4^+$ lymphocyte count over the subsequent months (19).

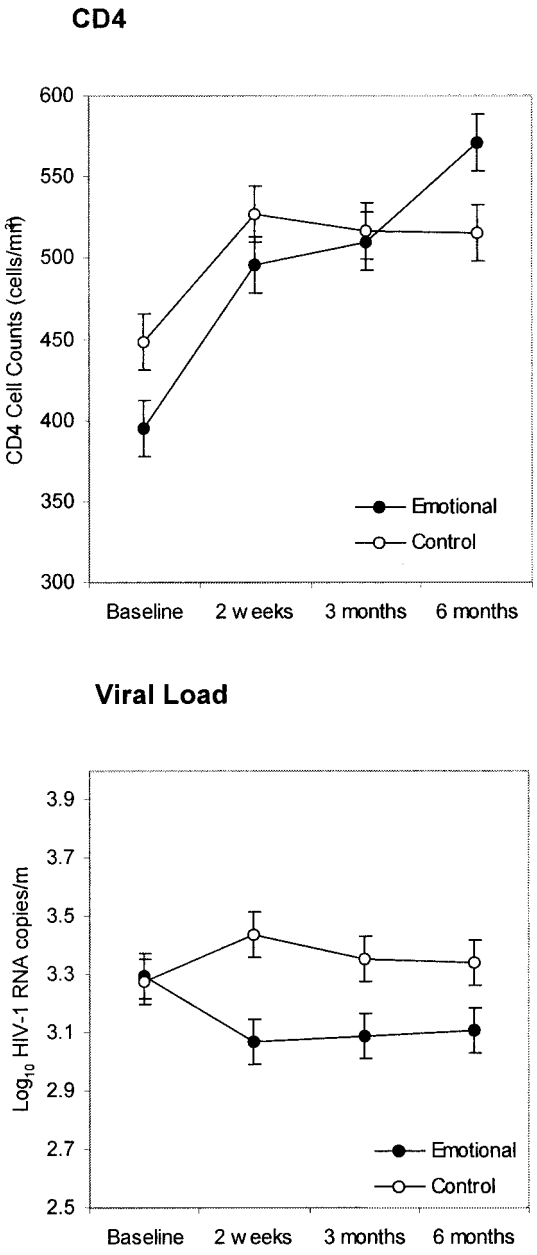

Figure 1. $CD4^+$ lymphocyte count and HIV viral load at baseline, 2 weeks, 3 months, and 6 months after writing in emotional and control writing conditions. Error bars are common standard error adjusted for subject variance.

DISCUSSION

This study demonstrates that emotional writing may provide benefits for patients with HIV infection. Patients randomized to write about emotional issues showed increased $CD4^+$ lymphocyte counts over the follow-up period, but no sustained change was detected in HIV viral load. This pattern of results is consistent with an improved immune response after the intervention and is similar in magnitude to effects seen with monotherapy with anti-HIV drugs (20).

The results are consistent with other recent work showing that psychological factors may significantly influence the course of HIV infection (12–14). Negative beliefs about the future and the self and about the course of the disease have been associated with an accelerated decline in $CD4^+$ lymphocyte count and premature death (21, 22). Furthermore, HIV infection has been found to progress more rapidly in men who conceal their homosexual identity compared with men who are openly gay (23). A recent study found that for each 1-unit increase in cumulative average support satisfaction, the risk of AIDS progression decreased by 62%, whereas for every 1-unit increase in cumulative average coping through denial, the risk of AIDS progression doubled (16). The results of our study also extend the findings of a recent study that showed improved health after emotional writing in patients with asthma and rheumatoid arthritis (5).

The mechanisms that link emotional disclosure to changes in HIV infection immune markers are not clear. It has recently been proposed that emotional disclosure may reduce the tonic catecholamine or cortisol elevations that result from an unresolved stressor and thus allow improved immune functioning to occur (24). Previous research has found higher cumulative stressful life events and higher serum cortisol levels to be associated with a faster progression to AIDS in HIV-infected men (12). Cognitive-behavioral stress management psychological interventions have recently been shown to reduce catecholamine and cortisol levels in men with HIV infection (25). This possible neuroendocrine mechanism should be investigated in future research.

Recent research points to the fact that particular cognitive changes associated with the writing intervention may determine health improvements. Analysis of the changes in the use of different types of words over time in those participants who benefited from writing compared with those who did not has shown that positive health changes are correlated with a greater use of positive emotion words, a moderate number of negative words, and an increase in the use of causal and insight words over the course of writing (26, 27). These changes in word use may reflect changes in the meaning and understanding of traumatic events gained in the writing sessions. Future work with HIV-infected persons has the potential to clarify how differences in the way a person constructs a narrative about a previous traumatic event are associated with immune changes that have a more direct relationship to long-term health.

Several limitations of the findings should be acknowledged. First, the study was conducted on a relatively small sample and needs to be repeated in a larger group. Second, it may be that an emotional writing intervention in patients with HIV infection is more useful in some patients than in others. For example, patients who are socially isolated and lack a close confidant may have a better response to such therapy. There is some evidence from previous research that men benefit more than women from emotional writing (7). Finally, it is not clear from the current study how long the benefits from writing will last. The pattern of the results suggests that the therapy's effectiveness is relatively short-term, but it is possible that the improvement may continue with booster sessions. It may be that the effectiveness of emotional writing

diminishes over time; this needs to be investigated in further research. The results of the study support further investigation of emotional writing as an adjunctive therapy in HIV-infected people and suggest that further work needs to be performed to identify which patients are most likely to benefit from the treatment and the likely duration and impact of the therapy.

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