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God Give Me Strength: Exploring Prayer as Self-Disclosure

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Abstract The current project was designed to examine the contention that written prayers about difficult life events function as self-disclosure to God and are structurally and effectively the same as other forms of written self-disclosure, at least in the short term. Over four writing sessions, 155 participants either wrote about mundane experiences (the control group) or wrote narratives about traumatic or stressful life events that were targeted at no one, targeted at a person of their choice, or construed as prayers to God. The results indicate that written prayers are lexically similar to the other two types of written narratives and distinct from the control group. Furthermore, the immediate effects of trauma writing on mood and physical well-being were similar as well. These findings have potentially important implications for understanding the relationship between personal prayer and a variety of health outcomes.

Keywords Prayer · Health · Self-disclosure

The relationship between prayer and health has received much recent attention (Masters and Spielmans 2007). This focus is not surprising given the emphasis that many world religions place on the importance of prayer in healing. Belief in the relationship between personal prayer and health in the United States is reflected in the results of the 2002 National Health Interview Survey. According to the Centers for Disease Control and Prevention and National Center on Health Statistics, 43% of participants reported praying for their own health over the previous 12 months, setting prayer apart as the most used form of complementary and alternative medicine during this time period (Barnes et al. 2004). Personal prayer and other religious practices become especially important to individuals when dealing with traumatic or stressful life events such as health problems. Prayer is indeed a common form of coping, and the most popular form of religious coping

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(Pargament 1997). Given the recent explosion of research related to the effects of religion and religious practices on health outcomes, the impact of personal prayer for religious coping and its possible concomitant impact on health are of great interest. However, most current research on prayer and health has been based on cross-sectional correlational survey data (Koenig et al. 2001), and few studies explore the mechanisms that could play a role in reported relationships between prayer and heath. The current study utilizes an experimental paradigm to examine this important topic.

Prayer may be effective for religious coping and yield possible health benefits because it serves as a form of self-disclosure to God (VandeCreek et al. 2002). Self-disclosure, in this case, references the construction of narratives addressing difficult life experiences, in which the individual discusses both the events and emotions related to the experience (Pennebaker and Keough 1999). This process of self-disclosure has been shown to allow individuals to express emotion and make meaning in light of traumatic experiences, allowing for positive health outcomes in a variety of domains. The current project examined the contention that prayer is similar to self-disclosure in both form (lexical content) and function (immediate impact on writer's emotional state and physiological response).

Trauma, Disclosure, and Health Outcomes

In the mid-1980s James Pennebaker and his colleagues began to examine the relationship between disclosure of traumatic events and a variety of health outcomes. In a piece that launched current self-disclosure research, Pennebaker and O'Heeron (1984) examined the effects of losing a spouse to suicide or accidental death on a variety of health-related outcomes. They found that those survivors who spent more time discussing these traumatic events with others experienced better physical health a year later. These intriguing results led to further studies to explore this relationship. For example, Pennebaker and Susman (1988) found that childhood traumas led to a variety of negative health outcomes in adulthood when they went undiscussed. Though these studies and others revealed a consistent relationship between self-disclosure and health outcomes, their correlational nature limited the interpretability of the findings.

In order to move beyond these correlational interpretations, Pennebaker and Beall (1986) developed a method by which they could manipulate self-disclosure in a laboratory setting. Specifically, they developed a paradigm in which participants were asked to write about either mundane or traumatic events for 15 min each day over four consecutive days. They found that writing about traumatic events had some immediate negative effects for mood and blood pressure, but the long-term health effects appeared to be positive. Those in the self-disclosure conditions reported fewer health center visits and reduced aspirin usage over the next 6 months. Though these results generally supported their assumptions, Pennebaker and Beall (1986) made cautious interpretations of the data given some marginally significant effects and a relatively small sample of only 46 students.

Since this original experiment, several studies have examined the role of self-disclosure on a variety of health outcomes using this writing paradigm. These include examinations of the effects of disclosure on physician visits (Cameron and Nicholls 1998; Greenberg and Stone 1992; Greenberg et al. 1996; Pennebaker and Francis 1996), physical symptoms (Greenberg and Stone 1992; Pennebaker and Beall 1986), Epstein–Barr virus antibody production (Esterling et al. 1994), NK cell activity (Christiansen and Smith 1993) and skin conductance (Dominguez et al. 1995; Hughes et al. 1994; Pennebaker et al. 1987).

Additionally, writing about traumatic experiences appears to lower blood pressure and heart rate below baseline rates shortly after the exercise (Pennebaker et al. 1987). Self-disclosure also positively impacts self-reports of well-being and promotes lower levels of distress over time (Greenberg and Stone 1992; Greenberg et al. 1996; Rimé 1995). Taken as a whole, the results of these studies show that writing about traumatic experiences has a powerful positive effect on physical and emotional health. Moreover, in a recent meta-analysis regarding the effects of self-disclosure on long-term health benefits, Smyth (1998) found an overall effect size of $d = .47$, further substantiating the practice's salutary effects.

Accounting for the Relationship Between Disclosure and Health Outcomes

Building on the work of Jouard (1971), Pennebaker and Beall (1986) theorized that not talking about or otherwise psychologically confronting traumatic events was a form of inhibition. Inhibition, in this context, refers to actively avoiding the sharing of thoughts and feelings related to traumatic experiences. They contended that "actively inhibiting one's behavior, thoughts, and feelings over time place[d] cumulative stress on the body and thus increase[d] the probability of stress-related diseases" (Pennebaker and Beall 1986, p. 275). Based on this assumption, they proposed that giving individuals an opportunity to divulge and discuss traumatic experiences would reduce the burden on one's psychological and physiological systems, thereby reducing both stress and stress-related disease. The importance of emotional expression, in particular, has been substantiated by Pennebaker et al. (1997). They found that individuals who expressed greater proportions of positive emotion words (e. g., happy, joy) realized greater health benefits, while those expressing more than moderate levels of negative emotion words (e.g., angry, wrong) experienced worse health outcomes.

This framework linking inhibition, stress, and health outcomes dominated self-disclosure research through the 1980s and into the 1990s. A flood of studies produced some conflicting findings, partial replications, and failed replications (Pennebaker and Keough 1999). It became apparent that the relationship between self-disclosure and health was more complex than simple emotional expression, so scholars began examining other possible mechanisms to explain the link between disclosure and health, such as meaning making.

Park and Blumberg (2002) state that "distress is caused by the discrepancy between appraised and global meaning, which underlies and motivates the process of meaning making (p. 599)." Meaning making can be defined as being able to make sense of or find purpose in a traumatic event within the context of one's own worldview. To make meaning from a negative event, one must either change their appraisal of the event or shift their worldview to accommodate the trauma. To the extent that an individual is able to perform one of these cognitive functions, distress will be reduced. Individuals might reappraise the meaning of a negative event by reframing it as less traumatic than first thought or viewing it as a source of personal growth.

In support of the meaning-making hypothesis, Park and Blumberg (2002) found that on the last day of writing, students viewed traumatic events as much more under their control and less threatening than they did on the first day of writing. Students also perceived the event as less stressful and expressed a greater sense of coherence after the 4 days of writing.

Additionally, lexical analyses of self-disclosure texts by Pennebaker et al. (1997) substantiate the importance of meaning making for health outcomes as a result of self-disclosure. These researchers found that participants who incorporated more causal (e.g.,

because, why) and insight words (e.g., see, understand) over the course of writing sessions showed greater health benefits. According to Pennebaker and Keough (1999), the inclusion of these words over time shows increased meaning making and organization of the self in light of the traumatic events discussed.

Initial Evidence for Prayer as Self-disclosure

VandeCreek et al. (2002) set out to compare traditional trauma disclosure narratives with those couched as prayers to God. In this research, seminary students were recruited to one of the three experimental conditions. They were instructed to write self-disclosure narratives, letters to God about difficult experiences, or prayers about difficult experiences. VandeCreek et al. (2002) used the Linguistic Inquiry and Word Count program to analyze the occurrence of positive emotion words, negative emotion words, causal statements, and insights of expression across the three experimental conditions. They found that essays written as letters to God and as prayers contained no significant differences from one another in expression across the four linguistic categories. Additionally, the proportion of causal expressions and negative emotion words was similar across the self-disclosure, letter to God, and prayer conditions. However, there were significant differences between conditions in the expression of positive emotions and insight. Those in the letter to God and prayer conditions expressed greater proportions of positive emotion and insight words than those in the normal trauma disclosure condition. VandeCreek et al. (2002) concluded that these results showed promise for the assumption that prayer about difficult experiences can function as self-disclosure to God. Though innovative, their study is limited by its study population of seminary students. The current study is the first to examine the content and effects of self-disclosure to God on a more general population of people with much more variable religious beliefs.

Understanding Prayer as Self-disclosure: Unique Form of SD?

Though many have speculated that prayer can function as self-disclosure to God (e.g. Pennebaker 1997; Brown 2002; VandeCreek et al. 2002), prayer may serve as a unique form of self-disclosure in that it differs from typical self-disclosure in a number of important ways. First, unlike traditional self-disclosure exercises, prayer is usually directed toward an explicit target. In the typical self-disclosure paradigm, participants are asked to write anonymously about their most traumatic or difficult life events. Though one can speculate that participants may assume that they are disclosing to the experimenter or to some general other (Pennebaker and Keough 1999), it is equally possible that they might simply be disclosing to themselves (Pennebaker 1997). Even if it were the case that one of these targets were assumed, each offers anonymity to the individual and provides confidentiality of the written content of disclosure narratives. These characteristics provide for freedom of expression in disclosure writing. In reference to prayer, the individual is writing to his or her perceived image of God, which has potential to influence the narrative. If God is seen as a heavenly being who is loving and responsive, prayer could provide for feelings of increased closeness to God, support, and comfort (Lowenthal 2000). This could account for the increased level of positive emotion expressed by prayer writers in the VandeCreek et al. (2002). In contrast, if God is seen as punitive, prayer may actual heighten negative emotions such as guilt associated with past trauma.

Another important difference between prayer and self-disclosure is that prayer orients the individual toward a particular religious framework (Lowenthal 2000). This framework may constrain and guide the content of the self-disclosure. For example, if religion is seen as a positive force, prayer can lead to what Pargament (1997) calls "benevolent religious reframing." This could allow the individual to reorganize the self and make meaning from traumatic experiences in a positive way. Indeed, research shows that coping with negative events is easier when they are understood within a "benevolent religious framework" (Pargament 1997). This positive reframing could in turn promote positive emotion (Emmons 2005) and may account for the increased level of positive emotion expressed by prayer writers in VandeCreek et al. (2002). In contrast, those who have a more negative orientation toward God may find that prayer is a less healthful form of self-disclosure than traditional, non-directive forms. In such cases, one might expect to see greater expression of insight or causal words in the written narratives.

Goals of the Current Study

The goals of this study were (1) to test whether prayer self-disclosure texts are structurally similar to other self-disclosure texts and (2) to test whether the immediate emotional and physical health impacts of writing prayer texts are similar to the impact of writing other types of self-disclosure texts. In order to meet these goals, one difference between prayer narratives and typical self-disclosure narratives had to be addressed. As mentioned earlier, prayer is unique from typical self-disclosure in that a target for the writing has been specified. If differences were found between the typical self-disclosure and prayer conditions in reference to the outcomes being examined, it would be impossible to know whether those differences were due to the fact that there was a specific target or that the target was God. To address this possible confound, an additional writing condition, referred to as targeted self-disclosure, was added in which participants were asked to write about traumatic life events as if they were writing a letter to a specific other. With this addition, the project included a total of four writing conditions: control, self-disclosure, targeted self-disclosure, and prayer-as-self-disclosure.

In this research, the writing paradigm developed by Pennebaker and Beall (1986) was utilized to compare the content of self-disclosure in the form of writing a prayer to God to self-disclosure written to a specific target of one's choice and self-disclosure written without a designated target. It was hypothesized that self-disclosure, targeted self-disclosure, and prayer-as-self-disclosure texts will be lexically similar to one another and distinct from control texts in relation to instances of expression of positive and negative emotion, causality, and insight (Hypothesis 1). It was also hypothesized that similar patterns of change will exist across writing sessions for the three trauma-writing conditions and that these patterns will contrast with no change across writing sessions in the control condition (Hypothesis 2). These four word types were important because of their established implications for physical health (Pennebaker and Keough 1999).

The second goal was to compare the immediate impact of trauma writing between those who were writing a prayer to God with the other trauma-writing conditions and the control group. One of the most consistent findings in the self-disclosure literature deals with the short-term impact of trauma writing. Based on the meta-analytic work of Smyth (1998), trauma writing results in increased short-term stress. This is manifest in elevated levels of negative affect, increased physical symptoms, and reduced positive affect immediately after the writing session as a direct result of the exercise. This is in stark contrast to those in

the control condition whose levels of negative affect and physical symptoms stay relatively stable pre- and post-writing. Therefore, it was hypothesized that those in the three trauma-writing conditions (self-disclosure, targeted self-disclosure, and prayer) would experience similar immediate effects of the writing exercises (distinct from controls) in relation to negative affect and the experience of physical symptoms (Hypothesis 3). Moreover, it was hypothesized that the patterns of change across sessions will be similar for the trauma-writing conditions and that these patterns will contrast with no change across sessions for control writers (Hypothesis 4).

In examining these hypotheses, two of the primary limitations of previous research were addressed. First, participants were recruited from a general student population. This guaranteed the inclusion of participants with a wide breadth of religious beliefs and experiences. Second, instead of examining only the aggregate scores for lexical content and writing experience across sessions for each condition, lexical content and writing experience both within and between writing sessions are compared in order to detect change over time.

Method

Participants

One hundred and fifty-five participants who self-identified as religious were recruited from the adult student population of a mid-sized public university in the western United States. This final sample consisted of 122 women (79%) and 33 men (21%). The participants' ages ranged from 18 to 48 with a mean of 20.27 years.

Recruitment

Students were solicited for participation through campus fliers and classroom announcements. During the recruitment process, students were informed the project involved writing. No mention of prayer was made in the title of the study or recruitment materials. This was critical to the experiment because only a quarter of the participants were assigned to the prayer condition. In order for this to be an effective comparison group, it was important that prayer was not mentioned to participants in other groups. This could have sensitized them to the purpose of the study and bias their narratives. Each prospective participant was informed that they might be asked to write about personal topics.

Setting

All experimental sessions for this study took place in a social psychology research laboratory on the university campus. The laboratory space was partitioned into four private cubicles. Each cubicle was outfitted with a desk, chair, and reading light.

Procedure

Participants were required to complete four experimental sessions. Each of the four sessions consisted of three distinct components: the pre-writing questionnaires, the writing exercise, and post-writing questionnaires. After the pre-writing questionnaires were filled

out, participants moved to the writing exercise. Each writing session lasted 15 min from the time the participant began writing. For each session, they were given specific instructions which presented their writing topic and four lined pages on which to write. Those participants assigned to the control condition were asked to write objectively about daily events, including how they used their time. These instructions were adapted from Spera et al. (1994). Participants in the typical self-disclosure condition were instructed to write about the most traumatic or difficult experience in their life. These were encouraged to express their "deepest emotions and thoughts" related to these events and to confront aspects of these experiences they had not previously shared. Subjects in the target-specific disclosure condition were asked to write about their most traumatic experience as if they were sharing their writing with a friend. Finally, those in the prayer condition were asked to write about their most traumatic experience as a prayer to God.

After 15 min of writing, participants were asked to complete the post-writing questionnaires. Upon completion of these assessments, participants were excused. Participants were fully debriefed at the conclusion of session four.

Measures

Lexical Measures

The occurrence of positive emotion words, negative emotion words, words denoting causality, and words related to insight in the narratives was measured through the use of the Linguistic Inquiry and Word Count program (LIWC) developed by Pennebaker and Francis (1996). In order to analyze the writing samples produced by participants, each of their handwritten accounts was typed into separate Microsoft Word files for editing. Any spelling errors in the texts were corrected so that the files could be examined accurately for content. After editing, each file was saved as a plain text file in order to be read by the LIWC program. The LIWC compares each individual word in the text files to predefined dictionaries of words related to specific themes. In this case, each text file was examined for words related to positive and negative emotion, causality, and insight. Once the text files were processed, output files were created for each separate text file that reported the percentage of words in the texts which matched each of the four categories. For example, if a particular text file consisted of a total of 300 words and included 6 positive emotion words, the percentage of positive emotion words would be represented by a value of 2% or (6/300 * 100). By reporting the proportion, the analysis controls for the length of the writing sample. In this experiment, each participant completed four separate writing sessions. Therefore, each had four values related to the occurrence of positive emotion words, negative emotion words, words related to causality, and words of insight.

Measures of Impact of the Writing Experience

Two separate instruments were used to assess the impact of the writing experience. The first measure was related to affect experienced by participants. A measure of positive and negative affect was collected by administering the Positive and Negative Affect Schedule (PANAS) developed by Watson et al. (1988) prior to and after each writing session. The PANAS consists of 20 words that describe different emotion and feeling states. Participants were asked to rate to what extent they felt each emotion or feeling state word described them at the time. The response options range from a score of one (very slightly or not at all) to a score of five (extremely). The 20 emotion or feeling words in the PANAS

are evenly split between 10 positive affect words (excited, proud, etc.) and 10 negative affect words (distressed, nervous, etc.). To score the PANAS, the item scores for positive and negative affect words are summed separately and divided by the total number of items in each scale. This provided composite scores for positive and negative affect. The average reliabilities for both the positive and negative affect scales across the four sessions were $\alpha = .90$.

The final short-term health outcome measure used in the study was related to physical symptoms experienced prior to and after each writing session. In order to assess these physical symptoms, we utilized Pennebaker's Symptom Checklist (Pennebaker 1982). The checklist presents the participant with 12 physical symptoms ranging from headache to sweaty hands. The participant was asked to rate their experience of each physical symptom on a scale from one to seven. A score of one corresponds to the total absence of the symptom while a score of seven relates to its strong presence. In order to compute the composite score for this checklist, the numeric responses to each individual item were added.

Results

The two primary goals of this project were to compare the lexical structure of prayer texts with other forms of self-disclosure and to compare the impact of the writing experience (both affective and physiological) between writing conditions. In order to meet these goals, seven separate 4 (writing condition) $\times$ 4 (session) mixed model ANOVAs were employed with the inclusion of positive emotion, negative emotion, causal, and insight words as dependent variables for the lexical analysis and positive affect, negative affect, and the experience of physical symptoms as DVs for the analysis of writing experience. Significant main and interaction effects are probed through post hoc analysis with Bonferroni correction for multiple comparisons. Particular attention is paid to the comparison of differences in writing condition by session.

Lexical Comparison for Writing Condition and Session

Descriptive statistics for the lexical content of all four writing conditions are presented in Table 1. Clear differences are apparent between the control condition and the trauma-writing conditions. There appear to be some differences between writing conditions that are examined more formally now.

The first lexical analysis examined the inclusion of positive emotion words. The 4 $\times$ 4 ANOVA revealed a significant main effect based on writing condition, $F\ (3, 151) = 35.33$, $P < .000$, partial $\eta^2 = .412$. A post hoc analysis yielded two effects. First, texts in each of the three trauma-writing conditions contained significantly greater levels of positive emotion than control texts, all P's $< .001$. In addition, prayer texts also contained significantly higher levels of positive emotion words than either self-disclosure or targeted self-disclosure texts, both P's $< .05$. The analysis also produced a significant main effect for writing session, $F\ (3, 453) = 21.26$, $P < .000$, partial $\eta^2 = .119$. The post hoc analysis revealed that a significantly greater proportion of positive emotion words were used in the fourth session compared to all previous ones, all P's $< .001$.

The analysis of negative emotion words in the written texts also produced a significant difference between writing conditions, $F\ (3, 151) = 70.78$, $P < .001$, partial $\eta^2 = .584$. A post hoc test revealed that the trauma-writing texts contained a significantly greater

Table 1 Means and standard deviations for percentage of words in text by writing condition and session

	Control		Disclosure		Targeted		Prayer	
	M	SD	*M*	SD	*M*	SD	*M*	SD
Positive emotion words								
Session 1	1.2	.87	2.2	1.08	2.2	.97	2.9	1.13
Session 2	1.2	1.02	2.4	1.27	2.1	1.12	2.8	1.29
Session 3	.9	.76	2.3	1.29	2.3	1.31	2.9	1.28
Session 4	2.0	1.30	3.1	1.42	2.8	.96	3.4	1.19
Negative emotion words								
Session 1	.6	.44	3.0	1.30	2.7	1.42	2.8	1.38
Session 2	.7	.54	3.1	1.35	3.0	1.51	2.9	1.42
Session 3	.4	.44	3.1	1.86	3.1	1.98	2.7	1.39
Session 4	.5	.60	2.5	1.38	2.6	1.44	2.4	1.27
Causal words								
Session 1	.5	.47	1.0	.54	.9	.64	1.4	.83
Session 2	.8	.58	1.4	.84	1.2	.88	1.4	.75
Session 3	.6	.66	1.4	.98	1.4	.76	1.5	.83
Session 4	.6	.51	1.2	.91	1.5	1.00	1.3	.83
Insight words								
Session 1	1.0	.55	2.2	.89	2.6	1.11	2.8	1.05
Session 2	1.2	.80	2.8	.90	2.8	1.30	2.6	1.09
Session 3	.7	.55	3.1	1.17	2.7	1.43	2.8	1.51
Session 4	.6	.64	2.9	1.14	3.3	1.41	3.3	1.26

proportion of negative emotion than control texts, all P's $< .001$, with no differences occurring between trauma-writing texts. The analysis also revealed significant differences based on the writing session, F (3, 453) = 3.72, $P < .05$, partial $\eta^2 = .024$. In this case, the post hoc analysis showed significantly fewer negative emotion words in the fourth session when compared to session two, $P < .01$.

The mixed model ANOVA used to examine the occurrence of causal words in the written text produced a significant main effect for writing condition, F (3, 151) = 21.69, $P < .001$, partial $\eta^2 = .301$. Post hoc analyses revealed significant differences between the trauma-writing and control conditions. To further explore differences between writing conditions, four one-way ANOVAs were calculated, one for each session. For each session, the ANOVAs produced significant differences. These were largely due to significant differences (P's $< .05$) between the trauma-writing and control conditions during each session. Beyond these differences, prayer texts contained a significantly greater percentage of causal words in session one than targeted self-disclosure texts.

The analysis also showed a significant main effect for writing session, F (3, 453) = 3.45, $P < .05$, partial $\eta^2 = .022$. The post hoc test revealed a significant increase in the use of causal words in session two and three when compared to session one, $P < .05$ across conditions. There was a significant interaction effect, F (9, 453) = 1.90, $P < .05$, partial $\eta^2 = .036$. The proportion of causal words incorporated into targeted self-disclosure texts increased significantly from session one to session four ($P < .05$), while the other three conditions showed no significant changes over time.

The final 4 × 4 mixed model ANOVA regarding the occurrence of insight words (e.g. *accept* and *learn*) in the written text yielded a significant main effect for writing condition, F (3, 151) = 87.03, $P < .001$, partial $\eta^2 = .634$. In order to understand differences between experimental conditions as they occurred in each of the four sessions, four separate ANOVAs were performed. At each point in time, we observed that the proportion of insight words varied significantly between conditions. Post hoc tests confirmed that for all four points in time, the trauma-writing texts contained a significantly greater proportion of insight words than control texts, all P's < .001. It also revealed that the prayer texts contained a greater proportion of insight words than the self-disclosure texts in session one ($P < .05$), but these differences were not apparent in the other sessions.

This analysis also yielded an overall main effect for writing session, F (3, 561) = 3.50, $P < .014$, partial $\eta^2 = .019$ and a significant interaction effect between writing condition and writing session, F (9, 453) = 4.77, $P < .001$, partial $\eta^2 = .087$. For the three trauma-writing conditions, the proportion of insight words increased significantly from session one to session four (P's < .05). However, this pattern was distinctly absent in the control condition where a drop in the occurrence of insight words was observed between session one and session four, post hoc $P < .01$.

In sum, the use of each of the four types of words analyzed was significantly different in the trauma-writing conditions than in the control condition as predicted by Hypothesis 1. The prayer condition differed from the other two trauma-writing conditions in that prayer texts contained more positive emotion words across all four sessions, and more causal and insight words in session one. Over time, the use of positive emotion, causal and insight words tended to increase whereas the use of negative emotion words tended to decreased for the trauma-writing groups but not for the control group which supports Hypothesis 2.

Emotional Impact and Physical Symptoms by Writing Condition and Session

Research using the self-disclosure paradigm has consistently shown that those engaged in trauma writing experience greater levels of negative affect as a result of the writing exercise than controls (Pennebaker and Keough 1999). Table 2 presents descriptive statistics for affect and physical symptoms across the four writing conditions.

The 4 × 4 ANOVA revealed significant differences between the four writing conditions in reference to reported negative affect, F (3, 148) = 23.04, $P < .001$, partial $\eta^2 = .318$. A post hoc test revealed that those in the trauma-writing conditions experienced significantly greater levels (all P's < .001) of negative affect based on the writing exercise than those in the control condition, while no significant differences existed between the trauma-writing conditions. Separate ANOVAs for each session confirmed the omnibus results for all but session four.

This analysis also resulted in a significant main effect for between-session differences, F (3, 444) = 19.24, $P < .001$, partial $\eta^2 = .115$. Post hoc tests revealed a significant decrease in the experience of negative affect from session one to session two, $P < .05$. Moreover, there was a second significant decrease between session three and session four, $P < .01$. There was also a significant interaction between session and writing condition in relation to the experience of negative affect, F (9, 444) = 3.75, $P < .001$, partial $\eta^2 = .071$. Those in the trauma-writing conditions experienced significant reductions in negative affect across the writing sessions (all P's < .01), while control writers experienced no change in affect over the four sessions.

The analysis of the impact of writing condition produced no main effect for positive affect. However, it did produce a main effect for writing session, F (3, 438) = 22.51,

Table 2 Means and standard deviations for writing experience by writing condition and session

	Control		Disclosure		Targeted		Prayer	
	M	SD	*M*	SD	*M*	SD	*M*	SD
Change in positive affect								
Session 1	−3.3	5.92	−6.9	8.16	−4.1	7.68	−4.9	7.23
Session 2	−2.7	4.16	−2.4	9.22	−3.8	7.23	−2.3	7.90
Session 3	−.7	4.95	−4.7	7.80	.0	5.89	−2.5	5.82
Session 4	−.5	3.93	1.0	6.40	1.8	6.40	.4	7.48
Change in negative affect								
Session 1	−.6	5.19	7.4	5.82	8.2	7.76	5.4	7.28
Session 2	−1.0	3.17	5.3	6.00	6.2	6.62	5.8	5.65
Session 3	−1.0	2.82	4.0	5.21	4.2	6.21	5.5	6.21
Session 4	−.2	1.88	1.7	4.48	3.5	5.12	2.3	4.97
Change in physical symptoms								
Session 1	.1	4.57	4.3	6.63	5.3	7.56	5.0	8.02
Session 2	−.4	4.85	2.7	5.62	4.0	7.15	2.9	6.37
Session 3	−1.2	3.96	3.1	5.74	3.1	9.01	3.1	6.42
Session 4	−2.3	5.07	1.3	5.07	2.2	8.24	2.4	4.96

$P < .001$, partial $\eta^2 = .134$. The post hoc analysis showed significant increases between session one and sessions two, three, and four (all P's $< .01$), session two and four ($P < .001$), and session three and four ($P < .001$). The analysis of change in positive affect by session and writing condition yielded a significant interaction, F (9, 438) = 2.06, $P < .05$, partial $\eta^2 = .041$. This can be explained by the fact that trauma writers, across all three conditions, reported significant increases (all P's $< .01$) in positive affect across writing sessions while control writers reported significant change.

Those in the trauma-writing conditions were expected to experience increased physical symptoms as a result of the writing compared to controls. The 4 × 4 mixed model ANOVA examining this contention showed significant between-condition differences existed in the experience of physical symptoms as well, F (3, 144) = 7.46, $P < .001$, partial $\eta^2 = .134$. A post hoc test was utilized to examine differences between the trauma-writing and control conditions in reference to physical symptoms. As expected, those in the three trauma-writing conditions experienced significantly higher levels (all P's $< .01$) of physical symptoms than controls. At the same time, no significant differences existed between the trauma-writing conditions. Significant differences between writing sessions also existed, F (3, 432) = 8.84, $P < .001$, partial $\eta^2 = .058$. The post hoc analysis revealed that a significant reduction in physical symptoms took place between sessions one and three ($P < .05$), one and four ($P < .001$), and two and four ($P < .005$).

As expected, writing about trauma was associated with increased negative affect and more physical symptoms when compared to writing about mundane activities (supporting Hypothesis 3). However, writing about trauma appeared to decrease negative affect and physical symptoms and increase positive affect over time, suggesting a somewhat longer-term benefit of writing about trauma for mood and physical well-being (Hypothesis 4).

Discussion

Comparing the Content of the Writing Between Conditions

One of the primary goals of this project was to compare the lexical content of prayer texts with more typical forms of written self-disclosure. The lexical analysis undertaken for this project provided a convincing replication for the work of VandeCreek et al. (2002). When comparing the lexical content of the trauma-writing groups (self-disclosure, targeted self-disclosure, and prayer) across the four critical components (positive emotion, negative emotion, causality, and insight), we found that prayer texts contained significantly more positive emotion words than the other trauma-writing texts across all four writing sessions, and more causal and insight words in the first session. These differences, though small, could be important given the known relationship between the expression of positive emotion, causality, and insight and better health outcomes in self-disclosure writing (Pennebaker and Keough 1999). In addition, we found that all three trauma-writing conditions are lexically different than controls, showing a far greater proportion of positive and negative emotion, causal, and insight words.

The expression of positive emotion, negative emotion, causality, and insight was also found to vary by writing session. As participants moved through the sessions, the texts they produced showed increased positive emotion and decreased negative emotion in each of the trauma-writing conditions. Over the four sessions, the proportion of causal words and the expression of insight incorporated into the texts grew as well for those in the trauma-writing conditions. Given these findings, it appears that the participants' appraisals of traumatic events changed, becoming less threatening. At the same time, there is lexical evidence for the development of understanding related to the trauma. These patterns of change are consistent with Park and Blumberg's (2002) hypothesis that self-disclosure allows one to make meaning from the traumatic event.

Short-Term Impacts of Prayer-as-Self-Disclosure

This pattern of results was evident in our findings as well. In relation to the experience of negative affect, participants in the prayer and other trauma-writing conditions reported a significant increase in negative feelings as a result of the writing exercises compared to controls. Further analysis revealed that no significant differences in experienced negative affect existed between the trauma-writing conditions. Similarly, the trauma writers experienced greater levels of physical symptoms than participants in the control condition. Again, each of the trauma-writing groups reported similar levels of physical symptoms as a result of writing. These results were consistent with expectations. Though differences exist in the instructions for the various trauma-writing conditions, the primary thrust of the exercise is the same in each. Participants were asked to write emotionally laden accounts of traumatic life experiences. It is important to note, however, that the impact of the writing exercises on negative affect and physical symptoms did diminish significantly over the course of the four sessions.

Limitations

Though the current study provides compelling evidence that prayer functions as self-disclosure, it must be understood that the procedures and analyses have some limitations.

One limitation of this is gender imbalance of the sample, which consisted of 122 women and 33 men, due to the disproportionate number of women enrolled in entry-level social science courses. The gender imbalance in this study raises a question of generalizability. Given this limitation, the results of this study may apply more to women than to men, though further research would be necessary to reach such a conclusion.

Another limitation of this study is the modality of prayer. When individuals pray about difficult life experiences, it is not likely that they do so in writing. The prayer exercise that was utilized for this research would be more akin to prayer journaling. Although our approach was appropriate for testing our hypotheses regarding prayer as written self-disclosure, future research on the association between prayer and health should expand to more common modalities (e.g., spoken, silent) and more naturalistic settings, such as at home or in a religious setting.

A final limitation of this study is the absence of reliable and valid measures of longer-term health outcomes. Thus, we are unable to assess whether writing in the form of a prayer has similar health benefits to those demonstrated by decades of research by Pennebaker and his colleagues. However, the diminishing effect of trauma writing on negative affect and physical symptoms, and the appearance of increasing positive affect over the four writing sessions hints at a potential for salutary effects over time.

Conclusion

This study makes no claim to unravel or explain the supernatural effects of prayer. This research simply represents an examination of one mechanism through which prayer might exert an impact on physical and emotional health. Indeed, as has been shown, prayers about traumatic experiences appear to be structurally and functionally equivalent to other more typical forms of self-disclosure. This process of self-disclosure allows the participant to express emotion and make meaning from traumatic life events, which may lead to health benefits. Understanding of the link between religion and health has grown exponentially over recent years. It has been shown that institutionalized religion and private religious practice impact health through a number of pathways such as providing social support networks and mandating standards for healthy living. Religion also impacts health by providing resources for coping with difficult life events (Pargament 1997). The current research has shown prayer to be one such resource. Many religious traditions espouse this practice, which allows for self-reflection and disclosure about traumatic life events to a higher power. This opportunity for self-disclosure has now been shown to impact both physical and emotional health. Beyond the practice of personal prayer, institutionalized religion and private religious practice provide other opportunities to confront difficult life events such as ritualized prayers, confession, and public worship. Future research should address the ability to effectively self-disclose in these settings and examine possible implications for health.

Taken as a whole, these results provide considerable support for the idea that prayer functions as self-disclosure to God and may provide for health benefits similar to writing about trauma without God in mind. An important next step will be to examine the impact of prayer as self-disclosure within clinical populations. This practice could be of particular benefit for those coming to terms with difficult diagnoses or terminal illness as it provides a way to express emotion and make meaning from the experience. For those patients who are open to a religious/spiritual intervention, prayer-as-self-disclosure could be an effective tool for allowing individuals to organize and express thoughts and feelings related to their

illness. This practice could be especially useful for patients who do not have many other outlets (e.g. family, friends, health care workers) for disclosure about their illness.

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