

Spring 5-1-2021

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**Exploring Emotion Regulation as a Moderator of the Relationship between Benefit-Finding
and Measures of Stress in Cancer Survivors**

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Undergraduate Honors Thesis

University of Connecticut

May 2021

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Abstract

Cancer is a life-threatening illness caused by uncontrolled and abnormal cell division. Diagnosis and treatment of cancer is often viewed as a traumatic event and can elicit unique physical, social, and psychological stressors with wide ranging effects on an individual. These chronic stressors can cause a considerable amount of distress for individuals throughout their treatment process and even months to years after their cancer experience. The psychological health of this population post-treatment can therefore be measured by the presence or absence of distress or negative psychological responses as well as the presence or absence of positive psychological responses. Distress encompasses a multitude of negative psychological responses including anxiety, depression, and fear. Positive psychological responses include coping efforts that promote resilience and well-being. One such factor is benefit-finding, which could include “positive change in relationships, a greater appreciation of life and a change in life priorities” (Mols, 2009). Identifying positive coping strategies or resources that promote positive physiological responses, such as lowered cortisol stress levels, may have implications for future interventions.

We sampled 128 cancer survivors previously diagnosed with either prostate, colorectal, or breast cancer and within 4 months of anticipated end of treatment. Participants were given baseline and post-active treatment questionnaires to assess psychological responses, overall wellbeing, and cortisol levels as reflected in hair and nail samples. Participants also received by mail an actigraph and materials for cortisol collection. This thesis study aims to examine the relationship between benefit finding and both physiological outcomes of stress, as assessed by hair cortisol levels, and psychological stress, as assessed by post-traumatic stress outcomes. We also sought to examine whether usage of certain resources, specifically emotion regulation,

promote more beneficial forms of coping and in turn enhance the effect of coping on lowering both physiological and psychological stress. Results showed that high degrees of benefit finding may lead to high levels of physiological stress as assessed by hair cortisol levels and high levels of psychological stress as assessed by degree of post-traumatic stress, though those relationships are not statistically significant. Finally, emotion regulation acts as a moderator of the relationship between benefit finding and hair cortisol levels.

Introduction

Cancer Survivorship and Resilience

Cancer survivorship involves the transition from a state of illness to a state of health, including dealing with changes in structure from a hospital setting back to “normal” life (Andrykowski, 2008). While some individuals adjust readily, others experience high levels of distress, and some may achieve higher levels of well-being than before cancer (Bellizzi et al., 2012; Cho & Park, 2017).

Resilience is defined as continued well-being, both in physical and psychological functioning, across the challenge or stressor and is therefore time-dependent and an indicator of adjustment (Bonanno 2004). Current literature suggests that survivors’ appraisals are strong indicators of their adjustment, though studies on the effect of survivors’ coping on well-being and health behavior change remains understudied (Park et. al., 2008). While trajectories of resilience and recovery have been applied to other stressors such as bereavement or natural disasters, the trajectories of cancer survivorship post-treatment has not been extensively studied (Bonnano, 2004). In addition, current literature focuses more heavily on resilience and recovery after a cancer diagnosis and less on the transition to survivorship at the end of primary treatment.

The YUCAN Cancer Survivorship Study being conducted by Park and colleagues uses a model that connects cancer or treatment-related factors, personal and social resources, appraisal, and coping with health outcomes including physical, psychological, social functioning, and health behaviors. This study seeks to integrate concepts of the Biopsychosocial Restorative Model of Well-Being in the context of cancer-related resilience, including the processes of appraisal and coping, to further characterize the resources and processes necessary to promote resilience (Lent, 2007). Given the interconnectedness of appraisal, coping, and physiological health outcomes as well as the challenges cancer patients face, further study of those relationships with specific measures is warranted (Sumalla, 2009).

Benefit Finding and its Relation to Physiological and Psychological Stress Outcomes

Research has shown that positively-oriented coping responses may be beneficial to cancer survivors (Thambyrajah et al., 2010). One such coping response is benefit finding. Benefit finding is a meaning focused method of coping that includes the ability to look for the positives despite adversity or making positive change due to the struggle with a major life event (Pascoe, 2013 and Calhoun et al., 2000). Studies have previously shown that this process of benefit finding takes place for chronically ill patients, include those with cancer (Affleck & Tennen, 1996; Carver & Antoni, 2004; Petrie et al., 1999; Schulz & Mohamed, 2004; Sears et al., 2003; Tomich & Helgeson, 2004). Benefit finding overall has been associated with better mental health outcomes in terms of depression and positive well-being. Higher perceived stress has been associated with benefit finding and stress-related growth more broadly and is positively correlated with the perceived stressfulness of the event (Lassmann, 2021 and Park, 1996). Additionally, a moderately strong relationship has been established between posttraumatic stress

disorder symptoms, specifically when assessed with the Impact of Events Scale, and measures of post-traumatic growth, one of which is benefit finding (Marzilliano, 2019). Benefit finding has also been associated with objective physical health, although whether or not objective physical health drives benefit finding or benefit finding drives changes on objective physical health is unclear (Helgeson 2006). There is therefore a need to further study the relationship between benefit finding and objective measures of physical health.

Cortisol as an Outcome and Physiological Measure of Stress

A commonly studied physiological health outcome measure is stress as measured by cortisol levels. Cortisol can be used as an objective biomarker of stress that can further indicate resilience. It's been shown that cortisol levels within the cancer survivor population are related to perceived growth (Cruess et al., 2000) as well as survival (Sephton et al., 2000; Sephton et al., 2013). Systematic review of cortisol as a biomarker of chronic stress has validated the use of hair cortisol concentrations as an accurate reflection of chronic stress. Each centimeter of hair collected contains approximately a month's concentration of cortisol levels and therefore accurately represents response to chronic stressors (Phillips, 2021 & Binz, 2018). The effect of benefit finding on acute cortisol has been previously studied. Deriving benefit from experience with prostate cancer has been associated with a healthier diurnal cortisol rhythm (Wang, 2018). Similarly, women with metastatic breast cancer who reported more posttraumatic growth had more normal cortisol patterns (Diaz, 2014). In a sample of maternal caregivers, those with greater life appreciation, personal strength, and positive affect had steeper cortisol slopes, indicating a more normal diurnal cortisol pattern as well (Diaz, 2014). However, a study conducted by Gudenkauf and colleagues show non-significant relationships between benefit

finding and cortisol in women with breast cancer (Gudenkauf and colleagues, 2013). These inconsistent findings not only prove a need to further study benefit-finding in relation to cortisol more generally, but to also study chronic cortisol as opposed to acute levels of cortisol.

The Relationship between Post-Traumatic Stress and Cortisol Levels

More broadly, posttraumatic stress disorder (PTSD) symptoms might be important in understanding cortisol changes in cancer as well. Recent studies show evidence that those with greater PTSD symptoms had blunted diurnal cortisol production (Cordova, 2017). There is, however, limited data in this area showing a need to better evaluate the relationship between self-reported distress and objective measures of stress such as cortisol. Specifically, the effect of benefit finding on both self-reported and physiological outcomes should be further studied.

The Relationship between Benefit Finding, Stress Outcomes, and Emotion Regulation

A systematic literature review conducted by Pascoe and colleagues has shown that while there is inconclusive evidence on what factors influence benefit finding, there is an association between benefit finding and reduced physiological stress-response biomarkers (Pascoe, 2013). This lack of evidence on what impacts benefit finding both demonstrates the need to further explore the relationship between benefit-finding and cortisol and the need to identify covariates or moderators of that relationship. This thesis proposes to study emotion regulation as a potential moderator of the relationship between benefit finding and both psychological as well as physiological outcomes. In a study with a sample of women being treated for non-metastatic breast cancer, the effects of sociodemographic, pathological, and psychological variables on benefit finding were tested. It was found that cognitive emotional regulation strategies are

important factors contributing to degree of benefit finding in women with breast cancer (Wang, 2014). Specifically, there are positive associations between adaptive cognitive emotion regulation strategies and benefit finding whereas there are significant negative associations between maladaptive cognitive emotion regulation strategies and benefit finding in this population (Wang, 2014). In addition to its relation with benefit finding, emotion regulation has also been shown to be associated with both physiological stress outcomes as assessed by cortisol and psychological outcomes as assessed by post-traumatic stress. Weiss and colleagues showed that emotion regulation can contribute to both the development and maintenance of post-traumatic stress (Weiss, 2013). Emotion regulation has also been shown to affect the HPA axis activation in response to a stressor as assessed by salivary cortisol. HPA dysregulation, specifically hypersensitivity in the face of stress, has been associated with emotion regulation (Krkovic, 2018). Since emotion regulation has been associated with both benefit finding and stress outcomes, further testing of this variable as a moderator of the relationship between benefit finding and physiological as well as psychological stress can further determine the directionality and nature of these relationships. Lastly, studies have shown that emotion regulation plays a large role in cancer resilience and counteracting distress in this population (Vaughan, 2019).

Thesis Objectives and Aims

Through this study we aim to better understand benefit finding and examine whether usage of certain resources, specifically emotion regulation, promote more beneficial forms of coping via benefit finding and in turn enhance the effect of coping on lowering both physiological and psychological stress. The following questions were tested:

1. How does benefit finding predict physiological stress as assessed by levels of hair cortisol in the cancer survivor population? We predict that higher levels of benefit finding will be correlated with lower levels of cortisol, indicating a lower amount of physiological stress.
2. How does benefit finding predict psychological stress as assessed by degree of post-traumatic stress in the cancer survivor population? We predict that higher levels of benefit finding will be correlated with lower levels of post-traumatic stress, indicating a lower amount of psychological stress.
3. How does hair cortisol levels as a physiological measure of stress relate to post-traumatic stress, as an indicator of psychological stress? Our hypothesis predicts that cortisol concentration levels and post-traumatic stress symptoms would be positively and significantly associated as both are indicators of stress.
4. Do higher scores in emotion regulation moderate the relationship between benefit finding and cortisol levels? We predict that higher scores in benefit finding will be associated with lower cortisol levels and that low degrees of difficulty with emotion regulation will strengthen the relationship between high scores in benefit finding and low cortisol levels.
5. Do higher scores in emotion regulation moderate the relationship between benefit finding and post-traumatic stress? We predict that higher scores in benefit finding will be associated with lower degrees of post-traumatic stress and that low degrees of difficulty with emotion regulation will strengthen the relationship between high scores in benefit finding and low scores in post-traumatic stress.

Methods

Participants

Patients at Yale-New Haven Hospital were recruited in July of 2018 and are being assessed over five years with five assessment time points . The sample for the YUCAN cancer survivorship study will eventually enroll up to 575 participants of which a subset of 128 participants was used for the present study; all were examined solely at baseline (time point one).

Procedures

Eligibility includes a diagnosis of breast, prostate or colorectal cancer stages 1 to 3, being between the ages of 18-80 at the time of diagnosis, and being within four months of the end of primary treatment. Participants were given baseline questionnaires at the time of enrollment, or time point one. Post-active treatment questionnaires were administered in a similar manner via mail or an online survey between time points two and five. Participants also received by mail the materials for cortisol samples and actigraphy to return for analysis.

Measures and Materials

Demographics questionnaire

Participants were asked to provide their age, gender, ethnicity, race, marital status, employment status, level of education, and medical history upon study enrollment.

Benefit Finding Scale

Benefit-finding was assessed with the Benefit Finding Scale, with higher scores indicating a higher degree of benefit-finding. The 17-item scale consists of statements on how

benefit finding is experienced by adults living with cancer including questions such as *'Having had cancer has helped me to take things as they come.'* Participants were asked to indicate, on a scale from (1) "great negative change" to (5) "great positive change" to allow for change in both the negative and positive direction. Scoring in this way avoids response bias, suggesting that only one direction of change is possible. This measure was re-coded as 1 = -2, 2 = -1, 3 = 0, 4 = 1 and 5 = 2 and then summed for subsequent analysis. Construct validity was determined by Pascoe and colleagues with a Cronbach's alpha of .95 (Pascoe, 2015).

Difficulties in Emotion Regulation Scale

Emotion regulation was accessed using the Difficulties in Emotion Regulation Scale (DERS), with higher scores indicating greater emotion dysregulation. The survey consists of six subscales with each subscale consisting of five to eight items. Participants were asked to indicate, on a scale of (1) "almost never" to (5) "almost always" the extent to which each item applied to them. The 36-item scale consists of statements relating to nonacceptance, difficulties engaging in goal directed behavior, impulse control, lack of emotional awareness, limited access to emotion regulation strategies, and lack of emotional clarity (Kaufman, 2016).

Nonacceptance refers to the tendency towards negative emotion or denial of distress. An example item used to measure nonacceptance is "When I'm upset, I become embarrassed for feeling that way." Difficulties engaging in goal directed behavior refers to problems concentrating and completing tasks while upset or overwhelmed with emotion. An example item used to measure this subscale is "When I'm upset, I have difficulty focusing on other things." Impulse control refers to the ability control behavior when upset. An example item to access impulse control is "When I'm upset, I become out of control." Lack of emotional awareness

refers to lack of attention to emotional responses and can be assessed by items such as “When I’m upset, I acknowledge my emotions.” Limited access to emotion regulation strategies refers to beliefs about the one’s ability to regulate their own emotions and can be assessed by items such as “When I’m upset, I believe there is nothing I can do to make myself feel better” Emotional clarity refers to the extent to which individuals feel they are clear about what emotions they are experience and can be assessed by items such as “I have difficulty making sense out of my feelings.” Construct validity was determined by Kaufman and colleagues with a Cronbach’s alpha of .78 to .91 (Kaufman, 2016).

Physiological Stress Measure

Hair cortisol levels were used as a physiological measure of stress. Cortisol levels were measured via hair samples and analyzed with the method described by Meyer and colleagues. Samples will be weighed, washed in isopropanol twice, ground to fine powder, and extracted with methanol. The methanol will then be evaporated, the residue redissolved in the assay buffer, and the cortisol will be measured using Salimetrics enzyme immunoassay kit (Meyer et al. 2014).

Impact of Events Scale - Revised

Posttraumatic stress disorder (PTSD) is characterized by symptoms such as hyperarousal as well as avoidance of feelings and situations and is a self-reported indicator of distress or long term stress after a traumatic event, such as one’s cancer diagnosis and treatment experience. PTSD symptomatology was assessed with the Impact of Events Scale with higher scores indicating greater prevalence of PTSD-like symptoms. The 22-item scale consists of statements

on how distressing each difficulty has been for them within the past week with items such as '*I avoided letting myself get upset when I thought about it or was reminded of it*' and '*Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea, or a pounding heart.*' Participants were asked to indicate, using a four-point Likert scale with (0) "not at all" to (4) "extremely" as anchors, the extent to which each item applied to them in the past seven days. Construct validity was determined by Weiss and colleagues (Briere, 1997).

Data Analysis

For preliminary analysis, we computed descriptive statistics on each variable including means, distribution, and standard deviation. The relationship between benefit-finding and hair cortisol level was determined with bivariate correlation analysis on SPSS software. The relationship between benefit-finding and degree of post-traumatic stress, as well as the relationship between post-traumatic stress and hair cortisol level was also determined with bivariate correlation analysis on SPSS software.

To test whether perceived control moderates the relationship between benefit-finding and cortisol levels, we conducted moderation analyses. An interaction term was created via SPSS Statistics PROCESS Macro between benefit finding and emotion regulation score by centering means and then multiplying as a means to measure moderation. A linear regression was conducted between this interaction variable and cortisol levels to determine the effect of emotion regulation on coping via benefit-finding and physiological stress outcomes via cortisol levels. Parallel models with the predictor and moderator were also run with post-traumatic stress symptoms as an outcome of psychological stress in order to determine how closely cortisol levels

relate to self-reported stress and well-being. Significance effects were based on a 95% confidence interval.

Results

Demographic Characteristics

Participants consisted of 128 participants diagnosed with breast, prostate, colorectal cancer within four months of anticipated end of primary treatment, including surgery, chemotherapy, or radiation were assessed at time point one. Based on demographic characteristics, participants were generally female (76%), white (85.9%), and non-Hispanic or Latino (89.5%). Participants were the mean age of 60 (SD=11.5). Participant demographic analyses are presented in Table 1.

Descriptive Statistics

Hair cortisol concentration was $M=24.7133$. Descriptive statistics of cortisol measures suggest a high level of variability across participants ($SD=77.9$). Previous research by Binz and colleagues indicated sample scores with the median hair cortisol concentration level reported to be 5.8 pg/mg for adults ages 18-70. Benefit-finding was $M=11.66$ ($SD=10.182$). Post-traumatic stress was $M=16.0947$ ($SD=15.23021$). Emotion regulation was $M=32.9268$ ($SD=10.58081$). Descriptive findings are presented in Table 2.

Benefit-Finding and Cortisol Concentration Levels

The Benefit-Finding Time Point 1 Total score was used to capture the degree of benefit-finding. Hair cortisol concentrations were measured in picograms per milligram (pg/mg).

Results show that benefit finding is not significantly correlated with hair cortisol concentration though it is strongly trending with cortisol concentration ($p=0.058$). Correlation is significant at the 0.05 level (2-tailed). The pearson coefficient indicates that higher degrees of benefit finding is actually associated with higher hair cortisol ($+0.172$, $N=123$). See Table 3 and Figure 2. In addition, linear regression analysis further indicates that benefit-finding does not significantly predict cortisol concentration levels (See Table 6).

Benefit-Finding and Post-Traumatic Stress

The Benefit-Finding Time Point 1 Total score was used to capture the degree of benefit-finding and the Impact of Events Scale Time Point 1 Total score was used to capture the degree to which post-traumatic stress was experienced by participants. Benefit finding is also not significantly correlated with post traumatic psychological stress ($p=0.186$). In addition benefit finding seems to be positively associated with greater PTSD symptoms ($+0.169$, $N=366$). See Table 3 and Figure 2.

Cortisol Concentration Levels and Post-Traumatic Stress

Hair cortisol concentration as an indicator of physiological stress wasn't significantly correlated with post-traumatic stress symptoms as an indicator of psychological stress shown ($p=0.76$). Correlation is significant at the 0.05 level (2-tailed). See Table 3 and Figure 2.

Emotion Regulation as a Moderator

The Difficulties in Emotion Regulation Time Point 1 Total score was used to capture the degree of difficulty participants had regulating their emotions. Emotion regulation was shown to

not moderate the relationship between benefit finding and psychological stress as assessed by the post-traumatic stress survey [95% CI -0.0160, 0.0232]. The null hypothesis is represented by the value 0. If the 95% CI doesn't include 0, the p-value would be $<.05$, which is the conventional cutoff for significance. See Table 5.

However, emotion regulation does moderate the relationship between benefit finding and physiological stress as assessed by cortisol concentration [95% CI 0.0004, 0.0026]. See Table 4.

Discussion

General Discussion

The first hypothesis predicted that higher levels of benefit finding would be correlated with lower levels of cortisol, indicating a lower amount of physiological stress. However, results showed that benefit finding actually is positively associated with hair cortisol concentration, indicating a high level of physiological stress is a result of higher degrees of benefit-finding, though it is not statistically significant ($+0.172, p=0.058$). The second hypothesis predicted that higher levels of benefit finding would be correlated with lower levels of post-traumatic stress, indicating a lower amount of psychological stress. However, results showed that benefit-finding is positively associated with degree of PTSD symptoms, indicating that a high level of psychological stress is a result of high degrees of benefit-finding, though not significantly ($+0.169, p=0.186$).

The above two findings suggest that although benefit finding is thought to be a positive coping mechanism, perceived positive growth is not always reflective of actual growth, which may be why benefit finding was related to higher stress outcomes both physiologically and psychologically (Bower, 2009 & Sumalla, 2009). It is possible that participants think they find

more positive components in stressful situations than they actually do and therefore have more stress than their perception of benefit finding would indicate.

The third hypothesis predicted that cortisol concentration levels and post-traumatic stress symptoms would be positively and significantly associated as both are indicators of stress, despite one being a physiological measure and the other being a psychosocial measure. Results showed that cortisol concentration levels and post-traumatic stress symptoms are positively associated (+0.029). However, this relationship wasn't significant as hair cortisol concentration as an indicator of physiological stress wasn't significantly correlated with post-traumatic stress symptoms as an indicator of psychological stress shown ($p=0.76$).

The fourth hypothesis predicted that higher scores in benefit finding would be associated with lower cortisol levels and that lower degrees of difficulties with emotion regulation would strengthen the relationship between high scores in benefit finding and low cortisol levels. Results showed that benefit finding actually is positively associated with hair cortisol concentration, and that emotion dysregulation strengthens the how positive the relationship is between benefit finding and cortisol levels is (Figure 4). Therefore, greater difficulties with emotion regulation significantly strengthens the effect a high degree of benefit finding has on high cortisol levels ([95% CI 0.0004, 0.0026], $p= 0.0125$). This finding is consistent with previous literature that has shown that those who have higher usage of maladaptive emotion regulation strategies tend to have an increased stress response measured by salivary cortisol levels across time points (Krkovic, 2018).

The fifth hypothesis predicted that higher scores in benefit finding would be associated with lower post-traumatic stress levels and that lower degrees of difficulties with emotion regulation would strengthen the relationship between high scores in benefit finding and low

degree of post-traumatic stress. Results showed that benefit finding is positively associated with hair post-traumatic stress, and that emotion regulation does not strengthen or weaken the how positive the relationship is between benefit finding and post-traumatic stress is (Figure 3).

Therefore, emotion regulation has no significant influence on the effect benefit finding has on the degree of post-traumatic stress experienced [95% CI -0.0160, 0.0232].

Limitations and Future Research

To account for limitations, hair care factors were tested to determine if frequency of hair washing, usage of dyes, and frequency of exercise and chlorine exposure would explain the variability in the hair cortisol concentrations. Previous literature suggests that hair washing could influence hair cortisol concentrations and therefore the validity of hair cortisol as a physiological measure of stress (Binz et al. 2018 & Dettenborn, 2012). Results from bivariate correlation analysis show that hair care factors were not significantly correlated with hair cortisol concentration overall given that correlations are labeled as significant at the 0.05 level. Specifically, hair washing was not significantly correlated with hair cortisol concentrations in pg/mg (-0.111, $p=0.296$) Hair coloring, bleaching, straightening, or other hair produce use was not significantly correlated with hair cortisol concentrations in pg/mg (-0.158, $p=0.118$). Lastly, swimming and exercising for more than 2 hours a day was not significantly correlated with hair cortisol concentrations in pg/mg (-0.15, $p=0.141$ & 0.049, $p=0.626$).

Other limitations include the small sample size which may have limited the statistical power of the analysis. Out of the 576 participants enrolled in the study, only 128 participants were used for analysis in the present thesis as there was a limited amount of cortisol data available. In addition, though well validated scales were used to measure benefit finding,

post-traumatic stress, and emotion regulation, certain subscales were not accessed. Also, this thesis study had assessed benefit finding and its relationship to stress outcomes at one time point. Previous studies have found that there is a relationship between degree of benefit finding and stage of cancer, specifically in breast cancer patients. The perceived severity of disease in addition to stage of cancer may impact the emergence and maintenance of benefit finding (Wang, 2014). Future studies should measure and analyze benefit finding across multiple time points to account for these factors.

Finally, the implications of our finding show that a high degree of benefit finding may be related to higher levels of physiological and psychological stress. The use of personal resources such as emotion regulation can enhance the effect of coping skills like benefit finding on physiological stress outcomes, specifically hair cortisol levels. Further research in this area is necessary as current findings are inconsistent within the literature and when comparing the results of this thesis study to previous research. Although there is evidence in the literature to suggest that benefit finding is associated with physiological and psychological health outcomes in the cancer survivor population, further research in exploring predictors, covariates, and mechanisms of the relationships is warranted (Pascoe, 2013).

Conclusion

A high degree of benefit-finding, although highly regarded as a positive meaning-based coping strategies, may be associated with high levels of physiological stress as assessed by hair cortisol levels and high levels of psychological stress as assessed by degree of post-traumatic stress. Further research is necessary to confirm the significance of these results. Finally, emotion regulation acts as a moderator of the relationship between benefit finding and hair cortisol levels,

indicating that negative use of personal resources, such as high levels of emotion dysregulation, can strengthen the effect that benefit finding has on increasing physiological and psychological stress outcomes.

Acknowledgements

Thank you to Dr. Park for her support and guidance on this thesis project as well as Ms. Katherine Gnall for her assistance with the data analysis process.

Figures and Tables

Figure 1. *Thesis Proposed Model*

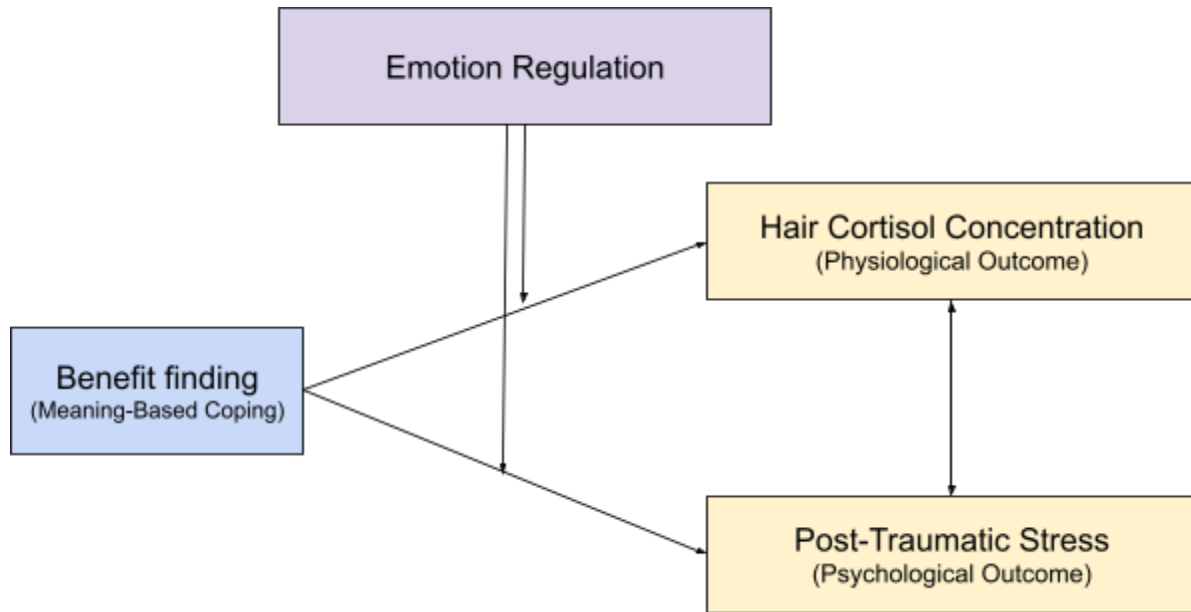


Table 1
Participant Demographics

Demographic	N	Valid Percent
Age	128	
25-40	6	4.8
40-49	20	15.7
50-59	26	20.4
60-69	40	31.1
70-79	36	28.2
Race	128	
White	110	85.9
Black	8	6.3
Asian	3	2.3
Refuse to answer	6	4.7
Unknown	1	0.8
Ethnicity		
Hispanic or Latino	5	4.4
Not Hispanic or Latino	102	89.5
Not Reported	20	15.6
Unknown	1	0.9
Gender	128	
Female	76	59.4
Male	52	40.6
Not Reported	5	3.9
Level of Education	128	
No formal Education	1	0.8
High School	17	13.3
Some college or associate degree	25	19.5
Bachelor's Degree	37	28.9
Graduate or professional degree	4	3.1
Master's degree	29	22.7
Doctoral degree or professional degree	9	7
Prefer not to answer	1	0.8
Not Reported	5	3.9

Table 2
Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Benefit Finding	403	-22	34	11.66	10.182
Hair Cortisol Concentration (pg/mg)	128	0.1	514.4	24.7133	77.92559
Post-Traumatic Stress	380	0	83	16.0947	15.23021
Emotion Regulation	123	18	65	32.9268	10.58081

Table 3
Bivariate Correlations

		Benefit-Finding	Hair Cortisol Concentration (pg/mg)	Post-Traumatic Stress	Emotion Regulation
Benefit Finding	Pearson Correlation	1	0.172	0.069	-0.084
	Significance (2-tailed)		0.058	0.186	0.101
Hair Cortisol Concentration (pg/mg)	Pearson Correlation	0.172	1	0.029	0.028
	Significance (2-tailed)	0.058		0.76	0.755
Post-Traumatic Stress	Pearson Correlation	0.069	0.029	1	0.583**
	Significance (2-tailed)	0.186	0.76		0
Emotion Regulation	Pearson Correlation	-0.084	0.028	0.583**	1
	Significance (2-tailed)	0.101	0.755	0	

* $p < .05$, ** $p < 0.01$

Figure 2. *Thesis Model Bivariate Correlations*

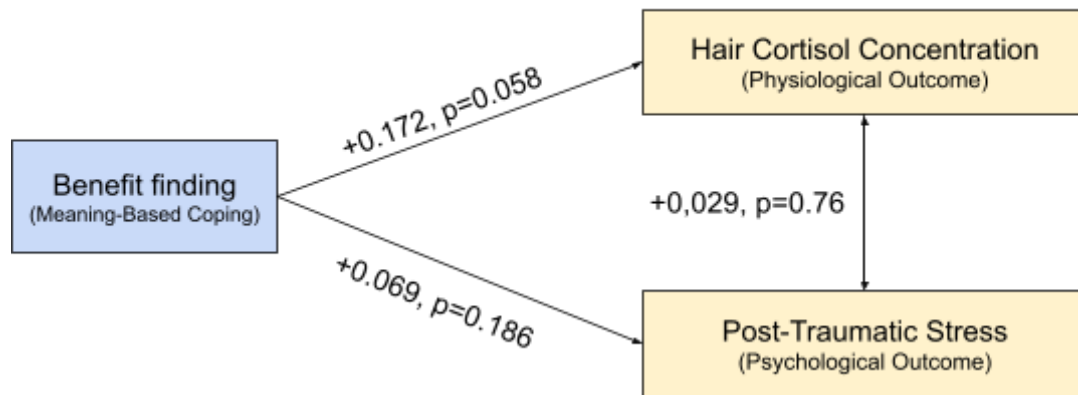


Table 4
Moderation Model

Model Summary		R	R-sq	MSE	F	p
		0.2983	0.0890	0.3570	3.7759	.0125
Model						
	Coefficient	Se	t	p	LLCI	ULCI
Constant	1.1434	0.2997	3.8155	0.0002	0.5498	1.7369
BFS_T1	-0.0330	0.0177	-1.8651	0.0647	-0.0681	0.0020
DERS_T1	-0.0169	0.0090	-1.8664	0.0645	-0.0347	0.0010
Int_1	0.0015	0.0006	2.6392	0.0095	0.0004	0.0026

Note: Moderation effects of emotion regulation on benefit-finding and hair cortisol concentration

Figure 3. *Emotion Regulation as a Moderator between Benefit-Finding and Degree of Post-Traumatic Stress*

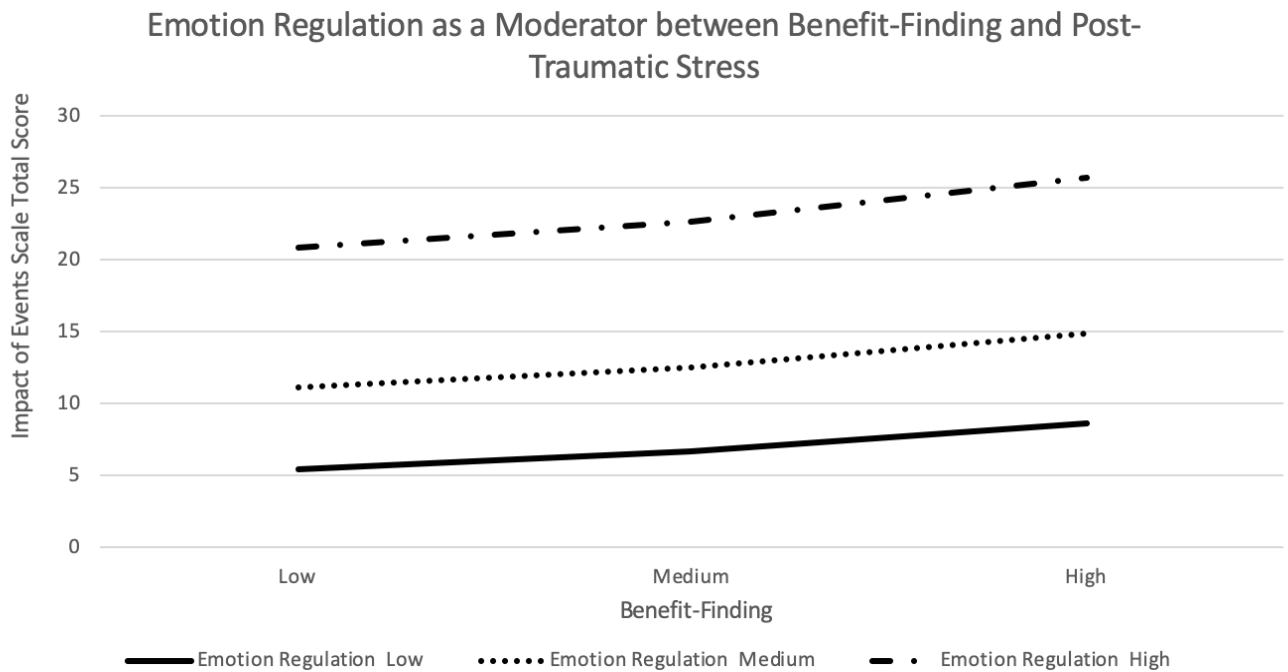


Table 5
Moderation Model

Model Summary		R	R-sq	MSE	F	p
		0.6853	0.4696	96.1413	30.1009	.0000
Model						
	Coefficient	Se	t	p	LLCI	ULCI
Constant	-13.2224	5.2868	-2.5010	0.0140	-23.7088	-2.7360
BFS_T1	0.508	0.3093	0.1643	0.8698	-0.5626	0.6643
DERS_T1	0.8069	0.1620	4.9792	0.0000	0.4854	1.1283
Int_1	0.0036	0.0099	0.3620	0.7181	-0.0160	0.0232

Note: Moderation effects of emotion regulation on benefit-finding and post-traumatic stress experiences

Figure 4. *Emotion Regulation as a Moderator between Benefit-Finding and Cortisol Levels*

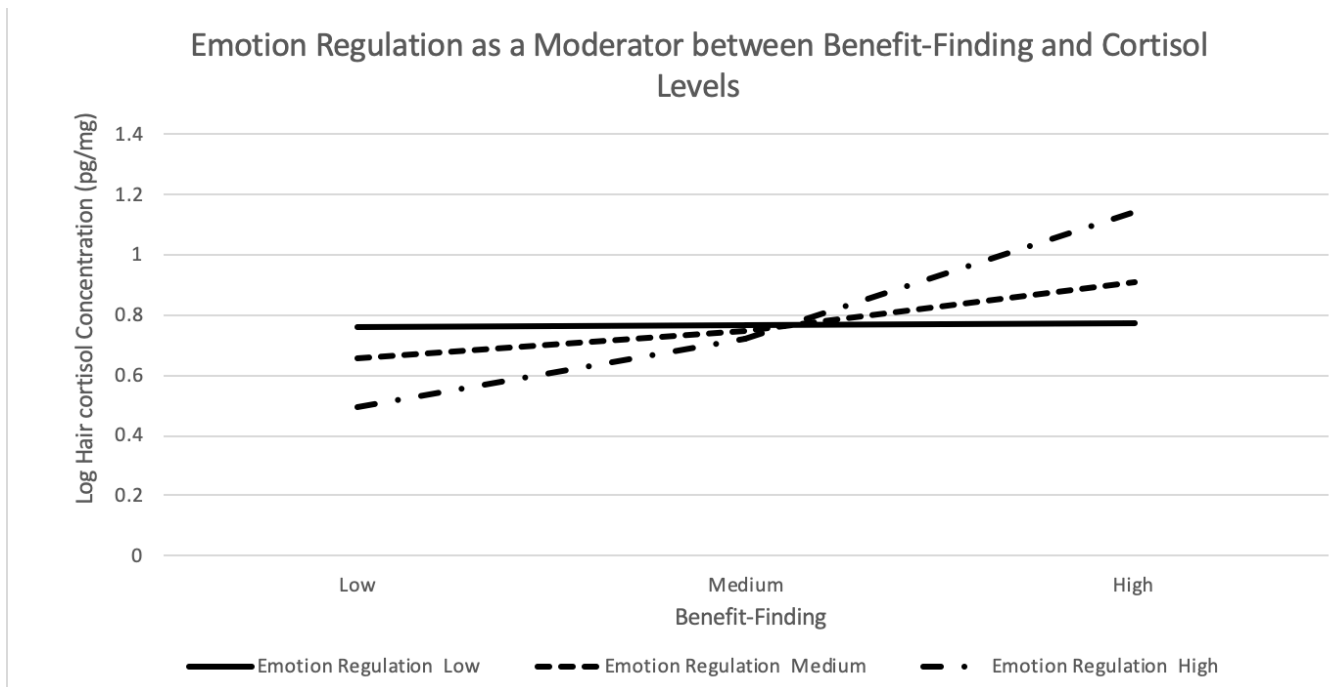


Table 6*Regression Model*

Model	R	R-sq	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.172a.	0.029	0.021	0.61256	2.151
a. Predictors (Constant), Benefit Finding Scale T1					
b. Dependent Variable: Log Transformed Hair Cortisol pg/mg					

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