

SHORT THESIS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY (PhD)

**EXPLORING POSTTRAUMATIC GROWTH AND HEALTH-RELATED QUALITY OF LIFE AMONG CANCER PATIENTS**

By Zsuzsanna Tanyi MA

Supervisor: Antal Bugán PhD  
Co-supervisor: Kornélia Szluha PhD



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# **Exploring posttraumatic growth and health-related quality of life among cancer patients**

By Zsuzsanna Tanyi, MA

Supervisors: Antal Bugán, PhD

Kornélia Szluha, MD, PhD

Doctoral School of Health Sciences, University of Debrecen

Head of the **Examination Committee:** Róza Ádány, MD, PhD, DSc

Members of the Examination Committee: Márta Csabai, PhD

Attila Oláh, PhD

The Examination takes place at the Department of Preventive Medicine, Faculty of Public Health, University of Debrecen, on the 21<sup>st</sup> March, 2016 at 11 am.

Head of the Defense Committee: Róza Ádány, MD, PhD, DSc

Reviewers: János Kállai, PhD, DSc

Dóra Perczel-Forintos, PhD

Members of the Defense Committee: Márta Csabai, PhD

Attila Oláh, PhD

The PhD Defense takes place at the Lecture Hall of Bldg. A, Department of Internal Medicine, Faculty of Medicine, University of Debrecen, on the 21<sup>st</sup> March, 2016 at 1 pm.

## Literature review

### About cancers

According to data from 2004 from the WHO, cancer is the third leading cause of death after cardiovascular and infectious diseases. In 2008, approximately 12.7 million new cancer cases were registered and 7.6 million persons died from cancer all over the world. Cancer has unfortunately been demonstrated to be the second leading cause of death also in our country (23%). In Hungary in 2008, 70,527 new cancer cases were registered (36,190 males and 34,337 females), and the number of deaths from cancer reached nearly 33,000. With this mortality rate, our country occupies the first place in mortality statistics of the member states in the European Union.

### About breast cancer in short

Breast cancer is the most common type of cancer among females in our country. Its oncological therapy is a complex medical process. The most fundamental treatment is surgery, which attempts to remove the tumor and its surrounding tissues containing cancerous cells. Moreover, numerous other types of treatment can be applied: chemotherapy, radiation therapy, hormone therapy, and in certain cases immunotherapy.

### About prostate cancer in short

Prostate cancer is the fourth most common type of cancer among males in our country. During its oncotherapy the following types of treatment can be applied: observation, surgery, hormone therapy, and radiation therapy.

### The radiation therapy

One of the most important oncotherapies is radiation therapy, which means the use of ionizing radiation of high energy. *Gray (Gy)* is the derived unit of ionizing radiation dose. Two thirds of cancer patients receive radiation therapy during their treatment process. This type of treatment can be curative or palliative. In the case of *curative radiotherapy*, irradiation can bring complete recovery by itself, together with chemotherapy, or after operation. It aims to destroy all the cancerous cells. The aim of *palliative radiotherapy* is to manage pain and other symptoms and to enhance the quality of life in advanced cancers. Two forms of radiation therapy exist: external and internal radiotherapy. In the case of *external radiotherapy*, irradiation reaches the organ through the skin and impinges to the tumor and its surrounding

areas with penetration of the tissue. *Internal radiotherapy* uses radioactive metals or liquids (isotopes) to treat tumors.

The efficacy of radiotherapy is based upon the mechanism that (as medical experience has pointed out) the rapidly dividing cancer cells are more sensitive to radiation than healthy cells. However, as a consequence of this treatment the surrounding healthy cells may also be injured, which causes *early* and *late side-effects*. Among the side-effects of radiotherapy there are *common* ones experienced by most patients (e.g., fatigue, changes in the skin), and there may be *specific side-effects* depending on the place of irradiation (e.g., coughing in the case of chest irradiation).

### About oncopsychology

The health care system puts greater stress on cancer patients' somatic healing or the management of somatic symptoms, but psychological care is also an important part of the treatment. For this "mission" a borderline discipline of oncology and psychology is responsible, termed oncopsychology (in the USA it is named psycho-oncology). According to Holland and Weiss's definition, oncopsychology deals with the following two psychological dimensions of cancer:

- (1) the psychological reactions of cancer patients and their families at all stages of the disease and the stress on oncological staff,
- (2) the psychological, social, and behavioral factors that contribute to cancer causes and survival.

### Quality of life

During the treatment of chronic disease, several medical interventions can be completed that can prolong the duration of patients' lives. Certain treatments may change the parameters of the disease only to a small degree, but the quality of life of the patient improves. Other treatments (e.g., chemotherapy) may increase the patient's chance for survival, but because of their aggressive side-effects they may impair the patient's general condition. It can be a relevant question as to which treatments and interventions are "worthwhile" for patients. The measurement of *health-related quality of life* (HRQoL) can help to answer this question. HRQoL is usually regarded as a multidimensional construct that includes several core domains, such as (1) mental functioning; (2) physical functioning; (3) role functioning; and (4) social functioning. The essence of this concept is: to what extent is a person contented

with his/her actual functioning (physical, psychological, and social), and how does he/she measure them in comparison with what he/she holds as ideal.

Recently, oncology and other divisions of medicine have placed great emphasis on measuring patients' HRQoL, which is an important indicator of treatment outcomes and provides information about the side effects of treatment. Moreover, HRQoL is a relevant determinant of cancer patients' judgments and their adherence to oncological treatments.

### **The impact of external radiation therapy on health-related quality of life**

Radiotherapy (RT) is an increasingly used oncological treatment, with growing attention paid to its effects on HRQoL. Studies with RT recipients have measured HRQoL using the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QOL-C30), the Functional Assessment of Cancer Therapy Scale (FACT), and the Short Form-36 (SF-36) questionnaire. These studies can be divided into the following two groups: half assess changes in HRQoL before, during, and after RT using a longitudinal design, whereas the other half compare the HRQoL of RT recipients to non-recipients or RT recipients to healthy comparison subjects.

The number of longitudinal studies examining the quality of life of cancer patients during and after RT is, surprisingly, quite low. Several studies have shown that HRQoL significantly declines during RT, and then significantly improves some weeks after the treatment has ended. Deshields et al. found that breast cancer patients reported low levels of HRQoL at the conclusion of RT, but by two weeks post-treatment, their quality of life improved significantly and remained relatively stable at six months post-treatment. This finding suggests that psychological recovery occurs within a short time post-treatment. Stone et al. investigated HRQoL in a group of breast and prostate cancer patients receiving RT. They reported that there was a significant deterioration of global quality of life and some of its subscales (e.g., role functioning, cognitive functioning, and social functioning) between two points of measurement, which were pre-treatment (immediately prior to treatment) and within one week of the completion of RT. Another study found the same results with early-stage breast cancer patients. Wengström et al. revealed a small decline in HRQoL during RT, but post-treatment scores seemed to equalize at follow-up measures (two weeks and three months after RT). A study by Dow and Lafferty demonstrated that overall quality of life and its subdomains (e.g., social, family, and psychological/spiritual functioning) declined from the start of RT to the midpoint of treatment, and then improved by six months after treatment

ended (except for social functioning, which remained at a level that was lower than reported at the start of RT). By contrast, a number of studies have found that patients' quality of life remains unchanged during radiation treatment.

### **Fatigue as a common side effect of radiation therapy**

HRQoL declines during RT partly because RT may make existing symptoms worsen or may produce new physical symptoms (side effects). Fatigue is a common, highly disruptive complaint of patients undergoing external RT, and its prevalence rates among patients receiving RT can reach 70% or more. A number of studies have demonstrated that fatigue increases during the course of RT, and then returns to pre-treatment levels several months after the completion of RT. In a study by Wengström et al., fatigue worsened as the course of RT progressed, with a prevalence rate of over 85% among breast cancer patients in the third and fifth weeks of treatment (87% and 90%, respectively). The pre-treatment prevalence rate (63%) returned by three months post-treatment. Fatigue has a relevant effect on patients' well-being, as it has been found to be the strongest determinant of overall quality of life. Lee et al. revealed similar results by showing that fatigue is highly predictive of lower quality of life upon completion of RT and also at seven months after treatment ended. Moreover, fatigue is the most frequently mentioned symptom during RT.

### **Diagnosis of cancer as a psychological trauma**

The Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR) provides a long list of potential psychological traumas and includes 'being diagnosed with a life-threatening illness' as a potential cause of posttraumatic stress disorder. Cancer, as a life-threatening illness, could also be considered a traumatic event and may therefore have a number of negative consequences. The physical symptoms, which may include the painful side effects of treatments, may cause a number of disruptions in patients' social and family life and in their daily activities. By contrast, a growing body of literature has recently shown that a highly stressful life event can contribute to the experience of positive psychosocial changes in various life domains of patients.

### **Personality development deriving from cancer: the posttraumatic growth**

An oncological illness may serve as a catalyst for unexpected positive psychological changes in various life domains such as interpersonal relationships, self-perception, priorities, and the

philosophy of life. The concept of posttraumatic growth (PTG) refers to an “experience of positive change that occurs as a result of the struggle with highly challenging life crises”.

Recently, a growing body of literature has demonstrated that people report positive consequences following a diagnosis of breast cancer, colorectal cancer, cervical cancer, prostate cancer, oral cavity cancer, melanoma, and Non-Hodgkin’s lymphoma. According to these psycho-oncological studies, a high percentage of cancer survivors (80%) report at least one positive effect attributed to their cancer experience.

Although the majority of cancer patients report PTG, it is not experienced by all cancer patients. It is useful to identify which potential determinants enable persons to experience positive changes and which do not. These determinants can be divided into two groups: stressor-related variables and person-related variables. In the case of cancer, stressor-related variables comprise the site of cancer, the stage (representing the objective severity of the stressor), the subjective severity of the illness, the time elapsed since diagnosis, and the types of oncological treatment. According to the theory of PTG, the seriousness of a traumatic event is a significant determinant of positive changes. The trauma should be sufficiently challenging to question or shatter a person’s basic assumptions about the self and the world, which causes a schema change related to the experience of PTG. Studies aimed at identifying the cancer-related correlates and predictors of PTG have revealed that PTG has been associated with the stage of disease, the subjective appraisal of cancer as a stressor, the receipt of chemotherapy, and mastectomy.

The second group of PTG determinants are person-related variables, which encompass the sociodemographic characteristics and individual factors that may influence the responses to trauma (e.g., type of adult attachment, quality of life). Numerous studies have reported that women tend to report significantly more PTG than men. Moreover, younger respondents generally perceive more positive changes resulting from the cancer experience. Additionally, some studies have indicated that patients who are married or in a committed relationship report significantly higher levels of PTG .

The other important person-related determinant of PTG is the type of adult attachment. According to the theory proposed by Salo et al., the great differences in responses to trauma can be explained by the type of adult attachment. Persons with different attachment styles learn unique ways of reacting to distress during childhood, and these models are activated when their safety and integrity become jeopardised. Thus, in the case of a traumatic event, persons with insecure attachment will either be totally overwhelmed by the threat or deny its significance. By contrast, securely attached persons are likely to evaluate the event in a

relatively realistic manner and use situation-adequate, effective coping strategies, which enable them to respond to trauma with more PTG than insecurely attached individuals. A study by Schmidt et al. supported this theory, finding that in a sample of cancer survivors, using positive reframing and religion as coping strategies mediated the relationship between PTG and secure attachment. The number of studies exploring the relationship between adult attachment and PTG is still quite low; only two cross-sectional studies exist. Schmidt et al. demonstrated that secure attachment was positively associated with the amount of growth experienced by cancer survivors. In addition, Salo et al. found that men with secure attachment reported more PTG than those without secure attachment in a sample of political prisoners.

Several studies have tried to explore the potential significance of mental and physical adjustment in experiencing PTG. HRQoL is a widely used indicator of physical and mental adjustment to a physical illness. The results regarding the relationship between quality of life and PTG are inconsistent in the literature. In some cross-sectional studies, PTG was related to higher quality of life. For example, Lelorain et al. reported that the mental health and vitality subscales of quality of life measures were positively correlated with PTG among breast cancer patients. In other studies, however, no relationship was reported between PTG and quality of life.

## Cross-sectional study

### Research hypotheses

The aim of this *cross-sectional study* was to explore the prevalence and nature of PTG among Hungarian patients with breast or prostate cancer. Moreover, it was a significant goal to examine the potential role of certain stressor-related and person-related variables in predicting the experience of PTG among cancer patients. The hypotheses of the study were as follows:

**Hypothesis 1:** Hungarian cancer patients may also experience the phenomenon of PTG, and the majority of patients can report positive changes as a result of their oncological illness.

**Hypothesis 2:** Regarding sociodemographic variables, patients who are younger, female, and married/live with a partner would be more likely to experience PTG.

**Hypothesis 3:** Among the cancer-related variables, a higher stage of disease, subjective severity and perceived aftermath of cancer would be significantly associated with more PTG.

**Hypothesis 4:** The amount of time elapsed since diagnosis would not be significantly associated with PTG.

**Hypothesis 5:** Among the oncological treatments, patients treated with chemotherapy and mastectomy/prostatectomy would experience more PTG compared to those who were not treated. Other forms of oncotherapy would not be significantly associated with PTG.

**Hypothesis 6:** The secure type of adult attachment would be predictive of higher PTG compared to insecure types of adult attachment.

Because of the highly inconsistent results of previous studies, we had no hypothesis regarding the relationship between PTG and HRQoL.

## Methods

### *Procedure*

For this cross-sectional study, patients were recruited from the Department of Radiotherapy of the University of Debrecen. The inclusion criteria for the study were as follows: (1) no previous cancer history; (2) primary breast or prostate cancer without distant metastases; (3) imminent initiation of radiotherapy; and (4) above 18 years of age. The sample consisted of patients with either breast or prostate cancer, given that these types of cancer cause similar impairments to quality of life. Eligible patients were identified by a radiation oncologist and were then personally approached after a session of radiation simulation. Participants completed a written informed consent form and a questionnaire packet. All study documents were approved by the Medical Ethical Committee of the Medical and Health Science Center of the University of Debrecen.

### *Participants*

The final sample used for the study consisted of 152 breast or prostate cancer patients who were scheduled for radiotherapy at the Department of Radiotherapy of the University of Debrecen (74.3% were female). The average age of the patients was 59.1 years ( $SD=10.77$ , range 34-80). Of the 152 participants, 65.8% were married or lived with a partner ( $N=100$ ), and most of them ( $N=95$ , 62.5%) had completed secondary education. The mean time since diagnosis was 3.5 months ( $SD=2.2$ , range 0.2-7.9), and the majority of patients sampled had

been diagnosed with stage I or II cancer (N=120, 78.9%). All patients had undergone some form of surgery, but only 17.8% (N=27) had undergone a mastectomy or prostatectomy. Approximately half of the participants had received chemotherapy (N=74, 48.7%), and a majority had undergone hormonal therapy (N=117, 77%).

### *Measures*

*PTG.* The Posttraumatic Growth Inventory (PTGI) is a 21-item self-report questionnaire that measures positive changes in the aftermath of a traumatic life event. The original English version consists of the following five subscales: Relating to Others (e.g., “I put more effort into my relationships.”), New Possibilities (e.g., “I established a new path for my life.”), Personal Strength (e.g., “I know better that I can handle difficulties.”), Spiritual Change (e.g., “I have a stronger religious faith.”), and Appreciation of Life (e.g., “I can better appreciate each day.”). The items are rated on a 6-point Likert scale ranging from 0 (*I did not experience this change as a result of my cancer*) to 5 (*I experienced this change to a great degree as a result of my cancer*). Adding the scores of the five subscales yields a PTGI total score (range 0-105). The Hungarian version of the PTGI, with the original 21 items and five subscales, was used to assess cancer-related PTG. In the present study, the internal consistency was 0.81 for the PTGI total score and ranged from 0.70 (Personal Strength) to 0.81 (Relating to Others) for the subscales.

*Adult attachment.* Adult attachment style was measured using the Hungarian version of the 36-item Experiences in Close Relationships Scale (ECRS), which asks respondents to rate how well each statement describes their typical feelings in relationships. Responses are provided on a 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The ECRS has two subscales, Anxiety and Avoidance. The Attachment Anxiety subscale assesses fear of abandonment and rejection (range 18-126). The Attachment Avoidance subscale measures avoidance of intimacy and discomfort with closeness (range 18-126). As recommended by Brennan et al., persons can be placed into the following four attachment-style categories based on their scores on the two subscales: secure, preoccupied, fearful-avoidant, and dismissive. In the present study, the internal consistency for the ECRS total was 0.91; the internal consistency for the subscales was 0.90 (for Attachment Avoidance) and 0.87 (for Attachment Anxiety).

*HRQoL.* Quality of life was assessed with the Hungarian version of the Functional Assessment of Cancer Therapy-General Questionnaire (FACT-G version 4). This questionnaire was originally developed and widely used for adult patients with any type of

tumour. It is composed of 27 questions that assess the following four subscales of HRQoL: Physical Well-being (PWB) (e.g., “I have pain.”- reverse item), Emotional Well-being (EWB) (e.g., “I feel sad.”- reverse item), Social/Family Well-being (SFWB) (e.g., “I get support from my friends.”), and Functional Well-being (FWB) (e.g., “I am able to work.”). Items are rated on a 5-point Likert scale ranging from 0 (*not at all*) to 4 (*very much*). The FACT-G total score (range 0-108) is the sum of the four subscale scores. Greater total scores indicate better HRQoL. In the current study, the Cronbach’s alpha was 0.72 for the total score of the FACT-G and ranged from 0.73 (for EWB) to 0.81 (for PWB) for the subscales.

*Sociodemographic and medical variables.* Patients completed a questionnaire about sociodemographic characteristics including age, gender, marital status, and education. The following medical variables were derived from patients’ medical charts: the stage of cancer, the type of treatment received (type of surgery, hormonal therapy, chemotherapy), and the length of time elapsed since diagnosis.

*Subjective severity and perceived aftermath of cancer.* To assess the subjective severity and perceived aftermath of cancer, each participant responded to two questions. Participants were asked to indicate the extent to which they considered both their cancer and the aftermath of their cancer to be serious on an 11-point Likert scale (0=*not serious at all*, 10=*very serious*).

### **Statistical analyses**

To explore the prevalence of PTG among Hungarian cancer patients, we used Schoevers & Teo’s method. PTGI items were dichotomised as follows: 0=item endorsed between ‘not at all’ and a ‘small degree’ (answer rating 0, 1, or 2) and 1=item endorsed between a ‘moderate degree’ and a ‘very great degree’ (answer rating 3, 4, or 5). The total score was then calculated (between 0 and 21) and used for descriptive aims. For the correlational and regression analyses, the continuous PTGI total score was used.

Associations between the sociodemographic and cancer-related variables and PTG were determined using *Student’s t-test*, the *Mann-Whitney U test*, *Welch’s t-test*, *analyses of variance (ANOVA)*, the *Kruskal-Wallis test*, or the *Pearson/Spearman correlation*. In addition, *Pearson* or *Spearman correlations* were calculated to examine the associations between HRQoL and PTG and the relationships between adult attachment and PTG, respectively. Brennan et al. asserted that individuals could be placed into four attachment categories based on their scores on the Attachment Anxiety and Attachment Avoidance subscales. In the present study, participants were placed into those four attachment-style categories using cluster analysis. Attachment categories were analysed by three different

*clustering methods* (K-means clustering, Ward's method, and the unweighted pair-group average with Euclidean distance). As all methods resulted in almost the same cluster structure, the classifications were compared to each other. The K-means classification was chosen for further analyses as this one differed less from the others. The four attachment-style categories (as the four clusters) explained 62.1% of the variance in ECRS total score, 80.73% of the variance in Attachment Avoidance subscale, and 77.7% of the variance in Attachment Anxiety subscale. The differences in PTG (total and subscale scores) between participants in the four attachment-style categories were *analysed using ANOVA, Kruskal-Wallis test, Student's t-test, and the Mann-Whitney U test*. Finally, *hierarchical multiple regression analyses* were performed to investigate the unique contribution of each variable to the PTGI total score and its subscales. In the first step of each regression model, sociodemographic and cancer-related variables (including subjective severity and perceived aftermath of cancer) that were significantly related to the dependent variable in the initial bivariate analyses were entered into the model. In the subsequent steps, other variables (HRQoL and adult attachment) that were significantly related to the dependent variable in the initial bivariate analyses were entered individually into the regression model. The significance level for all analyses was defined as 0.05.

## Results

### *Descriptive statistics*

The mean PTGI score was 63.53 ( $SD=22.07$ , range 0-103). The mean item rating was 3.02 (range 0-5), which indicated a “moderate degree of positive change” (on the 6-point Likert scale) as a result of the cancer experience. As in the study by Schroevers and Teo, the PTGI items endorsed by patients to a “moderate degree” or greater were computed. On average, the participants endorsed 14 of the 21 PTGI items ( $M=14.3$ ,  $SD=5.16$ ; range 0-21) to a “moderate degree” or greater ( $\geq 3$  on the 0-5 scale). According to this computation, the top four most frequently endorsed items of PTGI were “Having more compassion for others” (85.5%, Relating to Others subscale), “Better appreciation for each day” (84.8%, Appreciation of Life subscale), “Knowing I can count on people in times of trouble” (84.2%, Relating to Others subscale), and “Knowing better that I can handle difficulties” (83.5%, Personal Strength subscale).

The mean FACT-G score was 81.54 ( $SD=16.73$ , range 39-108), and the mean ECRS score was 93.65 ( $SD=37.92$ , range 36-196). The average perceived severity and the average

perceived aftermath of cancer were both moderately serious ( $M=4.69$ ,  $SD=2.54$ ; and  $M=4.78$ ,  $SD=2.77$ , respectively). As recommended by Brennan et al., participants were placed into four attachment-style categories. In the current sample, 40.7% were categorised as secure, 15.1% were categorised as fearful, 25.6% were categorised as preoccupied, and 18.4% were categorised as dismissive.

### *Relationships between sociodemographic and cancer-related variables and posttraumatic growth*

First, we examined the relationships between the PTG (total score and its subscale scores) and various sociodemographic and cancer-related variables. Women with breast cancer reported a significantly higher score than men with prostate cancer for the PTGI total and its subscales (except New Possibilities). There were significant negative correlations between age and PTGI total and its subscales (except Personal Strength). The Mann-Whitney and t-tests revealed that married patients and those who lived with a partner scored higher on the Appreciation of Life (10.8 vs. 8.8,  $p<0.01$ ), New Possibilities (12.96 vs. 10.3,  $p<0.05$ ), and Spiritual Change (3.86 vs. 2.63,  $p<0.05$ ) subscales compared to patients who were not married and did not live with a partner. Education levels were not significantly associated with PTGI total and subscale scores.

Significant group differences were found among patients with different stages of cancer for the PTGI total score and the Appreciation of Life and Relating to Others subscales, such that individuals with stage I, II or III cancer reported significantly higher scores than those with stage IV cancer. There were no statistically significant associations between the PTGI total score or its subscales and the use of chemotherapy or the history of mastectomy/prostatectomy with one exception. Participants who were treated with chemotherapy and participants who underwent a mastectomy/prostatectomy reported significantly higher scores on the Appreciation of Life subscale compared to those who were not treated by these treatments (10.79 vs. 9.52,  $p<0.05$ ; 11.48 vs. 9.84,  $p<0.05$ , respectively). Subjective severity of cancer and its perceived aftermath were significantly positively correlated with PTGI total score and most of its subscales. Nevertheless, no significant correlations were found between subjective severity and stage ( $p=0.23$ ) or between perceived aftermath of cancer and stage ( $p=0.52$ ). Analyses of time since diagnosis and the effects of hormonal therapy on PTGI scores did not yield any significant differences.

### *Quality of life, adult attachment, and posttraumatic growth*

There was no significant association between the total score obtained on the PTGI and the FACT-G total score. Only the SFWB subscale score was significantly positively correlated with the PTGI total and its subscale scores. Moreover, the Personal Strength subscale demonstrated significant positive correlations with the HRQoL total score (FACT-G) and the well-being subscales (except PWB). We did not find a significant relationship between the PTGI total score and adult attachment. Only one significant correlation was observed between Personal Strength and Attachment Avoidance ( $r=-0.203$ ). The differences in PTG (total and subscale scores) between participants in the four attachment-style categories were analysed. Significant group differences were found in Personal Strength score ( $\chi^2=13.13, p<0.01$ ) and in Relating to Others score ( $F=6.11, p<0.05$ ), such that participants with dismissive attachment reported significantly lower scores than those with secure, preoccupied, and fearful-avoidant attachment.

### *Predictors of posttraumatic growth*

Hierarchical multiple regression analyses were conducted to examine the relative contribution of each variable that was previously related to PTGI total or PTGI subscale scores. The analyses resulted in a significant model ( $F=10.310, p<0.001$ ) that explained 29.9% of the variance in PTGI total score. Age ( $\beta=-0.177, p=0.020$ ), subjective severity ( $\beta=0.173, p=0.039$ ), and SFWB ( $\beta=0.377, p<0.001$ ) were significant predictors of PTGI total score. For the prediction of Appreciation of Life, the final model ( $F=7.924, p<0.001$ ) explained 33.4% of the variance. Subjective severity ( $\beta=0.228, p=0.006$ ), mastectomy/prostatectomy ( $\beta=0.224, p=0.004$ ), and SFWB ( $\beta=0.276, p<0.001$ ) were significant predictors of Appreciation of Life. For the prediction of New Possibilities, the final model ( $F=9.816, p<0.001$ ) explained 25.2% of the variance. Younger age ( $\beta=-0.259, p=0.001$ ), subjective severity ( $\beta=0.211, p=0.014$ ), and SFWB ( $\beta=0.263, p<0.001$ ) were significant predictors of New Possibilities. In the case of Personal Strength, the final model was significant ( $F=7.203, p<0.001$ ) and accounted for 25.9% of the variance. Gender ( $\beta=-0.209, p=0.005$ ), FWB ( $\beta=0.214, p=0.012$ ), and Dismissive attachment ( $\beta=-0.266, p=0.007$ ) were significant predictors of Personal Strength. For the prediction of Spiritual Change, the final model ( $F=6.387, p<0.001$ ) explained 17.9% of the variance. Gender ( $\beta=-0.181, p=0.028$ ) and SFWB ( $\beta=0.231, p=0.003$ ) were significant predictors of Spiritual Change. Finally, for the prediction of Relating to Others, the final model was significant ( $F=6.700, p<0.001$ ) and

accounted for 29.8% of the variance. SFWB ( $\beta=0.393$ ,  $p<0.001$ ) and Dismissive attachment ( $\beta=-0.207$ ,  $p=0.033$ ) were significant predictors of Relating to Others.

## Discussion

The aim of this cross-sectional study was to examine the relationships between PTG, sociodemographic and cancer-related variables, HRQoL, and adult attachment in a sample of 152 cancer patients. Analyses revealed that the majority of patients (85%) experienced positive psychological changes as a result of their struggles with cancer. The top four most frequently endorsed items on the PTGI fell within three subscales: Appreciation of Life, Relating to Others, and Personal Strength. Hierarchical multiple regression analyses were performed on PTGI total and subscale scores to reveal their possible predictors. We found that younger age was a significant predictor of higher PTGI total score and New Possibilities score. A negative association between age and PTG is commonly reported in the literature. A possible explanation is that a cancer diagnosis may be more disruptive and distressing for younger people, and a greater threat may prompt more growth. Another explanation is that younger patients may regard cancer to be more challenging, which activates more resources for positive re-evaluation and redefining of life goals and priorities, compared to older ones. In addition, higher Spiritual Change and Personal Strength subscale scores were predicted by female gender.

Among the cancer-related variables, undergoing a mastectomy or prostatectomy was a significant predictor of higher scores on the Appreciation of Life subscale. Moreover, greater subjective severity of cancer was a predictor of increased PTGI total score and scores on the Appreciation of Life, Spiritual Change, Relating to Others, and New Possibilities subscales. This is in line with previous studies that found a positive association between the subjective appraisal of cancer and PTG (but found no association between the stage of cancer and PTG); people who perceive their cancer as a traumatic/highly stressful event were more likely to report PTG. According to the theory of PTG, the subjective seriousness of the event is a determining factor for the experience of personal growth; that is, a certain level of threat is necessary to challenge one's existing schemata about the world.

Regarding HRQoL, SFWB was a significant predictor of PTGI total score and scores on the New Possibilities, Appreciation of Life, Spiritual Change, and Relating to Others subscales. Thus far, no study has explored the relationship between SFWB and PTG. However, in the present study, SFWB may refer to the perceived social support of the sample. Social support is usually reported to be positively associated with positive psychological changes in psycho-

oncological studies. The support of family members and friends, the expression of positive emotions toward the patient, and the regular discussion of problems relating to cancer can foster greater awareness of the positive changes resulting from the illness. Moreover, a positive relationship was found between FWB and the Personal Strength subscale, that is, patients who endorsed higher FWB perceived themselves as having greater Personal Strength. In connection to the relationship between adult attachment and PTG, we found that dismissive attachment style predicted fewer scores on the Personal Strength and Relating to Others subscales. Dismissing persons have high levels of attachment avoidance and low levels of attachment anxiety. They prefer not to get close to their partners because of their negative expectations. This attachment style may hinder the experience of growth in the domain of close relationships. Moreover, dismissing individuals maintain a sense of self-worth by denying the importance of close relationships. Due to their positive self model, they may have less room for growth in the field of Personal Strength.

## Longitudinal study

### Research hypotheses

The other large part of our study was a *longitudinal study*, which had the aim to investigate the patterns of change in HRQoL, fatigue, and PTG with a sample of breast and prostate cancer patients during a three-month period. All the patients completed measures at three time points as follows: one or two weeks before the start of RT, in the fifth/sixth week of treatment, and four to six weeks post-treatment. The hypotheses of the study were as follows:

**Hypothesis 1:** Cancer patients' quality of life would significantly decrease during RT but would significantly improve after treatment ended.

**Hypothesis 2:** PTG would significantly increase during the three-month period.

**Hypothesis 3:** We assumed that the fatigue reported by patients would worsen during the course of RT but would decrease after treatment ended.

Because of the highly inconsistent results of previous studies, we had no hypothesis regarding the relationship between PTG and HRQoL.

## Methods

### *Procedures*

The study sample was recruited from the Department of Radiotherapy at the University of Debrecen. The inclusion criteria for the study were the following: (1) no previous cancer history; (2) primary breast or prostate cancer without distant metastases; (3) imminent initiation of external beam radiotherapy; and (4) more than 18 years of age. Our sample consisted of patients with either breast or prostate cancer, given that these diseases have similar RT treatment regimens and cause similar impairments in the quality of life. All questionnaires were administered three times. For the first wave, eligible patients were identified and then provided with information about the study by a psychologist after a session of radiation simulation (one or two weeks before the start of RT). Participants completed a written informed consent form and a questionnaire packet (T1). For the second and third waves, questionnaires were mailed to the patients in the fifth/sixth week of RT treatment (T2) and four to six weeks after the end of RT (T3). The study was approved by the Medical Ethical Committee from the Medical and Health Science Center at the University of Debrecen.

### *Participants*

A total of 152 individuals were approached to participate in this study before RT (T1) (74.3% female patients; mean age: 59.1 years,  $SD=10.7$ , range 34-80). Of the 152 patients, 91 (59.8%) completed questionnaires at T2 and T3 (84.6% female patients; mean age: 58.7 years,  $SD=10.6$ , range 34-78). Attrition bias was examined by testing whether any systematic differences existed between patients missing at the follow-ups and patients who participated in all of the assessments. No significant differences were found between the two samples in socio-demographic and medical variables. Of the 91 patients, 65.9% were married or lived with a partner ( $N=60$ ), and a significant number reported having a secondary education ( $N=60$ , 65.9%). The mean length of time since diagnosis was 3.7 months ( $SD=2.5$ , range 0.2-7.6). The disease stages at diagnosis were Stage I (46.1%), Stage II (36.3%), Stage III (14.3%), or Stage IV (3.3%). All patients had undergone some form of surgery, but only 15.4% ( $N=14$ ) had undergone a mastectomy or prostatectomy. Many patients were treated by chemotherapy ( $N=43$ , 47.3%) and a majority were treated by hormonal therapy ( $N=66$ , 72.5%).

## Measures

All questionnaires were administered three times.

- ❖ Time 1 (*T1*): the following questionnaires were completed after a session of radiation simulation (one or two weeks before the start of RT):
  - Posttraumatic Growth Inventory (PTGI)
  - Functional Assessment of Cancer Therapy-General Questionnaire (FACT-G version 4)
  - Feelings of fatigue have been explored with the following two individual items from the Physical Well-being subscale of FACT-G: “*I have a lack of energy*” and “*I am forced to spend time in bed*”.
  - Socio-demographic and medical variables: The following socio-demographic variables were assessed: age, gender, marital status, and education. The following medical variables were derived from patients’ medical charts: the stage of the cancer, the type of treatment received (e.g., type of surgery, hormonal therapy, chemotherapy), and the length of time elapsed since diagnosis.
- ❖ Time 2 (*T2*): the following questionnaires were completed in the fifth/sixth week of RT treatment:
  - Posttraumatic Growth Inventory (PTGI)
  - Functional Assessment of Cancer Therapy-General Questionnaire (FACT-G version 4)
  - Feelings of fatigue have been explored with the following two individual items from the Physical Well-being subscale of FACT-G: “*I have a lack of energy*” and “*I am forced to spend time in bed*”.
- ❖ Time 3 (*T3*): the following questionnaires were completed four to six weeks after the end of RT:
  - Posttraumatic Growth Inventory (PTGI)
  - Functional Assessment of Cancer Therapy-General Questionnaire (FACT-G version 4)
  - Feelings of fatigue have been explored with the following two individual items from the Physical Well-being subscale of FACT-G: “*I have a lack of energy*” and “*I am forced to spend time in bed*”.

## **Statistical analyses**

Descriptive statistics were measured for normalcy, and means, standard deviations, ranges, and counts for the variables were calculated. *Chi-square tests*, *t-tests* or *Mann-Whitney U tests* were used to determine whether those patients who did not complete all of the assessments differed from those who completed all of the assessments with regard to socio-demographic and medical variables. The relationships between the socio-demographic, medical variables and the PTG and FACT-G were determined using *t-tests*, the *Mann-Whitney U test*, *Welch's t-tests*, *analyses of variance (ANOVA)*, or the *Kruskal-Wallis test*. *Pearson* or *Spearman correlations* were calculated to reveal associations between the FACT-G and PTG. Pairwise comparisons of the two individual fatigue-related items' scores at T1, T2, and T3 were completed with *Wilcoxon paired signed-rank tests*. Finally, *repeated measures analyses of variance* were conducted to examine whether there were significant changes in FACT-G scores and PTGI scores throughout the duration of the study. *Bonferroni's method* was used for multiple comparisons of FACT-G scores and PTGI scores at T1, T2, and T3. The significance level for all analyses was defined as 0.05.

## **Results**

### ***Relationships of socio-demographic and medical variables to HRQoL and PTG***

Preliminary analyses were conducted to examine whether socio-demographic or medical variables were related to HRQoL or PTG at the three measurement times. We found that neither PTGI total scores nor FACT-G total scores were significantly associated with any of the socio-demographic (i.e., age, gender, education, and marital status) or medical (i.e., stage, mastectomy/prostatectomy, hormonal therapy, chemotherapy, and time since diagnosis) variables at T1, T2, and T3.

### ***Changes in HRQoL***

The FACT-G total scores significantly declined between T1 and T2, and then significantly increased between T2 and T3. No significant difference was found between the FACT-G total scores at T1 and T3. The same pattern was found for the PWB subscale: scores significantly decreased during RT (T2), and then returned to baseline levels four to six weeks after RT ended (T3). During RT (T2), the SFWB score was significantly lower than the baseline SFWB score (T1), and it remained low at the time of the third measurement (T3). EWB did not significantly change during the time period of the study. The FWB scores significantly decreased between T1 and T2, and then showed nonsignificant improvement by T3.

Comparisons of the baseline HRQoL scores (T1) and the HRQoL scores at T3 revealed that none of the subscale scores at four to six weeks after RT ended (T3) were significantly different from the baseline scores (T1), except for the SFWB score. This result means that all of the well-being scores returned to the baseline scores four to six weeks after RT.

### *Changes in PTG*

The PTGI total score and the subscales for New Possibilities, Personal Strength, and Relating to Others remained relatively stable throughout the measurements. The Appreciation of Life scores increased but not significantly at T2 compared with T1, and then significantly declined between T2 and T3. The Spiritual Change scores significantly increased during RT (T2), and this improvement was maintained four to six weeks after RT ended (T3).

### *Relationships between HRQoL and PTG*

There were no statistically significant correlations between the PTGI total scores and the FACT-G total scores (at T1, T2, and T3). However, significant negative correlations were found between PWB scores and PTGI total scores. The strongest correlation was between the PWB score at T1 and the PTGI total score at T3 ( $r=-0.26$ ,  $p<0.01$ ). Moreover, significant positive correlations were revealed between SFWB subscales and PTGI total scores at all points of measurement. The strongest correlation was between the SFWB subscale and the PTGI total score at T1 ( $r=0.34$ ;  $p<0.01$ ).

### *Changes in fatigue*

Changes in feelings of fatigue were calculated by separating the two fatigue-related items from the PWB subscale of the FACT-G. The results derived from these two items show the same pattern of change, in that patients felt significantly more fatigue during RT (T2) compared with the baseline measurement (T1). However, fatigue significantly decreased by four to six weeks after RT ended (T3). Thus, the feeling of fatigue increased during RT, but it returned to the baseline level some weeks after the treatment ended.

## **Discussion**

This study is the only one available in the psycho-oncological literature that examined the relationship between HRQoL and PTG among breast and prostate cancer patients undergoing RT. We used a longitudinal design to measure HRQoL and PTG before, during (in the fifth/sixth week of the treatment), and after RT (four to six weeks after the end of treatment).

According to our results, neither PTGI total scores nor FACT-G total scores were significantly associated with any of the socio-demographic or medical variables during the study period. We found a significant deterioration in overall quality of life (FACT-G total) and PWB at the fifth/sixth week of RT. However, by four to six weeks after RT had ended, both of these variables showed improvement and had returned to their baseline levels. The FWB score decreased during RT, and then started to increase by four to six weeks post-treatment, but only to a small degree.

EWB was the only domain of HRQoL that remained unchanged, which is in line with results from a previous study reporting that RT recipients and healthy comparison subjects do not differ with regard to levels of anxiety and depressive symptoms. This result may suggest that a relative emotional equilibrium was typical for these patients during and shortly after RT in contrast with the upheaval caused by the diagnosis.

We observed a significant decline in the SFWB score during RT and that this was the only domain of HRQoL that did not return to the baseline level after RT ended. This result is in line with the study of Dow and Lafferty that found that social functioning significantly decreased during RT and remained lower by six months post-treatment. Although the specific cause of this decrease in SFWB could not be determined in this study, it is possible that during and shortly after RT patients temporarily withdraw from their social support system because of the experienced side effects caused by the RT.

Overall, we found that all of the well-being scores (except for EWB) significantly decreased during RT. However, by four to six weeks after RT had ended, all of them improved and returned to their baseline scores (except for SFWB, which did not return). The changes in HRQoL within this sample were similar to those reported in previous studies. For example, Stone et al. observed significant decreases in role, cognitive, and social functioning by the last week of RT. They also found that emotional functioning did not change during this period. A study conducted by Dow and Lafferty revealed that, by the midpoint of RT, significant deterioration had occurred in social, family, and psychological/spiritual functioning. By six months post-treatment, all of these factors improved with the exception of social functioning, which remained low.

Our hypothesis that fatigue reported by patients may worsen during the course of RT was supported by the results of this study. A clinically significant increase in fatigue was found during the RT, but it returned to the baseline level four to six weeks after the end of treatment. This finding is consistent with some previous studies that found the same pattern of change in fatigue among cancer patients receiving RT.

The overall PTG and most of its subscales did not change significantly during the time period of this study. Only two subscales were exceptions: Appreciation of Life and Spiritual Change. Appreciation of Life showed an increasing trend during RT, and then it significantly declined four to six weeks after the treatment ended. It is possible that receiving RT treatment constantly reminds a person of his/her illness and the possible danger of death, which can enhance feelings of appreciation and respect for life. However, after the treatment this “memento” may disappear, making the Appreciation of Life decrease. Moreover, Spiritual Change significantly increased during RT, and this improvement was maintained four to six weeks post-treatment. RT treatment may serve as a reminder of the threat of death, which can precipitate sensitivity to the transcendent. This experience may continue after the RT, as the signs of recovery (e.g., better HRQoL) confirm the relationship with the transcendent (e.g., God).

As expected, no significant associations were found between the PTGI total scores and the FACT-G total scores. Nevertheless, we found significant negative correlations between PWB and PTGI total scores: people with lower PWB reported greater PTG. Physical symptoms may remind patients of the threat caused by their illness and, as other studies have shown, greater feelings of threat may prompt more positive changes (PTG). In addition, positive correlations were reported between SFWB and PTGI total scores, indicating that patients with greater perceived social support experienced more positive changes. Several studies have found that social support is a determining factor in finding benefits in a life-threatening illness. The possibility for patients to disclose negative cancer-related emotions (e.g., fear) and the empathy and compassion coming from family members and friends can contribute to greater awareness of positive changes that result from an illness.

Although we found significant impairment in HRQoL during RT, it is important to note that RT has a highly relevant role in the curative and palliative treatment of cancer. For example, RT can significantly decrease the incidence of intra-breast tumor reappearance in the case of breast cancer. Moreover, this decline in quality of life is only transient, as Deshiels et al. demonstrated that psychological “recovery” occurs two weeks after the end of RT. It may be important for future research to compare changes in HRQoL during chemotherapy to changes in HRQoL during RT, since as Conner-Spady et al. found, the pattern of change in HRQoL during chemotherapy can be similar to our results.

## Summary

The oncological treatment of cancer patients puts less stress on the psychological processes happening in patients during the fight against the illness. Facing the diagnosis of cancer usually means a psychological trauma for patients, initiating a psychological crisis. This crisis may have not only a negative impact on people but may foster positive changes. The phenomenon of *posttraumatic growth* (PTG) is a relatively unexplored research area in Hungarian oncopsychology. Making up this shortage, a cross-sectional study has been accomplished with the participation of 152 cancer patients. We wondered whether Hungarian cancer patients experience positive changes coming from the struggle with this serious illness, what the prevalence of PTG is, and what kind of associations there are between PTG and person-related and cancer-related variables. According to our results, the majority of patients (85%) experienced positive changes, at least to a moderate degree, as a result of their cancer. Among the cancer-related variables, undergoing a mastectomy or prostatectomy and greater subjective severity of cancer were significant predictors of higher PTG scores. Regarding person-related variables, we found that younger age, female gender (in some ways), and persons with higher Social/Family well-being experienced higher PTG. Moreover, persons with a dismissive attachment style reported lower scores on two subscales of PTG. These results draw attention to the importance of PTG, which can assist patients in adjusting to cancer symptoms and the side effects of its treatment.

The number of longitudinal studies examining the *health-related quality of life* of cancer patients during and after radiotherapy (RT) is, surprisingly, quite low. For the sake of raising this number, a longitudinal study analysing the changes in quality of life, PTG and fatigue has been realized with the participation of 91 cancer patients. The results from this analysis suggest that significant declines in HRQoL and fatigue are evident in the fifth/sixth week of RT treatment. However, by four to six weeks after RT had ended, these variables improved and returned to their baseline scores (except for Social/Family well-being, which did not return). The PTG total score and almost all of its subscale scores did not change significantly during the period of the study. However, the subscale of Spiritual Change for PTG significantly increased during RT, and sustained this improvement at four to six weeks post-treatment. The results of this longitudinal study may emphasize the relevancy of proper information for patients about the probable side effects of RT and their effective management before the start of treatment.

## List of publications



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Doctoral School: Doctoral School of Health Sciences  
MTMT ID: 10034317

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Subject: Ph.D. List of Publications

### List of publications related to the dissertation

1. **Tanyi, Z.**, Szluha, K., Nemes, L., Kovács, S., Bugán, A.: Positive consequences of cancer: Exploring relationships between posttraumatic growth, adult attachment, and quality of life. *Tumori J.* 101 (2), 139-248, 2015.  
IF:1.269 (2014)
2. **Tanyi, Z.**, Szluha, K., Nemes, L., Kovács, S., Bugán, A.: Health-related Quality of Life, Fatigue, and Posttraumatic Growth of Cancer Patients Undergoing Radiation Therapy: A Longitudinal Study. *Appl. Res. Qual. Life.* 9 (3), 617-630, 2014.  
DOI: <http://dx.doi.org/10.1007/s11482-013-9261-7>  
IF:0.818



Address: 1 Egyetem tér, Debrecen 4032, Hungary Postal address: Pf. 39. Debrecen 4010, Hungary  
Tel.: +36 52 410 443 Fax: +36 52 512 900/63847 E-mail: [publikaciok@lib.unideb.hu](mailto:publikaciok@lib.unideb.hu), Web: [www.lib.unideb.hu](http://www.lib.unideb.hu)



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### List of other publications

3. **Tanyi Z.:** A trauma pozitív hozadéka: A poszttraumás növekedés.  
In: Úgy szerettem volna, ha nem bántottak volna. A családon belüli gyermekkori traumatizáció: elmélet és terápia. Szerk.: Kuritárné Szabó Ildikó, Tiszljár-Szabó Eszter, Oriold és Társai Kft., Budapest, 269-288, 2015.
4. **Tanyi Z.:** Poszttraumás növekedés a rákbetegek körében.  
*LAM - 24* (5-6), 263-269, 2014.
5. **Tanyi Z.,** Bugán A., Szluha K.: A daganatos betegség okozta trauma és annak pozitív illúziókra gyakorolt hatása.  
*Psychiatr. Hung.* 27 (4), 277-285, 2012.
6. **Tanyi Z.:** A halállal való szembesülés pszichológiája és etikája Fritz Zorn Mars című regényében.  
*Meditor.* 1 (2), 32-41, 2011.

**Total IF of journals (all publications): 2,087**

**Total IF of journals (publications related to the dissertation): 2,087**

The Candidate's publication data submitted to the iDEa Tudóstér have been validated by DEENK on the basis of Web of Science, Scopus and Journal Citation Report (Impact Factor) databases.

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## Conference presentations related to the thesis

Tanyi Zs.: A trauma, mint esély a fejlődésre. Oral presentation at the 10<sup>th</sup> Magatartástudományi Napok, Pécs, 2010. május 25-26.

Zs. Tanyi: Posttraumatic growth and other psychological factors in cancer patients. Poster presentation at the 4<sup>th</sup> Conference of Népegészségügyi Képző- és Kutatóhelyek, Szombathely, 2010. szeptember 2-4.

Tanyi Zs.: A trauma transzformatív ereje: a poszttraumás növekedés. Oral presentation at the Pszichológia Napja (MPT Kelet-Magyarországi Tagozata). Lélek-életmód-egészség, Debrecen, 2011. február 25.

Tanyi Zs.: A halállal való szembesülés pszichológiája és etikája Fritz Zorn Mars című regényében. Oral presentation at the Conference of Bioetikai témák a művészetben. Debrecen, 2011. április 29.

Zs. Tanyi: Diagnosis of cancer: a source of posttraumatic growth. Poster presentation at the 12<sup>th</sup> European Congress on Traumatic Stress, Vienna, June 2-5, 2011.

Zs. Tanyi: Diagnosis of Cancer: A Source of Posttraumatic Growth. Poster presentation at the 5<sup>th</sup> Conference of Népegészségügyi Képző- és Kutatóhelyek. Szeged, 2011. augusztus 31-szeptember 2.

Tanyi Zs., Bugán A., Szluha K.: A daganatos betegség okozta személyiségbeli pozitív változások. Oral presentation at the 29<sup>th</sup> Conference of Magyar Onkológusok Társasága, Budapest, 2011. november 10-12.

Tanyi Zs.: A daganatos betegség okozta lelki fejlődés: a poszttraumás növekedés. Oral presentation at the 3<sup>rd</sup> Conference of Sugárterápia a klinikai gyakorlatban, Debrecen, 2012. február 3-7.

Tanyi Zs.: A daganatos betegség okozta trauma. Avagy amikor a rózsaszín szemüveg eltörik. Oral presentation at the 12<sup>th</sup> Conference of Magatartástudományi Napok, Szeged, 2012. június 14-15.

Zs. Tanyi, A. Bugán, K. Szluha: Positive consequences of cancer as a psychological trauma. Poster presentation at the 13<sup>th</sup> International Congress of Behavioral Medicine, Budapest, 29 August-1 September, 2012.

Tanyi Zs.: Onkológiai betegek poszttraumás személyiségfejlődésének és más lélektani jellemzőinek kapcsolata. Oral presentation at the 6<sup>th</sup> Conference of Népegészségügyi Képző- és Kutatóhelyek, Budapest, 2012. szeptember 5-7.

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Tanyi Zs., Bugán A., Szluha K.: A poszttraumás növekedés vizsgálata magyar daganatos betegek körében. Oral presentation at the 13<sup>th</sup> Conference of Magatartástudományi Napok, Debrecen, 2013. június 20-21.

### **Other conference presentations**

Tanyi Zs.: „Fiam! Te beteg vagy!” Óvodás gyermekek betegség-reprezentációja. Oral presentation at the 29<sup>th</sup> Conference of Országos Tudományos Diákkör, Pécs, 2009. április 6-8.

Tanyi Zs.: „Fiam! Te beteg vagy!” Óvodás gyermekek betegség-reprezentációja. Oral presentation at the 23<sup>rd</sup> Conference of Magyar Családterápiás Egyesület, 2009. április 17.

Tanyi Zs.: Milyen a betegség a gyermek szemszögéből? Oral presentation at the 13<sup>th</sup> Conference of Pszinapszis- Budapesti Pszichológiai Napok, 2009. április 18-19.

Tanyi Zs.: Milyen a betegség a gyermek szemszögéből? Poster presentation at the 13<sup>th</sup> Conference of Pszinapszis - Budapesti Pszichológiai Napok, 2009. április 18-19.

Tanyi Zs.: A bölcsesség pszichológiai megközelítése és alkalmazása a pszichoterápiás munka során. Oral presentation at the 11<sup>th</sup> Conference of Magatartástudományi Napok, Gödöllő, 2011. június 28-29.