Investigation of Adjustment Problems in Children Receiving Orthodontic Treatment and the Resilience Factor

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Research Article

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Abstract

Background: In this study, various psychological characteristics affecting psychological maladjustment in children receiving orthodontic treatment were examined.

Aim: In this context, the predictive and mediating relationships between emotional reactivity, intolerance of uncertainty, psychological resilience and psychological maladjustment were discussed.

Design: The study was conducted with 543 children and adolescents getting orthodontic treatment. Systematic and convenient sampling methods were followed in the selection of the sample. Standardized measurement tools (The Emotional Reactivity Scale, Intolerance of Uncertainty Scale, Brief Resilience Scale, Depression Anxiety Stress Scale) and online data collection processes were used in the data collection process.

Results and Conclusions: Findings have shown that emotional reactivity and intolerance of uncertainty pose a risk for psychological maladjustment in children and adolescents receiving orthodontic treatment, but psychological resilience has a protective function against this risk. It is considered that these findings may contribute to the expansion of pediatric dentists' perspectives on the secondary outcomes of orthodontic treatment practices.

Introduction

Orthodontic treatment is a relatively long and laborious treatment process that is used in the treatment of common dental ailments today, and the individuals who apply for this treatment are mostly children and adolescents. The treatment process is usually spread over a long period of 1–2 years. Therefore, it seems possible that some secondary psychological consequences may occur depending on the treatment process. In this direction, it is thought that the uncertainty of the treatment process, the fear that occurs due to orthodontic treatment and the reflections of the apparatus used on the appearance may trigger the aforementioned secondary psychological results.

Individuals' reactions to difficult living conditions are generally defined as *shock, panic, acute stress, post-traumatic stress disorder, anxiety disorder* and *depression*, etc.[1,2] and these symptoms indicate the individual's psychological adjustment skills. Considering psychological adjustment as the ability of the individual to cope with daily life difficulties, to control intense anxiety, depressive symptoms and stress factors, it can be said that difficult living conditions have an effect that challenge the psychological adjustment skills of the individual. It can be said that the long and troublesome orthodontic treatment can put pressure on these symptoms and can challenge the individual's adjustment skills. It can also be said that the traumatic fear experienced by children and adolescents due to the COVID-19 process in the last year[3,4] will also intensify the risk factors that develop due to orthodontic treatment and put these individuals in a disadvantaged position.

It is possible that orthodontic treatment causes fear depending on the age of the child. It has been suggested by Ornell et al.[5] and Shigemura et al.[6] that if fear, which is a defense mechanism that the individual shows in the face of dangerous situations, is disproportionate to the conditions of the individual, it may pave the way for various psychological disorders such as anxiety, depression, stress and OCD, etc.[7,8]Therefore, it can be thought that the fear that may arise during the orthodontic treatment process can have various risks in terms of psychological adjustment. As a natural result of the COVID-19 pandemic, it is thought that the negativities experienced in treatment planning due to quarantine and social distancing practices increase the risk in children and adolescents and may intensify their disadvantaged position.[3] In this context, research results[4,9] are thought to support this view, showing that the fear of catching COVID-19 causes intense emotional and behavioral consequences such as *boredom*, *loneliness*, *anxiety*, *sleep problems* and *anger*. Thus, it can be thought that the psychological symptoms that develop in relation to the treatment in individuals receiving orthodontic treatment may worsen with the effect of the risk factor created by COVID-19 pandemic.

It is also thought that some psychological qualities of children may increase secondary results due to orthodontic treatment. Among these qualities, the intensity of the emotions experienced by the individual in various situations and emotional reactivity, which defines the reactions elicited depending on this intensity, can be shown.[10,3] It is considered that high emotional reactivity may pave the way for the development of psychological symptoms related to the treatment process in children. Literature data show that high emotional reactivity is associated with major depression[11], anxiety disorders[12,3] and OCD symptoms[13]. No studies addressing the role of emotional reactivity in orthodontic and dental treatments have been found in the literature. Therefore, addressing the role of this variable is important in understanding possible risk factors in orthodontic treatment planning.

Another risk factor for the secondary results of orthodontic treatments is *intolerance of uncertainty*. İntolerance of uncertainty is defined as a tendency to react emotionally, cognitively and behaviorally to uncertain situations and events[14]. It has been reported that people with high intolerance of uncertainty tend to see uncertainty situations as annoying and stressful, to avoid this uncertainty, and to experience difficulties in their functioning in situations involving uncertainty[15,16]. It has also been argued that their perceptions and interpretations of uncertain situations contain a negative bias and therefore these people are more prone to interpret uncertain situations as threatening[16]. In this context, it is thought that since orthodontic treatments require a long-term process and the uncertainty about the duration and success of the treatment, it is an important risk factor in terms of psychological symptoms.

Despite these negativities, in orthodontic treatment, besides the negative characteristics of individuals, there are individual qualities such as psychological resilience which has a protective function[2]. *Psychological resilience* is defined as the ability of an individual to recover quickly in the face of difficult living conditions, recover and quickly return to his former state after being injured[9,17]. Similarly, it is defined as the ability of the individual to be successful in the face of uncertain and challenging processes[18] and to quickly return to the position to fulfill the duties and behaviors expected of him[19].

From this point of view, it can be said that psychological resilience is an important protective feature to consider in reducing the risk and psychological symptoms caused by emotional reactivity and intolerance of uncertainty in orthodontic treatment.

The Current Study

This study sets out to examine various psychological variables that predict psychological maladjustment and mediate these predictive relationships in children receiving orthodontic treatment. In this context, the mediating role of psychological resilience in the predictive relationship between emotional reactivity, intolerance of uncertainty and psychological maladjustment was examined. It is aimed to contribute to the expansion of this perspective and to the limited number of studies in the literature on the psychological consequences of orthodontic treatments by analyzing personal risk factors and protective factors by addressing the negative psychological effects on children since orthodontic treatments require a long-term treatment planning.

Within this scope, the research questions to be answered are as follows;

1. Are emotional reactivity and intolerance of uncertainty a significant predictor of psychological maladjustment in children and adolescents receiving orthodontic treatment?
2. Is there a mediating role of psychological resilience between emotional reactivity, intolerance of uncertainty and psychological maladjustment in children and adolescents receiving orthodontic treatment?

Material & Methods

Participants

Participants of the study consisted of 543 children aged between 10 and 18 (m = 15.30, Sd = 2.14) who were accessed through systematic and convenient sampling methods among the patients who were still being treated in the Orthodontics clinic of Faculty of Dentistry, Atatürk University. 73.6% of the participants are females and 26.4% are males. 56.42% of the participants receive fixed treatments, 18.9% orthognathic surgery, 13% fixed treatments with extraoral device and 11.7% mobile orthodontic appliances. In terms of the timing of the treatment, 84.8% of the participants have continued their treatment for at least 3 months, and the treatment of 15.2% has just started. The reasons for starting the treatment are to straighten crooked teeth in 49.7%, fixing the jaw and facial appearance in 22.8%, the more aesthetic and beautiful appearance in 18.9%, the improvement of speech in 7.2% and 7% of them started the treatment process for reasons other than these.

Measures

The Emotional Reactivity Scale:

It was developed by Nock, et al.[10] to measure the emotional intensity experienced in the face of situations that arise in interpersonal relationships and the reactivity expressed in these intense emotional situations and it was adapted to Turkish culture by Seçer et al.[20]. The scale is a self-report and four-point likert scale. It includes a total of 15 items and three sub-dimensions, and it was determined that its original structure with three factors was preserved in Turkish culture during the adaptation process. It was determined that the reliability values for the sub-dimensions varied between .81 and .94, respectively. During this study, the construct validity of the scale was revised (χ2 / sd = 1.96; REMSEA: .062, RMR: .063, SRMR: .067, CFI: .98) and it was determined that the fit indices were at a good level. The current internal consistency value of the scale was calculated as .87. High scores from the scale indicate that emotional reactivity is at a high and risky level.

Intolerance of Uncertainty Scale: It is a four-point Likert-type measurement tool developed to measure the susceptibility of individuals to react emotionally, cognitively and behaviorally to uncertain events and situations negatively[21]. The scale consists of 27 items and four sub-dimensions. It was determined that the scale preserved its structure in its original form in Turkish culture, had a structure explaining 48% of the variance, and its internal consistency coefficient was .87. During this study, the construct validity of the scale was revised (χ2 / sd = 1.96; REMSEA: .062, RMR: .063, SRMR: .067, CFI: .98) and it was determined that the fit indices were at a good level. The current internal consistency value of the scale is calculated as .82. High scores from the scale are interpreted as individuals show cognitive and affective intolerance in situations involving uncertainty.

Brief Resilience Scale*:* It is a four-point likert (never, rarely, often, always) measurement tool developed by Smith et al.[22] and adapted to Turkish culture by Doğan[23]. The scale consists of 6 items in total, and high scores indicate high psychological resilience. The scores that can be obtained from the scale range from 6 to 24 (sample items are “I tend to bounce back quickly after hard times and I usually come through difficult times with little trouble”). In this study, the construct validity of the scale was reviewed and it was determined that the model fit indices (χ2 / df = 1.96; REMSEA: .062, RMR: .063, SRMR: .067, CFI: .98) were at a good level. Cronbach alpha internal consistency value was calculated as .87.

Depression Anxiety Stress Scale: It is a four-point (never, rarely, often, always) Likert-type measurement tool developed as 42 items by Lovibond & Lovibond[24] to measure depression, anxiety, and stress symptoms, and later revised as 21 items by Brown et al. (1997).[25] The scale was adapted to Turkish by Yılmaz et al[26]. The data regarding the construct validity of the scale (χ2 / df = 2.84; REMSEA: .051, RMR: .036, CFI: .98) showed that the three-factor structure consisting of 21 items has a good level of fit (sample questions are, “I felt scared without a valid reason and I was worried about situations where I would panic and make myself stupid”). The scores obtained from the scale range from 21 to 84, and high scores indicate high levels of depression, anxiety and stress symptoms.

Procedure and Data Analyses

The research process started with the approval of the Ethics Committee of Faculty of Dentistry, Atatürk University for research compliance. The data collection process was carried out using online tools due to COVID-19 social distance restrictions. In this context, children who were registered in the hospital database and whose orthodontic treatment continues were determined. In the second stage, the junior doctors who followed the treatment processes of these children were contacted to reach the children and their parents, and their consent was obtained for voluntary participation. The parents of the children who volunteered to participate were asked to help their children complete the measurement tools by sending its link via e-mail and WhatsApp-like applications. In this context, the online data collection link prepared through Google Documents was used (available from https://forms.gle/xJRQ3krHVo5cfDzu7). Additional explanations on volunteering and data privacy are also included in this link. In addition, information regarding that they can withdraw from filling the questionnaire at any time was added. The data collection process was completed within 20 days. Data collection and compilation procedures were carried out by three different specialists from dentistry, orthodontic treatments and psychology. However, as it was determined that the data of 21 participants in the data set did not meet the normality-homogeneity criteria, they were excluded from the analysis.

During the analysis process, structural equation analyzes were carried out with the LISREL 9.2 software. In the analysis process, the confirmatory measurement model was tested at the first stage and it was determined that the designed model fits well ($\chi2/sd=1.60$; REMSEA: .071, RMR: .073, SRMR: .073, NFI: .95, CFI: .97, GFI: .92). Verification of the measurement model shows that all the implicit variables in the model have a good level of fit with the indicator variables they represent and other implicit variables[27]. After the measurement model, three different structural models were tested for the purposes of the research. CFI, NFI, GFI, RMR, SRMR, RMSEA and $\chi2$ values were examined as fit indices in the structural equation model. In the evaluation of the model fit indices, different criteria were taken into account as suggested. In this context, suggest that the model fit indices in the structural equation model should be .90 for acceptable fit and ≥ .95 for perfect fit for RFI, TLI, CFI, NFI, NNFI and IFI, ≥ .85 for acceptable fit and ≥ .90 for perfect fit for GFI and AGFI, ≤ .08 for acceptable fit and ≤.50 for perfect fit for RMR, REMSEA and SRMR[28].

Results

Three different structural models were tested in line with the research questions. Each model and its findings are presented below. In this context, the research hypothesis, which was designed as "*Emotional reactivity and intolerance of uncertainty predict psychological adjustment skills in children receiving orthodontic treatment*" was tested as Model 1. In this model, high emotional reactivity and high intolerance of uncertainty are expected to positively predict psychological adjustment skills in children receiving orthodontic treatment. Findings related to Model 1 are presented in Fig. 1.

Considering the fit index values χ^2 *(44,26/34) = 1,30; CFI = .97; TLI = .96; NFI = .94;GFI = .93*) for the model tested in Fig. 1, it can be said that all of the implicit variables in Model 1 have a significant relationship with the observed variables ($p < 0.001$) they represent. In this sense, it is seen that emotional reactivity (β

= .41, p < .01, 17%) and intolerance of uncertainty (β = .47, p < .01, 22%) are positive and significant predictors of psychological adjustment skills in children receiving orthodontic treatment. Although the relationship patterns determined between the variables are significant and high, it is recommended to include the variables in structural equation models that are likely to mediate these relationships and test their effect. Therefore, whether it mediates the relationship patterns determined in Model 1 was analyzed by including the psychological resilience variable in the model. In this process defined as Model 2, the direct and indirect effects of emotional reactivity and intolerance of uncertainty on psychological adaptation skills were examined. In this sense, the research hypothesis, constructed as Model 2, was expressed as "How did the direct prediction effect of emotional reactivity and intolerance of uncertainty on psychological adaptation skills in children receiving orthodontic treatment change after the inclusion of resilience in the model?", and the findings obtained are presented in Fig. 2.

When Model 2, in which mediation relations is tested, is examined, it is seen that the mediation of psychological resilience is significant and the fit indices are sufficient. The general rule in mediation relations is that when the "mediator variable" is included in the model, a significant change occurs in the direct prediction coefficients obtained in Model 1. When Model 2 is examined, there is no significant change in the predictive coefficients of emotional reactivity and intolerance of uncertainty in Model 1 on psychological maladjustment. However, striking point in Model 2 is that the relationship between psychological resilience and psychological adjustment is not significant although emotional reactivity (β = .47, p < .01, 22%) and intolerance of uncertainty (= .47, p < .01, 22%) negatively predicted psychological resilience. Considering that this, which is considered as Type II error, stems from the direct prediction paths in the model, a new model that tests the full mediator relations was structured. In this model defined as Model 3, the answer was sought for the research question expressed as "*Does psychological resilience fully mediate the relationship between emotional reactivity and intolerance of uncertainty and psychological adjustment?*" Findings regarding this model are presented in Fig. 3. In this model, it is aimed to prevent Type II error and analyze the real relationship patterns between the variables by removing the direct paths from emotional reactivity and intolerance of uncertainty from the model.

When Fig. 3 is examined, it is seen that the model that tests the full mediation of psychological resilience in children receiving orthodontic treatment is well adapted and significantly differentiates from Model 2. In addition, there is a significant improvement in the prediction coefficients and fit indices between variables compared to Model 2 (χ^2 (299,32/205) = 1,46; CFI = .98; TLI = .97; SRMR = .048; RMSEA = .046). When the findings obtained regarding the mediation model were examined, it was found that emotional reactivity (β = − .67, p < .01, 45%) and intolerance of uncertainty (= − .24, p < .01, 6%) negatively predicted psychological resilience and it is also seen that they predict psychological adjustment through resilience (= − .32, p < .01, 10%). Findings obtained in Model 3 contain significant differences compared to Model 2. The first striking difference is that there is a significant increase in the predictive coefficients of emotional reactivity and intolerance of uncertainty on psychological resilience compared to Model 2. The second important difference is that although the predictive effect of psychological resilience on psychological adjustment is insignificant in Model 2, a serious change has occurred in this predictive coefficient in

Model 3 (β= − .78, p < .01, % 60). In this context, it can be said that psychological resilience has a fully mediating function in the relationship between emotional reactivity and intolerance of uncertainty and psychological adjustment in line with the findings in Model 3.

Conclusion And Discussion

In line with the findings obtained from the study, it was determined that children and adolescents receiving orthodontic treatment have a high probability of developing psychological maladjustment (depression, anxiety, stress), emotional reactivity and intolerance of uncertainty are risk factors, and psychological resilience stands out as an important variable that protects children and adolescents against this risk.

Research results show that emotional reactivity is a predictor of psychological maladjustment in children and adolescents receiving orthodontic treatment, and high emotional reactivity creates a significant risk for psychological maladjustment. This finding, which is parallel with the related literature, is thought to be significant [3,10,11]since such factors that orthodontic treatments are long-term, the treatment involves a troublesome process, and the apparatus used affects the appearance can possibly trigger psychological symptoms. Therefore, it can be thought that high emotional reactivity may increase the psychological symptoms in these children and cause the treatment to be negatively affected. It is even considered that emotional reactivity may have a negative function at the point of interrupting and disrupting the treatment.

Another important finding is the results showing that intolerance of uncertainty is a predictor of psychological maladjustment in children and adolescents receiving orthodontic treatment. It seems more likely to develop psychological symptoms in children with a high level of intolerance of uncertainty[3,14,15]. It can be said that children with low tolerance of uncertainty will develop more negative reactions in emotional, cognitive and behavioral terms and may disrupt the process considering the factors affecting the duration and success of orthodontic treatment. Therefore, intolerance of uncertainty and emotional reactivity, which are prominent risk factors in orthodontic treatments, are considered to be beneficial as variables that may affect the course of the treatment.

The most striking finding of the study is about the protective role of psychological resilience. The findings indicate that children who receive orthodontic treatment and have high psychological resilience are less likely to develop psychological symptoms. This finding, which coincides with the related literature[2,29,30,] indicates that psychological resilience may play an important role in reducing the risk of emotional reactivity and intolerance of uncertainty in orthodontic treatment and preventing children from developing psychological symptoms. In this sense, it is considered that there is a need to consider the psychological processes at every stage of orthodontic treatment procedure and to make a general evaluation in terms of psychological protective and risk factors since it is thought that such evaluations will provide important contributions both in preventing the development of treatment-related symptoms and ensuring the continuity of the treatment.

Limitations And Future Research

The findings of this research should be evaluated in the context of its limitations. The research was conducted only in a relational and cross-sectional context due to the negativities created by the epidemic. In addition, data collection was completed online for the same reason. Their effect on research results should be considered.

Why this paper is important to paediatric dentists

1. It is believed that the results of the research will contribute to the expansion of the perspective on orthodontic treatments carried out with children and young people in the national and international arena
2. It is considered that these findings may contribute to the expansion of pediatric dentists' perspectives on the secondary outcomes of orthodontic treatment practices
3. It will be able to contribute to the expansion of the perspective regarding the psychological consequences of orthodontic treatments.
4. In fact, based on analyzing the protective and risk factors for the findings and findings regarding psychological maladjustment in children receiving orthodontic treatment, it is thought that it can contribute to the development of action plans for making psychological intervention and therapy approaches a dimension of orthodontic treatment processes and to draw the attention of researchers to applications in this direction.

Declarations

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Author Contributions

As a result of the review of the relevant literature, İS, NBD, DD and acted together in the process of revealing the research idea. After determining the research subject, all authors took an active role in completing the research procedures. all authors conducted the data collection and analysis together. The process of creating online data collection processes and delivering them to the target groups was fulfilled together. The analysis and parametric test conditions were done by the İS and DD. Data analysis and reporting processes were done by NBD. In the writing process of the study, the introduction and discussion part was written by İS and DD significantly and NBD contributed to this process. The Methods and Findings section of the research were prepared for publication by DD and contributed by İS and NBD. The Discussion section is a section created by both authors together. During the publication of the article, the feedback from the editors and the referees were organized together by all authors.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Ethical Approval

The research conducted after getting the permission from the Ataturk University Healty Sciences Ethics Committee and then, the necessary permissions were granted from the local administrators to carry out the research. Also, the data collection process was based on volunteering and a separate link was provided to the participants directing them to the informed consent forms.

Conflict of Interest

There is no potential conflict of interest in the research, writing, and publication of this article.

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Figures

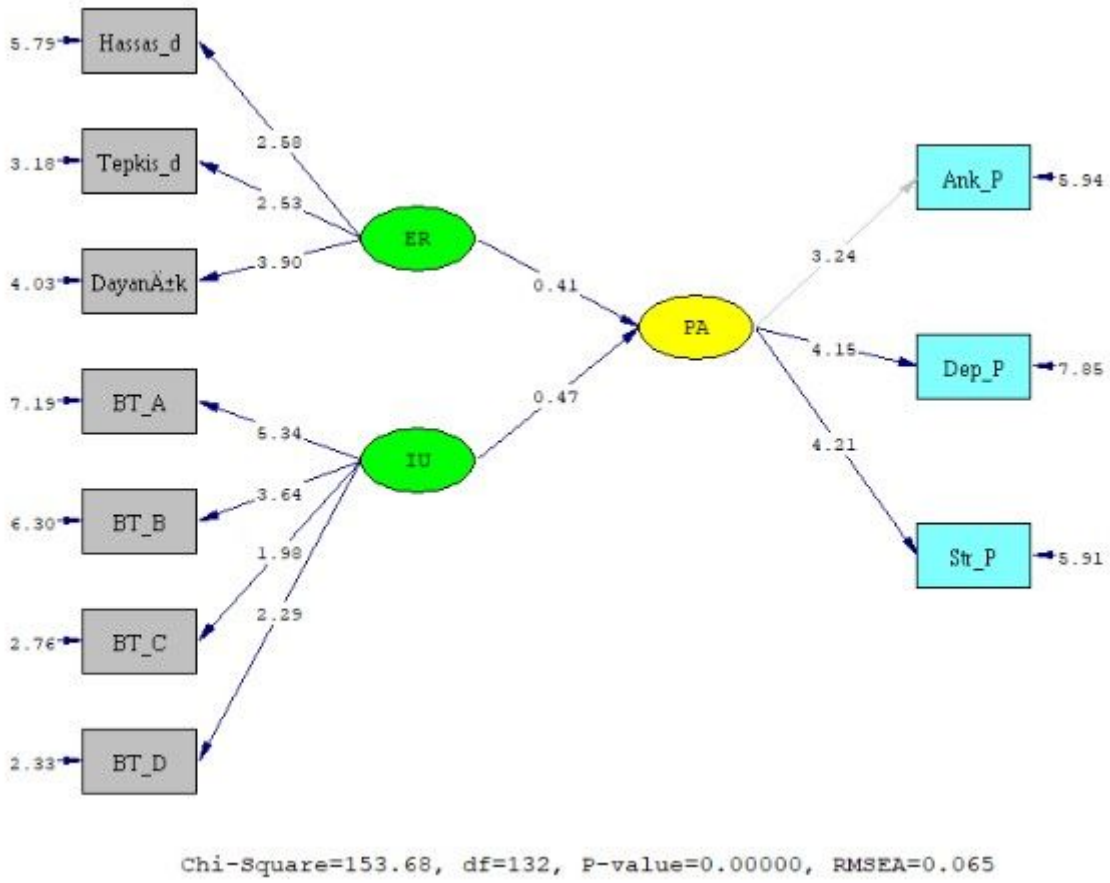

Figure 1

Model 1

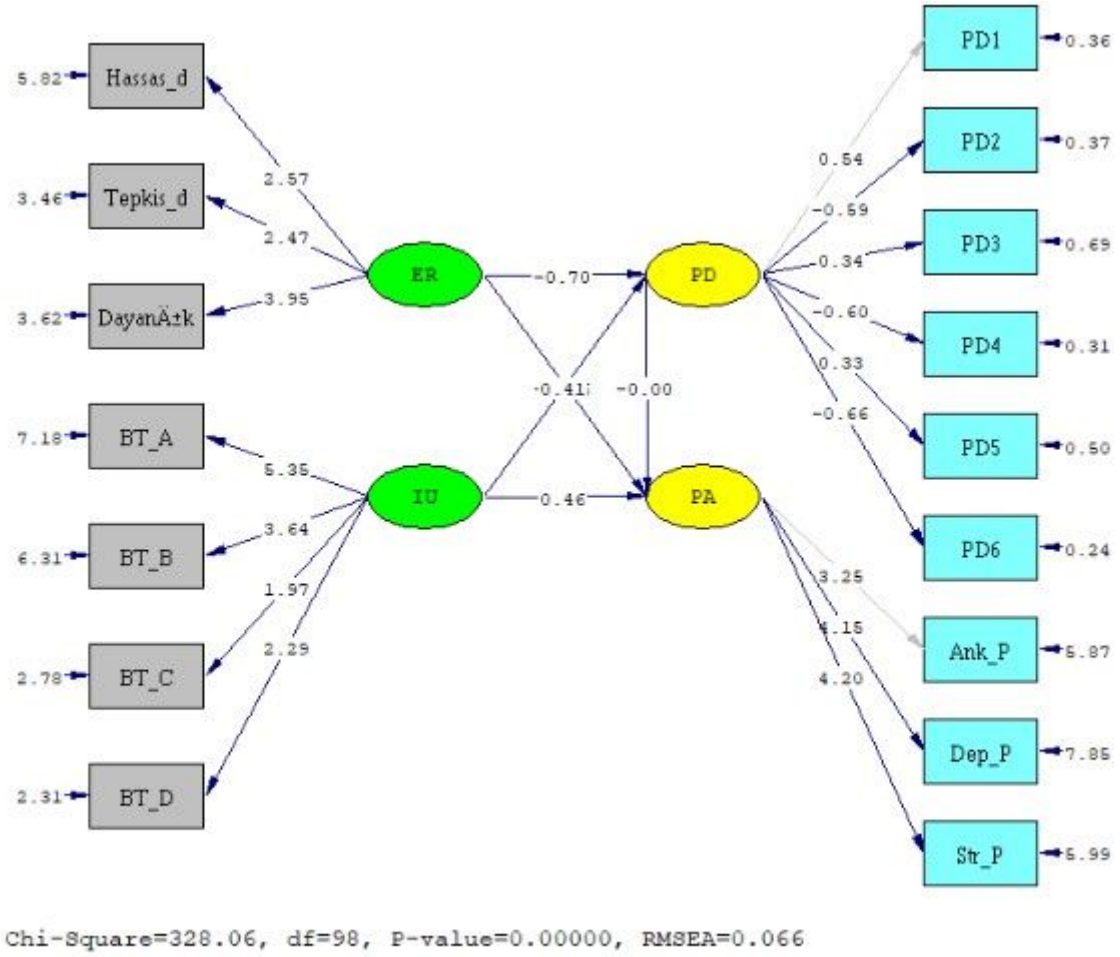

Figure 2

Model 2

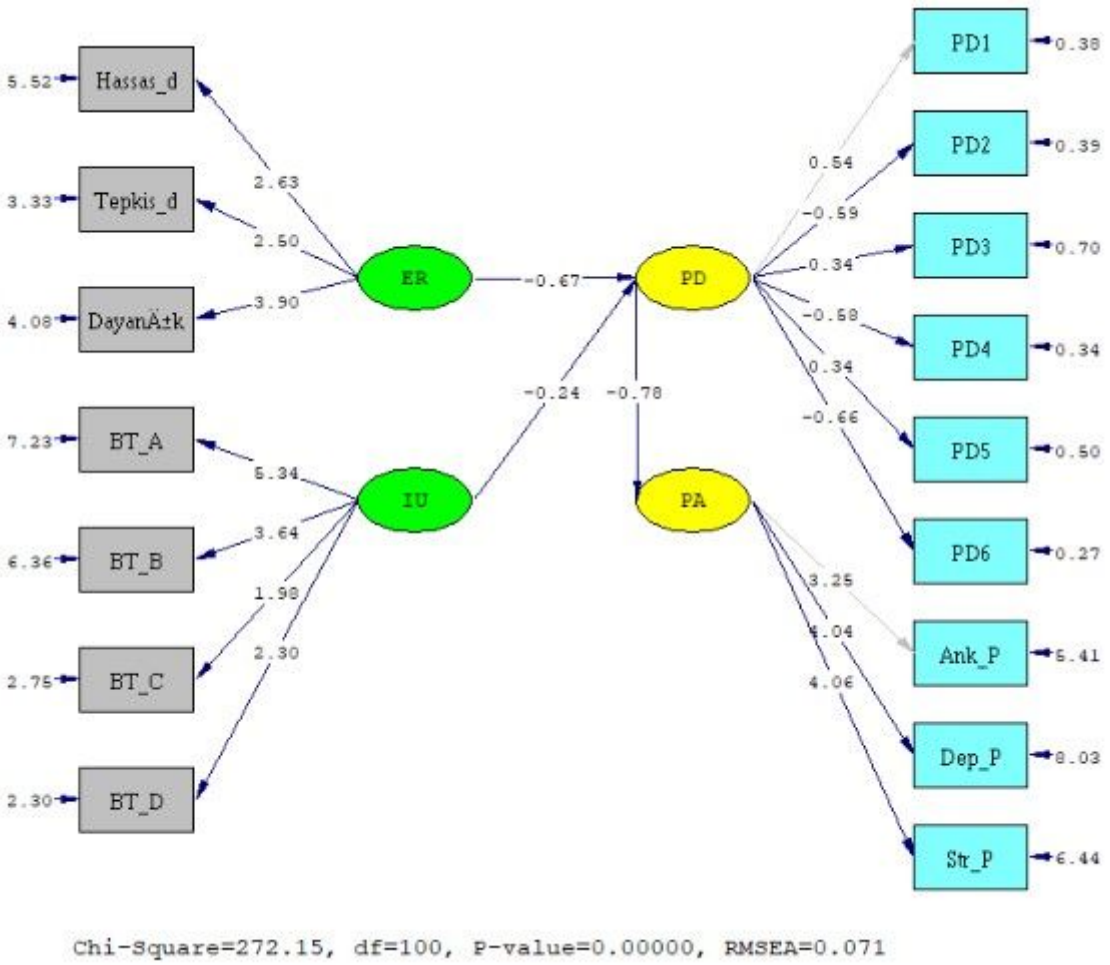

Figure 3

Model 3