Research Article / Araştırma Makalesi

Sport Anxiety Scale-2: Reliability and validity study in Turkish wrestlers

Spor Anksiyetesi Ölçeği-2: Türk güreşçilerde geçerlik ve güvenirlik çalışması

Hakan Akman[1] iD, Ayşegül Yetkin Tekin[2] iD, Atilla Tekin[3] iD

[1]*Private Clinic of Psychology, İstanbul, Türkiye*

[2]*Psychological Counseling and Guidance Department, Faculty of Education, Adıyaman University, Adıyaman, Türkiye*

[3]*Department of Psychiatry, Faculty of Medicine, Adıyaman University, Adıyaman, Türkiye*

ABSTRACT

Objective: The aim of this study is to evaluate the linguistic and construct validity of the Sport Anxiety Scale-2 (SAS-2) among Turkish wrestlers.

Materials and Methods: The study sample consisted of 150 active professional wrestlers aged between 18 and 40. Each participant completed a sociodemographic data form, the SAS-2-which includes three subscales and 15 items-and the Beck Anxiety Inventory. The linguistic and construct validity of the SAS-2 was assessed using confirmatory factor analysis, while its reliability was determined through the calculation of Composite Reliability (CR), Average Variance Extracted (AVE), and Cronbach's Alpha coefficients.

Results: The factor loadings of the SAS-2 ranged from .55 to .93. The goodness-of-fit indices indicated acceptable model fit (GFI = .84, NFI = .93, RFI = .92, CFI = .96, IFI = .96, and RMSEA = .10). Regarding internal consistency, Cronbach's alpha coefficients ranged from .83 to .92, Composite Reliability (CR) values ranged from .79 to .84, and Average Variance Extracted (AVE) values ranged from .54 to .67.

Conclusion: The findings suggest that the SAS-2 is a valid and reliable self-report scale for assessing sports-related anxiety in athletes aged 18 and above.

Keywords: Anxiety, confirmatory factor analysis, sport anxiety scale, reliability, validity

ÖZ

Amaç: Bu çalışmanın amacı Spor Anskiyetesi Ölçeği-2'nin (SAÖ-2) Türk güreşçilerde dil ve yapı geçerliliğini test etmektir.

Gereç ve Yöntemler: Araştırmanın örneklemini, 18-40 yaş arası 150 aktif profesyonel güreşçi oluşturmuştur. Her bir güreşçi, sosyodemografik veri formunun yanı sıra SAÖ-2 ve Beck Anksiyete Envanteri'ni doldurmuştur. SAÖ-2'nin dil ve yapı geçerliği doğrulayıcı faktör analiziyle, güvenirliği ise bileşik güvenirlik (CR), açıklanan ortak varyans değerleri (AVE) ve Cronbach Alpha katsayıları hesaplanarak değerlendirilmiştir.

Bulgular: SAÖ-2'nin faktör yükleri .55 ile .93 arasında değişmiştir. Uyum iyiliği indeksleri kabul edilebilir sınırlar içinde bulunmuştur (GFI = .84, NFI = .93, RFI = .92, CFI = .96, IFI = .96 ve RMSEA = .10). SAÖ-2'nin iç tutarlılık parametrelerinde, Cronbach Alfa katsayıları .83 ile .92, CR değerleri .79 ile .84, ve AVE değerleri .54 ile .67 arasında değişiklik göstermiştir.

Sonuç: SAÖ-2'nin 18 yaş üstü sporcularda spora ilişkin anksiyetenin değerlendirilmesinde kullanılabilecek geçerli ve güvenilir bir öz bildirim ölçeği olduğu söylenebilir.

Anahtar Sözcükler: Kaygı, doğrulayıcı faktör analizi, spor kaygısı ölçeği, güvenirlik, geçerlik

INTRODUCTION

Athletic performance can be influenced by various factors. Alongside physical characteristics and capacities of the athlete, factors such as the type and duration of the competition and personal characteristics also play a role in performance outcomes (1-3). Among the key factors negatively impacting athlete performance are physical inadequacy, injuries, inexperience, negative feedback from the coach, distracting behaviour from opponents, and unfavourable physical conditions of the sports environment (4-7).

Psychological factors also significantly influence performance, with anxiety being one of the most critical (5). Anxiety is defined as a state of subjective uneasiness, tension, worry, and concern, often regarded as a natural and necessary reaction. It is frequently accompanied by physical symptoms such as palpitations, muscle tension, numbness, and shortness of breath (6). Research indicates that many athletes experience anxiety either before or during competitions (7). Factors such as negative thoughts, perfectionist personality traits, social pressures to meet high performan–

ce expectations, and concerns about physical injuries can increase anxiety levels in athletes (8,9).

While moderate anxiety can positively influence performance by increasing alertness and focus, high anxiety levels have been shown to lead to performance failure (10,11). As anxiety intensifies, concentration and decision-making abilities diminish, making it difficult for athletes to perform optimally. Severe anxiety may hinder athletes from fully demonstrating their skills, leading to incorrect execution of movements or forgetting previously well-learned actions (12,13).

The information outlined above highlights that anxiety is a crucial factor influencing athletic performance. Therefore, tools designed to evaluate anxiety in athletes hold significant importance. Among the most widely used self-report scales for assessing anxiety in athletes globally is the Sport Anxiety Scale-2 (SAS-2). Developed by Smith et al., the SAS-2 is a self-assessment tool specifically designed to measure anxiety in athletes and has been validated as reliable in various countries, including Korea, China, Brazil, Spain, Indonesia, and Poland (14-20).

In Türkiye, a previous adaptation study of the SAS-2 was conducted with adolescent athletes (21). However, to the best of our knowledge, no adaptation study has been carried out for adult professional athletes in the Turkish population. Evaluating the validity and reliability of the SAS-2 for adult Turkish athletes is deemed essential to accurately measure anxiety in this demographic.

Thus, the aim of this study is to adapt the SAS-2 to Turkish culture and test its validity and reliability among wrestlers actively competing under the Turkish Wrestling Federation.

MATERIAL and METHODS

Sample

The research sample consisted of 150 wrestlers actively participating in camps organized by the Turkish Wrestling Federation. These included camps in Sarıyer and Beylikdüzü (Istanbul region) and Elmadağ and Edirne (Ankara region). According to scale adaptation guidelines, the sample size should be at least five times the number of scale items (22). In this study, the sample size was ten times the number of items in the SAS-2.

Of the participants, 19.3% (n=29) were women, and 80.7% (n=121) were men. The average age of participants was 24.9±7.5 years, with an age range of 18-40. The distribution of wrestling styles was as follows: 43.3% (n=65) were freestyle wrestlers, 28% (n=42) were Greco-Roman style wrestlers, and 28.7% (n=43) practiced traditional styles such as oil wrestling and karakucak. Regarding experience, 20%

(n=30) had been wrestling for 1-5 years, 34.7% (n=52) for 6-10 years, 16.7% (n=25) for 11-15 years, and 28.7% (n=43) for 16 years or more.

In terms of marital status, 72.7% (n=109) were single, and 27.3% (n=41) were married. Regarding education level, 60% (n=90) were university graduates, 34.7% (n=52) were high school graduates, and 2.7% each were secondary school (n=4) and primary school (n=4) graduates. Furthermore, 58% (n=87) of participants reported having suffered a sports injury in the past, and 12.7% (n=19) stated that they had previously received psychiatric or psychological support.

All participants were informed about the purpose of the research and signed an informed consent form. The study was approved by the Haliç University Ethics Committee (Approval Number: 04, Date: 26.10.2017) and received permission from the Turkish Wrestling Federation (Approval Number: 4485, Date: 01.11.2017).

Material

Each participant filled out the Sport Anxiety-2 Scale and the Beck Anxiety Inventory, along with the sociodemographic form.

Sociodemographic form: It included characteristics of each participant such as age, gender, education level, marital status, income level, and injury history.

Sport Anxiety-2 Scale (SAS-2):

The Sport Anxiety Scale-2 (SAS-2) is the revised version of the original 21-item scale developed by Smith et al. (23). The revised scale consists of 15 items and follows a four-point Likert format (14). It evaluates the components of somatic and cognitive anxiety under three main subdomains: **Worry**, **Somatic Anxiety**, and **Concentration Disruption**.

The **Worry** subdomain includes items such as: *"I worry that I will not play my best," "I worry that I will play badly," "I worry that I will mess up during the game."*

The **Somatic Anxiety** subdomain is assessed through items like: *"My body feels tense," "I feel tense in my stomach," "My muscles feel shaky."*

The **Concentration Disruption** subdomain evaluates the negative impact of anxiety on focus using items such as: *"It is hard to concentrate on the game," "It is hard for me to focus on what I am supposed to do," "I lose focus on the game."*

Higher scores on each SAS-2 subscale indicate greater levels of worry, somatic anxiety, or concentration disruption experienced by the athlete.

Beck Anxiety Inventory (BAI):

The Beck Anxiety Inventory (BAI) was developed by Beck et al. (24) as a four-point Likert-type scale consisting of 21 items. Each item is scored between 0 and 3, resulting in a total score range of 0 to 63. The Turkish validity and reliability study for the scale was conducted by Ulusoy et al. (25), with an internal consistency coefficient of .93 for the Turkish version.

Data Collection Process

The adaptation process of the Sport Anxiety Scale-2 (SAS-2) to Turkish followed a systematic methodology:

1. **Translation Process:** The original English version of the SAS-2 was translated into Turkish by three independent bilingual individuals proficient in both Turkish and English. The translations were reviewed and consolidated into a single version by a faculty member from the Psychology Department of Haliç University, who is fluent in both languages.
2. **Back-Translation Process:** The Turkish version was back-translated into English by three independent bilingual individuals. The most appropriate translations were combined to create a unified back-translated version, ensuring consistency with the original English scale.
3. **Linguistic Equivalence:** To establish linguistic equivalence, the Turkish version of SAS-2 was administered to 80 students from the Haliç University Translation and Interpreting Department. One month later, the back-translated English version was administered to the same group. No significant statistical difference was observed between the scores of the English and Turkish versions (t = 1.20, p = 0.234). A positive and statistically significant correlation was found between the two versions (r = .68, p < 0.001), indicating linguistic equivalence.
4. **Reliability and Validity Testing:** The Turkish SAS-2, along with a sociodemographic form and the Beck Anxiety Inventory (BAI), was administered to 150 athletes affiliated with the Turkish Wrestling Federa-

tion who agreed to participate in the study. One month later, the same scales were re-administered to the same participants to assess test-retest reliability.

Statistical analysis

SPSS (Statistical Package for the Social Sciences) 19.0 and LISREL programmes were used to conduct the reliability and validity study of the SAS-2. Sociodemographic data of the wrestlers were given as number, percentage, mean, standard deviation and range. Pearson correlation analysis was performed to evaluate of concurrent validity of SAS-2. Confirmatory factor analysis was performed for construct validity. Composite reliability (CR), Average Variance Extracted (AVE), and Cronbach's Alpha coefficients were calculated to evaluate of reliability of SAS-2.

RESULTS

Findings regarding confirmatory factor analysis

The goodness-of-fit indices for the confirmatory factor analysis (CFA) of the scale are presented in Table-1. The ratio of the chi-square (x^2) value to the degrees of freedom (df) was calculated as 2.48 (x^2 = 216.14, df = 87). The fit indices indicated the following values: **Goodness of Fit Index (GFI):** .84, **Normed Fit Index (NFI):** .93, **Relative Fit Index (RFI):** .92, **Comparative Fit Index (CFI):** .96, **Incremental Fit Index (IFI):** .96, **Root Mean Square Error of Approximation (RMSEA):** .10

These results suggest that the model demonstrated acceptable fit, with most indices meeting or exceeding recommended thresholds. However, the RMSEA value of .10 indicates a need for cautious interpretation as it approaches the upper limit of acceptability.

The factor loadings of the SAS-2 items ranged from .55 to .93 (Figure-1). Specifically, the factor loadings for the subdomains were as follows: **Worry:** .63 to .74, **Somatic Anxiety:** .65 to .92, **Concentration Disruption:** .55 to .93. These values indicate that the scale items exhibited moderate to strong loadings on their respective factors, supporting the construct validity of the scale (Figure-1).

Table 1. Goodness of fit indices for SAS-2 by using confirmatory factor analysis

χ^2/df	GFI	NFI	RFI	CFI	RMR	IFI	RMSEA
2.48	0.84	0.93	0.92	0.96	0.060	0.96	0.100

χ^2/sd: Chi-square/degree of freedom, GFI: Goodness of Fit Index, NFI: Normed Fit Index, RFI: Relative Fit Index, CFI: Comparative Fit Index, RMR: Root Mean Square Residuals, IFI: Incremental Fit Index, RMSEA: Root Mean Square Error of Approximation
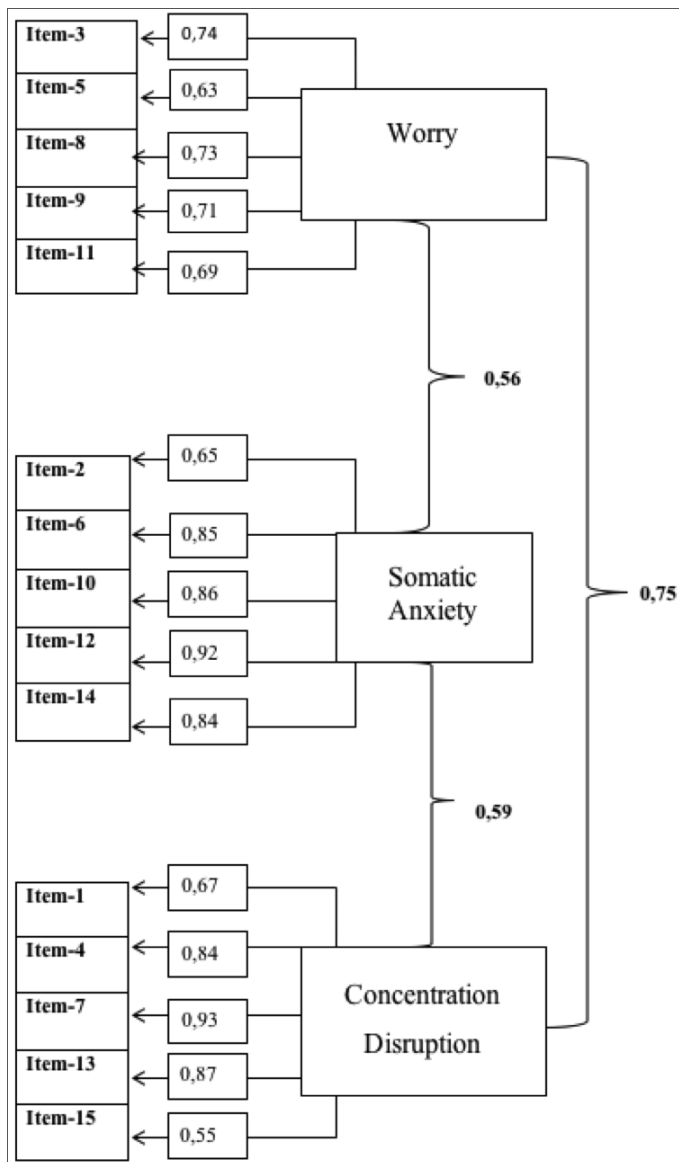
Figure 1. Factor loads of SAS-2 according to confirmatory factor analysis

Concurrent validity findings

For the evaluation of concurrent validity, both the SAS-2 and the Beck Anxiety Inventory (BAI) were administered. Positive and statistically significant correlations were observed between the SAS-2 subscales **(Worry, Somatic Anxiety,** and **Concentration Disruption)** and the BAI scores: **Pre-test correlations:** Worry: r=.67r=.67 Somatic Anxiety: r=.71r=.71 Concentration Disruption: r=.63r=.63 **Test-retest correlations:** Worry: r=.64r=.64, Somatic Anxiety: r=.70r=.70, Concentration Disruption: r=.59r=.59. These findings, presented in **Table-2**, indicate a strong and consistent relationship between SAS-2 subscales and BAI scores, supporting the concurrent validity of the SAS-2.

Findings regarding the reliability of the scale

The reliability of the Turkish version of the SAS-2 was assessed using Composite Reliability (CR), Average Variance Extracted (AVE), and Cronbach's Alpha coefficients through the internal consistency method. The results were as follows:CR values for worry, somatic anxiety, concentration disruption, and whole scale were .81, .84, .82, and .79; respectively. AVE values were .59 for worry, .67 for somatic anxiety, .61 for concentration disruption, and .54 for whole scale. Cronbach's Alpha coefficients were calculated for the worry, somatic anxiety, and concentration impairment subscales of SAS-2. Accordingly, the Cronbach's Alpha coefficient of the worry subscale was found to be .83 for the pre-test and .86 for the test-retest. The Cronbach's Alpha coefficient of the somatic anxiety subscale was .92 for the pretest and .87 for the test-retest. The Cronbach's Alpha coefficient of the concentration impairment subscale was .89 for the pre-test and .86 for the test-retest. The Cronbach's Alpha coefficient of the SAS-2 unidimensional form was found to be .88 for the pre-test and .84 for the test-retest.

Table 2. Correlation of BAI and SAS-2 for concurrent validity evaluation

Scale	Test BAI	Re-test BAI
SAS-2 Worry	.67[**]	.64[**]
SAS-2 Somatic Anxiety	.71[**]	.70[**]
SAS-2 Concentration Disruption	.63[**]	.59[**]
SAS-2 Total	.61[**]	.69[**]

BAI: Beck Anxiety Inventory, SAS-2: Sport Anxiety Scale-2; [**]p<0.01

DISCUSSION

The findings of this study indicate that the Turkish adaptation of the SAS-2 exhibits acceptable psychometric properties when applied to adult professional wrestlers. The goodness of fit indices obtained from confirmatory factor analysis (GFI=.84, NFI=.93, RFI=.92, CFI=.96, IFI=.96, RMSEA=.10) and internal consistency measures (CR: .79-.84, AVE: .54-.67, Cronbach's Alpha: .83-.92) support the reliability and validity of the scale in this population.

Factor loadings were found to be **0.55 and above**, surpassing the **0.30 threshold** recommended by Tabachnick and Fidell for exploratory factor analysis validity (26). The **x^2/df** ratio of **2.48** meets the ideal fit range (below 3), aligning with established criteria for confirmatory factor analysis (27).

Previous studies on the SAS-2 also report high validity and reliability: **Turkish athletes aged 9-18;** x^2/df = 1.57, CFI = .98, IFI = .98, GFI = .91, RMSEA = .06 (21), **Korean athletes (19-25 years);** CFI = .92, RMSEA = .07 (15), **Chinese student athletes;** CFI = .96, TLI = .93, RMSEA = .08 (16), **Brazilian athletes (13+ years);** CFI = .97, TLI = .96, RMSEA = .08 (17), **Polish athletes;** CFI = .945, RMSEA = .072 (20).

In this study, the RMSEA value of **.10** slightly exceeds the recommended threshold, suggesting a potential area for improvement in the Turkish version of SAS-2. Nevertheless, the majority of other fit indices are within acceptable ranges, supporting the overall usability of the scale. These results demonstrate that the Turkish version of SAS-2 is a reliable and valid instrument for assessing sport-related anxiety in Turkish adult professional wrestlers. The findings align with international studies, suggesting that the scale is suitable for use across different cultures and populations, despite minor limitations in the RMSEA value (28).

The findings of this study demonstrate that the **Turkish form of SAS-2** exhibits high concurrent validity when compared with the **Beck Anxiety Inventory (BAI)**, a well-established tool validated in Turkish society for assessing anxiety. Strong, positive correlations were found between the subscales of SAS-2 and BAI: **Worry;** $r=.64$, **somatic anxiety;** $r=.70$, **Concentration Disruption;** $r=.59$. These correlations underscore the consistency between SAS-2 and BAI in measuring anxiety-related constructs. Similar findings were reported by **Karadağ and Aşçı**, who validated the SAS-2 against the Trait Anxiety Inventory in a younger population, further supporting the scale's concurrent validity (14). The strong alignment between SAS-2 and BAI suggests that the **Turkish adaptation of SAS-2** effectively captures anxiety components relevant to sports, reflecting its suitability for evaluating anxiety levels in Turkish athletes.

To assess reliability, the study utilized internal consistency methods, calculating; composite reliability (CR); Demonstrates the scale's ability to consistently measure constructs, average variance extracted (AVE); reflects the proportion of variance captured by the scale's latent variables, Cronbach's alpha coefficients; indicates the scale's internal consistency. Reliability measures for SAS-2 showed acceptable levels across all subscales and the overall scale, reinforcing its stability and consistency as a psychometric tool. The strong correlations with BAI and high internal consistency measures suggest that the Turkish form of SAS-2 is both a valid and reliable tool for evaluating sport-related anxiety in professional athletes. Its concurrent validity ensures that it aligns with established anxiety assessments, making it a practical choice for researchers and practitioners in sports psychology.

The findings of the study indicate that the **Turkish form of the SAS-2** demonstrates strong reliability, as evidenced by high values for **Composite Reliability (CR)**, **Average Variance Extracted (AVE)**, and **Cronbach's Alpha coefficients**. **CR Values;** ranged between **.79 and .84** for the subs-

cales and the unidimensional form, meeting the threshold of >**.70** for construct reliability, **AVE values;** found between **.54 and .67**, exceeding the acceptable threshold of >**.50**, which supports the convergent validity of the scale, **Cronbach's alpha coefficients;** worry: **.86,** somatic anxiety; **.87,** concentration disruption; **.86.** These values indicate excellent internal consistency.

Karadağ and Aşçı reported higher Cronbach's Alpha coefficients in Turkish adolescent athletes (.93 for worry, .94 for somatic anxiety, .89 for concentration disruption) and CR values (.89-.97) than in the present study, likely reflecting differences in the age groups and samples used (21). **Korean Version of SAS-2** (Aged 19-25); CR values (.80-.89), AVE values (.45-.62), and Cronbach's Alpha coefficients (.78-.91) align closely with the findings in this study, showing consistency across cultural adaptations (15). **Polish version of SAS-2;** CR values (.82-.91), AVE values (.48-.68), and Cronbach's Alpha coefficients (.81-.92) were comparable to the Turkish form, further supporting the scale's reliability across diverse populations (20). These results, combined with benchmarks for reliability in scale adaptation studies (**CR > .70, AVE > .50, Cronbach's Alpha > .70**) (22, 30), indicate that the **Turkish form of SAS-2** is a reliable tool for assessing sports-related anxiety in professional athletes.

While the study provided significant insights into the reliability of the SAS-2 Turkish form, it also had notable limitations. With **80.7% of participants being male**, the responses of female athletes could not be adequately analyzed. Studies with a more gender-balanced sample are needed to evaluate potential differences in anxiety perception across genders. Limiting the study to wrestlers restricts the generalizability of findings to athletes from other sports. Broader sampling across different sports disciplines will enhance the applicability of the scale. To address these limitations and further validate the SAS-2 Turkish form, including athletes from a wider range of sports and with a balanced gender representation will ensure a more comprehensive evaluation. Testing the scale in recreational athletes, amateur players, and non-sports populations may reveal additional insights into its versatility. By overcoming these limitations, future research can enhance the generalizability and utility of the Turkish form of SAS-2 in assessing sports-related anxiety across various demographics and contexts.

CONCLUSION

The findings of this study demonstrate that the Turkish form of the SAS-2 exhibits acceptable validity and reliability for use among professional wrestlers. The scale's psychometric properties, including strong internal consistency, concurrent validity, and acceptable confirmatory factor

analysis indices, support its suitability for assessing sports-specific anxiety in Turkish athletes.

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APPENDIX: SPOR ANKSİYETESİ ÖLÇEĞİ-2				
Madde		Hiç	Nadiren	Sık	Çok Sık
1	Oyuna odaklanmakta güçlük çekerim.	1	2	3	4
2	Vücudum gergin olur.	1	2	3	4
3	İyi oynayamayacağım diye endişe duyarım.	1	2	3	4
4	Yapmam gereken şeylere odaklanmakta güçlük çekerim.	1	2	3	4
5	Başkalarını hayal kırıklığına uğratacağıma dair endişe duyarım.	1	2	3	4
6	Midemde gerginlik hissederim.	1	2	3	4
7	Oyun sırasında konsantrasyonumu kaybederim.	1	2	3	4
8	En iyi oyunumu oynayamayacağımdan korkarım.	1	2	3	4
9	Kötü oynayacağımdan korkarım.	1	2	3	4
10	Kaslarım titremeye başlar.	1	2	3	4
11	Oyun esnasında herşeyi mahvetmekten korkarım.	1	2	3	4
12	Midemde rahatsızlık hissederim.	1	2	3	4
13	Oyun sırasında net düşünemem.	1	2	3	4
14	Gergin olduğum için kaslarım sıkışır.	1	2	3	4
15	Antrenörümün bana dediklerini yapmakta zorluk çektiğim zamanlar olur.	1	2	3	4