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RESEARCH

Chemosensory Pleasure Scale: Validity and Reliability of Turkish Version

Kimyasal Duyu Keyif Ölçeği: Türkçe Versiyonunun Geçerliliği ve Güvenirliği

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Öz

Bu çalışmanın amacı, tat ve koku almada hedonik hazzı belirlemek için geliştirilen Kimyasal Duyu Keyif Ölçeği'nin Türkçe versiyonunun geçerlilik ve güvenilirliğini değerlendirmektir. Bu çalışma 247 katılımcı ile gerçekleştirilmiştir. Verilerin toplanmasında Sosyodemografik Form (SF), Kimyasal Duyu Keyif Ölçeği-Türkçe Versiyonu (CPS-TR), Fiziksel Anhedoni Ölçeği (FAÖ) ve Sosyal Anhedoni Ölçeği (SAÖ) kullanılmıştır. Güvenirlik analizi için Cronbach alfa iç tutarlılık katsayısı, madde-toplam puan korelasyon katsayıları ve Spearman Brown split-half testi hesaplanırken, ölçeğin yapı geçerliliğini tahmin etmek için açımlayıcı faktör analizi yapılmıştır. Ölçeğin iç tutarlılık güvenirliği dikkate alındığında, Cronbach alfa güvenirlik katsayısı $\alpha = 0.87$ olarak bulunmuştur. Ölçek maddelerinin madde ve toplam puan korelasyon katsayıları 0.35 ile 0.70 arasında bulunmuştur. Açımlayıcı faktör analizi toplam varyansın %68.9'unu açıklamış ve ölçeğin üç faktörlü yapısını desteklemiştir. Bu faktörlerin faktör yükleri 0.55 - 0.85 arasında tahmin edilmiştir. CPS-TR'nin FAÖ ve SAÖ ile korelasyonu istatistiksel olarak anlamlı bulunmuştur. CPS ölçeği Türkçe dilinde kimyasal hazzı değerlendirmek adına geçerli ve güvenilirdir.

Anahtar sözcükler: Kimyasal duyu keyif ölçeği, geçerlilik, güvenirlik

Abstract

The aim of this study was to assess the validity and reliability of the Turkish version of the Chemosensory Pleasure Scale, which is developed to determine the hedonic pleasure in taste and smell. The present study was conducted with a sample of 247 participants. Sociodemographic Form (SF), Chemosensory Pleasure Scale Turkish Version (CPS-TR), Physical Anhedonia Scale (PAS), and Social Anhedonia Scale (SAS) were used to collect data. For the reliability analysis, Cronchach alpha internal consistency coefficient, item-total score correlation coefficients, and Spearman-Brown split-half test were calculated, whereas Explanatory factor analysis was performed to estimate the construct validity of the scale. Considering the internal consistency reliability of the scale, Cronbach's alpha reliability coefficient was found to be α=0.87. The item and total score correlation coefficients of the scale items were found between 0.35 and 0.70. Exploratory factor analysis explained 68.9% of the total variance and supported the three-factor structure of the scale. Factor loadings of these factors were estimated between 0.55-0.85. The correlation of CPS-TR with PAS and SAS was statistically significant. The results of this study suggest that the Turkish version of the CPS is a reliable and valid instrument for determining chemosensory pleasure.

Keywords: Chemosensory pleasure scale, validity, reliability

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ANHEDONIA is characterized as a diminished interest in likable events or activities, including sensory, social, or behavioral experiences (Nusslock and Alloy 2017). Loss of pleasure impairs quality of life and may affect social functioning (Miller 1987). Considering experiencing pleasure is an essential part of well-functioning lives, anhedonia exists in many neuropsychiatric disorders like schizophrenia, depression, addiction, and Alzheimer's disease (Gard et al. 2007, McCabe 2014). Anticipatory (wanting) and consummatory (liking) pleasure are the two components of hedonic experience; while the former reflecting the anticipation of rewarding stimulus, the latter refers to the reaction to in the moment pleasure (Kring and Elis 2013). Neuroscientific studies showed that there are two different pathways in our brains regarding these two components (Berridge and Robinson 1998, Berridge 2009). In order to evaluate these domains in pleasure experience, several self-report scales have been developed, such as the Temporal Experience of Pleasure Scale (Gard et al. 2007, Chan et al. 2010), the Anticipatory and Consummatory Interpersonal Pleasure Scale (Gooding and Pflum 2014), the Chapman Physical Anhedonia Scale (CPAS), the Chapman Social Anhedonia Scale (CSAS; (Chapman et al. 1976)) and the Snaith-Hamilton Pleasure Scale (SHAPS; (Snaith et al. 1995)). Of these, Turkish reliability and validity studies were published for the Chapman Physical Anhedonia Scale (Baskak et al. 2009), the Chapman Social Anhedonia Scale (Cihan et al. 2015) and the Snaith-Hamilton Pleasure Scale (Kesebir et al. 2015) and Turkish validity and reliability of the Temporal Experience of Pleasure Scale is currently an ongoing project by the writer of this article.

In addition, the ability to experience pleasure driven by taste or smell is called chemosensory hedonic capacities (Li et al. 2020). It is thought that olfaction compared to any other sensory stimuli, might be more sensitive in the evaluation of anhedonia (Li et al. 2020). Therefore, another important symptom of neuropsychiatric disorders can be thought of as olfactory anhedonia. It is known that there is a significant overlap in the brain regions like the orbitofrontal cortex (OFC), amygdala, and hippocampus concerning emotional processing and olfaction (Kamath et al. 2013). Many of the researchers have reported that olfactory anhedonia is present in depression (McCabe 2014), Parkinson's disease (Mrochen et al. 2016), anorexia nervosa (Jiang et al. 2010), and schizophrenia, in a way that both hedonic odor processing and odor identification are shown to be impaired (Moberg et al. 2014). In addition, in patients with schizophrenia, it was reported that increased negative symptoms are associated with increased olfactory anhedonia (Kamath et al. 2013).

Just like olfactory anhedonia, taste anhedonia can also be thought of as being one of the crucial features of neuropsychiatric disorders. In depression, researches showed that patients might have higher sweet taste perception (Berlin et al. 1998), lessened appetites, less desire to eat, and decreased pleasure toward food (Kazes et al. 1993). Moreover, in alcohol dependence and anorexia nervosa, abnormal hedonic taste capacities are also reported (Krahn et al. 2006). These above-mentioned scales measure several aspects of anhedonia; however, none of them evaluates chemosensory pleasure. Because these capacities may be important in understanding the nature of neuropsychiatric disorders, an assessment tool for the chemosensory pleasure scale is essential. Moreover, previous findings also proposed that patients with schizophrenia showed impairments in anticipatory pleasure but not in consummatory pleasure (Gard et al. 2007, Yan et al. 2019). However, it is unknown whether patients show the same pattern in chemosensory hedonic experience or not. And this is another critical reason to develop a valid self-

report scale which helps to reveal both anticipatory and consummatory pleasure aspects in order to understand taste and smell hedonic responses.

All these findings suggested that olfactory anhedonia may be a significant indicator of neuropsychiatric disorders, and there were no practical tools for evaluating chemosensory pleasure. Therefore in 2019, the Chemosensory Pleasure Scale (CPS) was developed in order to evaluate taste and smell hedonic pleasure in order to understand various disorders (Zhao et al. 2019). Considering CPS is a new, practical assessment tool, we have aimed to study the psychometric properties of the Chemosensory Pleasure Scale to be used in the Turkish population. CPS is an instrument that was developed to determine the hedonic pleasure in taste and smell. The aim of the study was to translate CPS into Turkish and study the reliability and validity of the scale. The permission has been obtained from the developer of the scale.

Method

Sample

The inclusion criteria in the study included being between the ages of 18-55, being at least a primary school graduate, and having the mental capacity to fulfill the research instructions. Exclusion criteria from the study were any medical conditions that affect cognitive functions. For this reason, the participants were asked whether they had any diagnosed psychiatric disorders or not. If they had anxiety disorders, major depressive disorder, schizophrenia, bipolar disorder diagnosis, we excluded these participants. The data was obtained through an online survey between July 2020 to February 2021. 247 participants were included into study however 3 participants were excluded because they indicated that they had generalized anxiety disorders, unipolar depression and anorexia nervosa diagnosis

Measures

Sociodemographic Form (SF)

The form was developed by the researchers in order to evaluate sociodemographic characteristics of participants such as age, gender, marital status, and educational status, as well as the questions about the patterns of alcohol, nicotine, and substance use.

Chemosensory Pleasure Scale (CPS)

The scale was developed by Zhao et al., and the aim is to assess the hedonic capacity for smell and taste pleasure (Zhao et al. 2019). The Chemosensory Pleasure Scale (CPS) is a self-report scale that evaluates the enjoyment that an individual receives from stimulation of smell and taste. It includes 3 factors and consists of 12 items: with the dimensions of "consummatory", "anticipatory," and "purely olfactory," reflecting the hedonic eating, anticipating food, and smelling natural scents, respectively. Participants are expected to evaluate the pleasantness of their hedonic experience of smell and taste on a 6-point Likert scale (1 "very false for me" and 6 "very true for me"). A lower score in Chemosensory Pleasure Scale Turkish version (CPS-TR) indicates that the chemosensory anhedonia is severe. The Cronbach's alpha coefficient was 0.93 and test-retest reliability of CPS was 0.73. First factor "food" included 5 items and accounted for 46.979% of the variance. 4 items were loaded onto the second factor "imagination" with

a 14.968% of the variance and factor 3 "nature" had 3 items which accounted for 10.634% of the variance.

Physical Anhedonia Scale (PAS)

Physical Anhedonia Scale was developed by Chapman et al. in 1976 (Chapman et al. 1976). Physical anhedonia includes physical experiences such as food, touch, sexuality, warmth, movement, smell, and sound. Baskak et al. reported in 2009 that 50 out of 61 items are valid and reliable in the Turkish population (Baskak et al. 2009).

Social Anhedonia Scale (SAS)

The scale was first created by Chapman et al. in the form of a 48-item self-report scale to measure social satisfaction and social anxiety (Chapman et al. 1976). Mislove and Chapman reported the psychometric properties of the 40-item final version. Its Turkish validity and reliability study was conducted in 2015 by Cihan et al (Cihan et al. 2015).

Translation process

Before starting the study, the developer of the scale was contacted by the team via email, and permission for translation was obtained. The translation process was independently carried out by two independent psychologists with an advanced degree in English. After this procedure, researchers agreed on the best version of the translation; items thought to best express each item have been determined and it was compared to the original form by the same team. The back-translation was applied by another researcher who is also advanced in English. and The back-translated questionnaire was sent to the developer of the instrument, and feedback was obtained for the accuracy and clarity of the translation.

After these phases, a 12-item Turkish form was obtained. Izmir Democracy University Social Sciences and Humanities Research and Publication Ethics Committee (7.7.2020 date with the number of 2020/09-06) has approved the study prior to the start of the study. For evaluating the applicability and comprehensibility of items of CPS-TR, 58 participants (above 18 years, 53 females, 5 males) were administered a pilot study online. After feedback of participants, most understandable and appropriate sentences for each item were used in the Turkish form of original scale in this study. The last version of CPS-TR was applied to participants. The rules of the Declaration of Helsinki were complied with during the data collection process. The final form of the questionnaire was applied to the participants with a consent form, Sociodemographic Form (SF), Chemosensory Pleasure Scale Turkish version (CPS-TR), Physical Anhedonia Scale (PAS), and Social Anhedonia Scale (SAS). In the exploratory factor analysis, it was known that at least 5-10 participants per item were required. Therefore a total of 247 participants were enrolled in the study (Sencan 2005).

Statistical analysis

Cronchach alpha internal consistency coefficient, item-total score correlation coefficients, and Spearman-Brown split-half test were calculated for reliability analysis. Exploratory factor analysis was performed to estimate the construct validity of the scale. Items with a factor load over 0.4 were included in the evaluation. The convergent validity of CPS-TR was assessed by conducting a Pearson correlation. Statistical

analyzes were made with SPSS Statistics 20.0. The level of significance was set at $p < 0.05$.

Results

Among the participants, 59 (23.9%) were male, and 187(75.7%) were female, and 1 was (0.4%) queer with a mean age of 32.62±11.27. The sociodemographic characteristics of the participants were summarized in Table 1.

Table 1. Sociodemographic characteristic of participants

Variables	Mean±SD	
Age	32.62±11.27	
Total Year of Education	17.17±3.48	
Gender	N (%)	
Female	187(75.7%)	
Male	59 (23.9%)	
Queer	1 (0.4%)	
Education		
University	229 (92.7%)	
Highschool	17 (6.9%)	
Elementary School	1 (0.4%)	
	Yes (%)	No (%)
Smoking	70.9%	29.1%
Alcohol	70.9%	29.1%
Other Substance use(drugs etc.)	4.9%	95.1%

Table 2. CPS-TR item total correlation and Cronbach's alpha

Items	Corrected Item-total correlation	Cronbach-α if item deleted
Item1	0.353	0.875
Item2	0.588	0.863
Item 3	0.423	0.872
Item4	0.615	0.861
Item5	0.428	0.873
Item6	0.569	0.866
Item7	0.667	0.858
Item8	0.700	0.855
Item9	0.633	0.860
Item10	0.641	0.861
Item11	0.668	0.857
Item12	0.547	0.868

F1: Imagination: ability to experience pleasure when guessing food (Items: 2,4, 7, 8, 11); F2:Food: ability to experience pleasure while eating food (Items: 6, 9, 10, 12); F3: Nature: ability to experience pleasure when smelling natural scents (Items: 1, 3, 5)..

Reliability analysis

Cronbach alpha was used to calculate internal consistency coefficient of the scale was found as 0.87. Literature indicates Cronbach alpha levels as follows; excellent (0.93–0.94), strong (0.91–0.93), reliable (0.84–0.90), robust (0.81), fairly high (0.76–0.95), high (0.73–0.95), good (0.71–0.91), relatively high (0.70–0.77). Our result showed that cronbach alpha 0.87 reflected high reliability of the scale (Taber 2018). Corrected item-total score correlations and Cronbach's alpha values when the item is deleted are shown

in Table 2. In this study, we did not delete any of the items in the original scale because Cronbach alpha value did not increase. Item total correlation of all items in the scale were bigger than .30. Then, the split-half method was performed. The Spearman-Brown coefficient was found as 0.78 which means reliability of scale is at a good level (Taber 2018).

Table 3. Results of exploratory factor analysis (EFA)

Items	F1	F2	F3	Communalities
1) Yağmur sonrası, çimenle karışmış toprak kokusu beni mutlu eder.			0.817	0.694
2)Televizyonda pişirilen iyi bir yemek gördüğümde neredeyse kokusunu alabilirim	0.760			0.619
3)Yürüyüş için dışarı çıktığımda temiz havayı derince solumanın verdiği histen hoşlanırım.			0.784	0.656
4)Her yemek kokusu aldığımda mutlu hissederim	0.555			0.492
5)Yağmur sonrası parkta temiz havayı soluyabilmeyi dört gözle beklerim.			0.809	0.726
6)Lezzetli yiyecekler beni mutlu eder.		0.854		0.769
7)Bir yiyecek reklamı gördüğümde, o yiyeceğin tadını hayal etmeye başlarım	0.805			0.711
8)Bir restoranda menüyü incelerken yiyeceğin tadını hayal etmeyi severim.	0.826			0.755
9)Lezzetli yiyecekler yemek dört gözle beklenen bir şeydir.		0.791		0.750
10)Yemek yerken iyi hissederim.		0.782		0.729
11)En sevdiğim yiyeceği hayal ettiğimde lezzetini neredeyse tadarım.	0.744			0.652
12)En sevdiğim yemeği yemekten zevk alırım.		0.826		0.718
Variance Explained (%)	26.30	25.11	17.48	68.918
Eigenvalue	5.225	1.749	1.295	
Cronbach alpha	.85	.86	.75	

Validity analysis

To assess whether the scale is appropriate for factor analysis, first we performed Keiser Meyer Olkin and Barlett sphericity test. The Kaiser Meyer Olkin coefficient was calculated, and the sample was found to be suitable for factor analysis. The KMO sample fit coefficient was 0.87, which falls into the range of being good. The correlation between variables was sufficient according to the Barlett sphericity test (χ^2 = 1452.903, df = 66, p< 0.001). Therefore, it was appropriate for factor analysis. After the Varimax rotation technique was applied, items with an eigenvalue greater than 1 and factor loadings greater than 0.40 were evaluated. It is recommended for 200 participants, factor loads should be greater than 0.364 (Field A 2009). In the light of these results, none of the items of scale were excluded. Then, Three factors were obtained as the original scale. These factors were named as 'Imagination', 'Food' and 'Nature'. These 3 factors explained 68.918% of the total variance. Factor 1, Factor 2, and Factor 3 account for 26.300%, 25.106%, 17.482% of variances, respectively. Factor loadings are explained in Table 2. Scree plot is another reliable method which is used to determine the number of factors. Point of inflexion (where the slope is flattened) occured at the fourth factor therefore, three factors were extracted (see Figure 1), (Field 2009). Details of factor analysis were shown in Table 3.

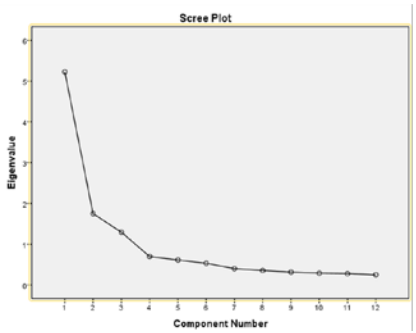

Figure 1. Scree plot

Moreover, the convergent validity of CPS-TR was performed to evaluate how similar CPS-TR to related scales which are PAS and SAS. PAS and SAS assess the level of anhedonia. These two scales were used for determining convergent validity because olfaction and taste might be more sensitive in the evaluation of anhedonia. CPS-TR was moderately correlated with PAS (r = 0.510, p< 0.01). However, CPS-TR showed a weak significant correlation with SAS (r = 0.185, p < 0.01).

Table 4. Correlation between CPS-TR and PAS, SAS

Measures	CPS-TR
PAS	r = 0.510*
SAS	r = 0.185*

PAS: Physical Anhedonia Scale,SAS: Social Anhedonia Scale; All correlations were significant at p<0.01

Discussion

In this study, we evaluated the reliability and validity of the Turkish form of CPS. Internal consistency coefficient was obtained greater than 0.7, that literature suggests it is a good indicator for reliability (Taber 2018). In addition to this, item-total correlation varies between 0.35 and 0.7. The split-half method was 0.78. According to these results, the reliability of the scale is at a good level (Taber 2018).

Exploratory factor analysis was performed to determine the factor structure of CPS-TR, and three factors were obtained. Then, 68.9% of the total variance was explained by three factors. Factor loads were between 0.55 and 0.85. These results indicate construct validity of the scale was achieved (Yong and Pearce 2013). Moreover, we determined the convergent validity of CPS-TR with SAS and PAS. Turkish reliability and validity of SAS and PAS showed that Cronbach's alpha internal consistency of both SAS and PAS were 0.84 and test-retest reliability were 0.76 and 0.60, respectively. Their results indicate SAS and PAS reliable and valid scales. CPS-TR was moderately correlated with PAS; it showed a weak significant correlation with SAS. These results are consistent with the study of the original scale. The previous research showed CPS and PAS were significantly correlated (Zhao et al. 2019). PAS measures physical experiences or pleasure such as eating, sex, or touching.

Similarly, CPS items focus on physical pleasure. SAS assesses socially pleasurable activities. Therefore, CPS was more related to PAS rather than SAS. Overall results show us, CPS-TR is a good tool to evaluate chemosensory pleasure.

The original scale's internal consistency coefficient was 0.932, and factors were loaded between 0.55-0.97. The original scale has excellent reliability, we showed also

CPS-TR is a reliable tool for evaluating chemosensory pleasure with this study. The factor loadings of the original scale were similar to our study. Consistently, we obtained three factors as the original scale did. However, we found that item 4 was loaded on the 'imagination' factor, Zhao's study showed it was on the 'food' factor (Zhao et al. 2019). Item 4 was 'Every time I smell food, I feel happy'. It seemed that 'feeling' came into prominence rather than 'smelling food'. The other items were exactly loaded, similar to the original study. In original form, 'food' factor 47%, 'imagination' factor 15 %, and 'nature' factor 11% of variances explained after performing exploratory factor analysis. Yet, in our study, food and imagination factor explained 26% of the variance and nature factor explained 17% of the variance. The discrepancies could be due to the sample size because the sample of Zhao's study was outnumbered compared to the current study (Zhao et al. 2019).

The CPS-TR is a valid and reliable tool for assessing pleasure in both clinical and non-clinical populations. Previous literature showed that some abnormalities may occur in smell and taste pleasure in the psychiatric patients diagnosed with schizophrenia and depression (Brewer et al 2003, Wicker et al. 2016). Therefore, this scale can be accepted as an indicator of smell and taste anhedonia symptoms in helping to detect possible early symptoms so that patients can get early medical diagnosis and treatment.

One of the limitations of the study was relatively small sample size. On the other hand, there was not a clinical scale to evaluate psychiatric conditions, and the participants were not evaluated by Structured Clinical Interview for DSM-5 or equivalent assessment to exclude psychiatric disorders. Further studies could be performed with mentally healthy people by doing a psychiatric examination. Besides mentally healthy samples, CPS should be performed in other samples, such as mental disorders. Another limitation of the current study is that most of the sample were university students or graduated people. It may lead to sampling error. Likewise, the range of age would be more diverse. In our study, there were more young people than middle age or elderly people. Large samples with various education and age groups may lead to a better understanding of the chemosensory pleasure process.

Conclusion

In conclusion, CPS-TR is a self-report scale, easy to use and helpful to evaluate chemosensory pleasure. This study showed CPS-TR is a valid and reliable measurement. Further studies should investigate the chemosensory hedonic capacity of the psychiatric population. CPS-TR may be a practical tool for the clinical and nonclinical population while measuring anhedonia symptoms or recognizing possible risks. Thus, it could be a helpful measurement for medical therapies. Moreover, symptoms such as anhedonia, loss of smell or taste could be seen in various neurological or psychiatric diseases (i.e., major depressive disorder, schizophrenia, or Parkinson's disease (Kazes et al. 1993, Berlin et al. 1998, Kamath et al. 2013, Moberg et al. 2014, Mrochen et al. 2016) . In the early stages, application of CPS-TR may present a potential risk of disease or evaluating the severity. Thus, it may pave the way for therapy options.

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Addendum. Chemosensory Pleasure Scale Turkish version (CPS-TR)

Please read each item carefully and tick the relevant box according to your preference (√).. When you are not so sure of your answer, you still have to make a choice. Please check the scale when you have finished to make sure you have answered all of them.

Soru	Hiç katılmıyorum	Katılmıyorum	Çok az katılıyorum	Kısmen katılıyorum	Katılıyorum	Tamamen katılıyorum
1.Yağmur sonrası, çimenle karışmış toprak kokusu beni mutlu eder.	1	2	3	4	5	6
2.Televizyonda pişirilen iyi bir yemek gördüğümde neredeyse kokusunu alabilirm.	1	2	3	4	5	6
3. Yürüyüş için dışarı çıktığımda temiz havayı derince solumanın verdiği histen hoşlanırım.	1	2	3	4	5	6
4. Her yemek kokusu aldığımda mutlu hissederim.	1	2	3	4	5	6
5. Yağmur sonrası parkta temiz havayı soluyabilmeyi dört gözle beklerim.	1	2	3	4	5	6
6. Lezzetli yiyecekler beni mutlu eder.	1	2	3	4	5	6
7. Bir yiyecek reklamı gördüğümde, o yiyeceğin tadını hayal etmeye başlarım.	1	2	3	4	5	6
8. Bir restoranda menüyü incelerken yiyeceğin tadını hayal etmeyi severim.	1	2	3	4	5	6
9. Lezzetli yiyecekler yemek dört gözle beklenen bir şeydir.	1	2	3	4	5	6
10. Yemek yerken iyi hissederim.	1	2	3	4	5	6
11. En sevdiğim yiyeceği hayal ettiğimde lezzetini neredeyse tadarım.	1	2	3	4	5	6
12. En sevdiğim yemeği yemekten zevk alırım.	1	2	3	4	5	6

Scoring

Food: the ability to experience pleasure while eating (Items 4, 6, 9, 10, 12);
Imagination: the ability to experience pleasure while guessing food (Items 2, 7, 8, 11);
Nature: The ability to experience pleasure while smelling natural scents (Items 1, 3, 5)