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Effects of anxiety sensitivity on nicotine dependence and smoking cessation success

Anksiyete Sensitivitesinin Nikotin Bağımlılığı ve Sigara Bırakma Başarısına Etkileri

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ABSTRACT

Aim: In this study, we aimed to investigate the relationship between the anxiety sensitivity levels and nicotine dependence and smoking cessation outcomes in patients referred to the Smoking Cessation Policlinics.
Methods: This retrospective study included 286 patients referred to a smoking cessation policlinic between January 2017 and July 2017. Socio-demographic characteristics, Fagerström Test for Nicotine Dependence (FTDN) scores, depression scores measured by the Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI) and Anxiety Sensitivity Index-3 (ASI) scale scores were retrospectively retrieved from patient medical files. All patients were contacted and the instant smoking status of the patients was recorded.
Results: Of the participants, 19.5% (n=56) (including those who did not come to follow-up) had quit smoking and were abstinent at least six months after the quitting date. The mean scores of anxiety sensitivity were significantly higher in moderate/high nicotine dependent patients than in mild nicotine dependent patients (p=0.001 and p<0.001, respectively). The mean scores of anxiety sensitivity and all its subscales were significantly higher in current smokers than ex-smokers (p<0.001 for each).
Conclusion: It has been determined that anxiety sensitivity may be a severe barrier to smoking cessation success. Therewithal, anxiety sensitivity is significantly associated with high nicotine dependence. It is essential to evaluate the anxiety sensitivity, anxiety, and depression levels from the first days of patients who are planning to stop smoking. High anxiety sensitivity smokers should be carefully monitored, and treatments should be applied to reduce their anxiety sensitivities to increase quit rates.

Keywords: anxiety, anxiety sensitivity, smoking cessation, nicotine dependence, depression

ÖZ

Amaç: Bu çalışmada, Sigara Bırakma Polikliniğine başvuran hastalarda anksiyete duyarlılık düzeyleri ile nikotin bağımlılığı ile sigara bırakma sonuçları arasındaki ilişkiyi araştırmayı amaçladık.
Yöntem: Bu retrospektif çalışma Ocak 2017-Temmuz 2017 tarihleri arasında sigara bırakma polikliniğine başvuran 286 hastayı içermektedir. Sosyo-demografik özellikler, sigara içme durumu, Nikotin Bağımlılığı için Fagerström Testi (FTDN) skorları, Beck Depresyon Envanteri (BDI) ile ölçülen depresyon skorları ve Beck Anksiyete Envanteri (BAI) ve Anksiyete Duyarlılığı İndeksi-3 (ASI) ölçeklerinin skorları hasta tıbbi dosyalarından geriye dönük olarak alındı. Tüm hastalar ile irtibata geçildi ve hastaların anlık sigara içme durumu kaydedildi.
Bulgular: Katılımcıların % 19,5'i (n = 56) (izlemeye gelmeyenler dahil) sigarayı bırakmış ve sigarayı bırakma tarihinden en az altı ay sonra hala içmemektedirler. Ortalama anksiyete duyarlılığı skorları orta / yüksek nikotin bağımlı hastalarda hafif nikotin bağımlı hastalardan anlamlı derecede yüksekti (sırasıyla p = 0.001 ve p <0.001). Anksiyete duyarlılığı ve tüm alt ölçeklerinin ortalama puanları, mevcut sigara içicilerin sigara içenlere göre anlamlı derecede yüksekti (her biri için p <0.001).
Sonuç: Anksiyete duyarlılığının sigara bırakma başarısında ciddi bir engel olabileceği belirlenmiştir. Bununla birlikte, kaygı duyarlılığı, yüksek nikotin bağımlılığı ile anlamlı şekilde ilişkilidir. Sigarayı bırakmayı planlayan hastaların ilk günlerinden kaygı duyarlılığı, kaygı ve depresyon düzeylerini değerlendirmek önemlidir. Yüksek kaygı duyarlılığına sahip sigara içicileri dikkatle izlenmeli ve bırakma oranlarını artırmak için kaygı hassasiyetlerini azaltmak için tedaviler uygulanmalıdır.

Anahtar Sözcükler: anksiyete, anksiyete duyarlılığı, sigara bırakma, nikotin bağımlılığı, depresyon

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INTRODUCTION

Anxiety sensitivity (AS) has been described as an extreme fear against anxiety-related sensations and statements, that are believed to have harmful physiological and social consequences [1]. Although the recent studies on anxiety sensitivity are aimed at associating the relationship between anxiety and mental disorders, there is a growing consensus that it plays a role in the problems of substance abuse [1,2]. An important one of these substances is cigarettes, which are widely used in society.

It has been shown in smokers that negative mood and mood disorders increase the chance of failure in smoking cessation [2]. For this reason, a better understanding of depressive and anxiety symptoms will benefit clinicians in terms of their clinical goals of improving smoking cessation outcomes. Understanding depressive and anxiety symptoms means identifying the current transdiagnostic factors rather than to focus on symptoms [2,3]. Anxiety symptoms (AS) is precisely such a transdiagnostic factor, that plays a crucial role in the development of these symptoms and increases the risk of developing a disease from the same symptoms. Sensitivity to anxious situations, in other words AS, has been recognized as an individual difference [1,4].

According to the growing scientific research, reducing the adverse effects of high AS is one of the most important reasons for smoking. Smoking is subjectively reducing the anxiety in high anxiety sensitivity smokers when compared with low anxiety sensitivity smokers. In addition, relative to those with lower anxiety sensitivity, smokers with high anxiety sensitivity, report perceiving the prospect of quitting as more difficult and experience more intense nicotine withdrawal during early phases of quitting. Furthermore, anxiety sensitivity explains the relationship between emotional disorders and nicotine dependence, barriers to cessation, and severity of symptoms while quitting [5]. Importantly, anxiety sensitivity is associated with an increased rate of smoking lapse (any smoking behavior) during the early phases of quitting in terms of smoking cessation. Furthermore, these observed anxiety sensitivity and smoking relations are not better explained by the amount of smoking, nicotine dependence, sex, other concurrent substance use (such as alcohol and cannabis), panic attack history, or trait-like negative mood propensity [4].

It will be an innovative approach to conduct these studies in our country and in the smoking cessation outpatient clinics in order to guide physicians when applying smoking cessation therapies, to facilitate treatment, and to determine the sensitivity of the patient's follow-up order to determine the relationship between smoking and cessation. In this study, we aimed to investigate the relationship between the beginning anxiety sensitivity levels and nicotine dependence of patients and smoking cessation outcomes in patients referred to the Smoking Cessation Policlinics.

MATERIALS AND METHODS

This retrospective descriptive study was carried out on patients who were referred to the Düzce University, Department of Family Medicine, Smoking Cessation Policlinic between January and July 2017. 472 patients applied to the Smoking Cessation Polyclinics during that period. At the Smoking Cessation Policlinic, if a patient has a psychiatric illness or psychiatric treatment, we routinely referred this patient to psychiatry. Therefore in this study, patients who were found to be in this situation (32 patients) were excluded from the study. 440 patients were identified and attempts were made to reach them on their registered phones. Of these, some 402 patients were in fact reached and the smoking cessation status of the 286 patients who agreed to participate in the study, were determined by telephone. Patients who had not smoked for at least six months were considered to have quit smoking. The recorded sociodemographic characteristics included age, sex, educational status, occupation, marital status, the age of first smoking experience and smoking initiation, as well as smoking cessation information. The treatments given to the patients were not included in the study. Socio-demographic characteristics, the Fagerström Test for Nicotine Dependence (FTDN) scores, the depression scores measured by the Beck Depression Inventory (BDI), the Beck Anxiety Inventory (BAI) and the Anxiety Sensitivity Index-3 (ASI) scale scores were retrospectively

retrieved from patient medical files. The continuity of smoking cessation status was queried and noted by reaching the patients 6 months after their application to the Smoking Cessation Policlinic.

Ethical approval: All procedures performed in studies involving human participants were done so in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments, or comparable ethical standards. The study was approved by the local ethics committee at Düzce University Medical Faculty (IRB number: 2017-125, date: 09.10.2017). Informed consent was obtained from all individual participants included in the study.

Study Instruments

The Anxiety Sensitivity Index-3 (ASI-3)

The anxiety sensitivity index was first developed in 1986 by Reiss et al., who also defined “anxiety sensitivity” [4]. This index is a 16-items measure, which utilizes a 5-point Likert-type scale. The instrument is used to assess the degree to which participants are concerned about the possible negative consequences of anxiety symptoms. A score ranging from 0 to 4 can be taken from each item. The scale is subjected to discrete physical, cognitive, and social calculations. Taylor and colleagues reviewed the scale in 2007 and the final state of this scale was named as “Anxiety Sensitivity Index-3”, consisting of 18 items, having three subscales and a score ranging from 0 to 72. The validity and reliability study in Turkish was carried out in 2008 [6].

Fagerström Test for Nicotine Dependence (FTND)

FTND, also known as "Fagerström Tolerance Test", is the most common test designed to assess grading tobacco dependence. FTND consists of six questions. It was developed by Fagerström in 1991 then, reassessed and modified by Heatherton and Kozlowski [7]. The reliability and validity study of FTND was conducted in Turkey and found to be applicable in Smoking Cessation Clinics. Responses to the questionnaire are classified as low (FTCD score ≤3), medium (4–6) and high (≥7).

Beck Depression Inventory (BDI)

The BDI consists of 21 self-rated questions, each answer being scored on a scale of 0–3 giving a score ranging from 0 to 63. The scores are interpreted as; 1–10 points - no depression, 11–16 points - mild mood disturbance, 17–20 points - borderline clinical depression, 21–30 points - moderate depression, 31–40 points - severe depression, and over 40 points - extreme depression. BDI was designed by Beck in 1961 to measure the risk of depression, the severity of depression, depressive symptoms, and depression levels in adults [8]. A study performed by Aktürk et al. stated that a short version of this scale could be used for depression screening in family practice [9].

Beck Anxiety Inventory (BAI)

The BAI scale was developed by Beck et al. in 1988 in response to the need for a scale that was able to distinguish anxiety from depression. It is designed to measure experienced severity of anxiety symptoms. The Beck Anxiety Inventory consists of 21 items and is scored from 0 to 3, based on a Likert scale. The validity and reliability study for a Turkish version of this inventory was performed by Ulusoy al. [10] in 1998. Scores are considered to indicate the following: 0–7, minimal anxiety; 8–15, mild anxiety; 16–25, moderate anxiety; and 26–63, severe anxiety.

Statistical Analysis

The following tests were used for the statistical analyzes of our study: the distribution of continuous variables was examined by the Shapiro-Wilk test, the independent Samples t-test - or Mann-Whitney U test - was used to compare two independent groups, and the One-Way ANOVA or Kruskal-Wallis tests were used to compare more than two independent groups. The Pearson Chi-Square or Fisher's exact tests were used to analyze categorical data. The Pearson or Spearman correlation analysis was used, depending on the distribution of variables, in examining correlations between continuous variables. Statistical analyzes were performed with the Statistical Packages for the Social Sciences (SPSS) v.22 and the level of significance was set at 0.05.

RESULTS

The sample included 194 (67.8%) male and 92 (32.2%) female participants. Fifty-six (19.5%) of all participants reported that they had quit smoking while 230 (80.4%) were current smokers. The mean age of ex-smokers was 38.07 ± 14.75 years, while the mean age of current smokers was 39.40 ± 13.09 years. There was no statistically significant difference between the mean ages of ex and current smokers (t=-0.666; p=0.506). 19.5% (n=38) of the male participants and 19.5% (n=18) of females ad quit smoking; smoking cessation rates were not statistically different between the two genders (Chi-Square=0.000; p=0.996). Additionally, 69.6% (n=39) of the quitters were married while 73% (n=168) of current smokers were married and the smoking cessation rate-increase in married participants was statistically insignificant (Chi-Square=0.260; p=0.610).

Although none of the farmers had quit smoking, 14.5% (n=8) of the unemployed participants, 27% (n=19) of the workers, 20% (n=8) of the civil servants, 29% (n=9) of the retirees, 11.1% (n=2) of the self-employed, 25.8% (n=8) of the students, and 18.2% of the private sector employees (n=2) had quit. The difference between occupations concerning smoking cessation rates was not statistically significant (Chi-Square=6.260; p=0.510). The median smoking rate of quitters was 15 (1-76) pack/year, while this rate for the current smokers was 18 (1-179) packet/year; this difference was not statistically significant (Z=-1.535; p=0.125). The mean age of the first smoking experience of the quitters was 14.79±3.66 years, whereas this figure was 14.78±4.99 years for the current smokers. There was no statistical difference in terms of age of the first smoking experience (t=0.011; p=0.992). The mean age of the quitters to start smoking was calculated as 17.02±3.96 years, while the same for current smokers was 16.75±4.91 years and there was no statistical difference in terms of smoking initiation ages (t=0.376; p=0.707).

The median values of total depression scores were significantly lower in ex-smokers than current smokers (Z=-2.763; p=0.006). The median values of total anxiety scores were significantly lower in ex-smokers compared to current smokers (Z=-5.033; p<0.001). The median values of total, physical, social, and cognitive ASI-3 scores were also significantly lower in quitters than current smokers (Z and p -6.830, <0.001; -6.225, <0.001; -6.463, <0.001; and -5.983, <0.001, respectively) (Table 1). Additionally, smoking cessation rates were higher in participants who had mild FTND scores than those with high or moderate FTND scores (Table 2).

Table 1. Factors affecting successful smoking cessation

	Ex-smokers (n=56) Median (range)	Current smokers (n=230) Median (range)	p
Beck depression score	10 (0-43)	15 (0-55)	0.006
Total ASI-3 score	13 (0-47)	30 (1-72)	<0.001
Physical ASI-3 score	8 (0-24)	15 (0-28)	<0.001
Social ASI-3 score	3 (0-16)	8 (0-28)	<0.001
Cognitive ASI-3 score	4 (0-16)	8 (0-24)	<0.001
Beck anxiety score	12 (0-32)	25 (0-52)	<0.001

Table 2. The relation of FTND scores to smoking cessation

	Smoking Status			
	Ex-smoker		Current smoker	
FTND score	n	%	n	%
Low (<4)	22	38.6	35	61.4
Medium (4-6)	15	12.2	108	87.8
High (>6)	19	38.6	87	82.1

Chi-Square=17.535, p<0.001

Nicotine dependence levels were highly related to the Beck Depression scores and the Beck Anxiety scores between smoking group and ex-smokers (p=0.002 and p<0.001, respectively) (Table 3).

The relationship between nicotine dependence levels and ADI-3 total, physical, cognitive, and social scores between smoking group and ex-smokers was also statistically significant (p=0.001, p<0.001, p= 0,02, p=0,007 respectively) (Table 3).

Anxiety had a weak correlation with social anxiety sensitivity whereas it had a moderate correlation with physical and cognitive anxiety sensitivity. Depression and anxiety levels were significantly correlated with nicotine dependence (Table 4).

DISCUSSION

In this study, smoking cessation rate was determined to be19.5%, based on the patients

Table 3. The relationship between FTND groups, ası-3 Scores and Beck Depression Inventory scores, and Beck Anxiety Inventory scores

	Mild (≤3) (n=57) Median (range)		Moderate (4-6) (n=123) Median (range)		High (≥7) (n=106) Median (range)		Kruskal-Wallis Z, p
	Ex-smoker (n=22)	Current smoker (n=35)	Ex-smoker (n=15)	Current smoker (n=108)	Ex-smoker (n=19)	Current smoker (n=87)	
Total ASI-3 score	17 (2-45)	25 (2-52)	29 (0-65)	30 (2-72)	26 (0-49)	28 (2-59)	14.254, 0.001
Physical ASI-3 score	7 (0-19)	12 (0-21)	11 (0-24)	16 (0-28)	13 (0-24)	16 (0-26)	15.964,<0.001
Social ASI-3 score	5 (0-20)	7 (0-21)	8 (0-25)	9 (0-28)	6 (0-20)	8 (0-21)	7.798,0.020
Cognitive ASI-3 score	5 (0-18)	8 (0-19)	6 (0-22)	10 (0-24)	6 (0-19)	8 (0-21)	9.890, 0.007
Beck Depression Inventory scores	8 (1-30)	12 (1-35)	10 (0-44)	15 (1-51)	17 (0-55)	21 (1-55)	12.481, 0.002
Beck Anxiety Inventory scores	10 (0-40)	15(1-43)	18 (0-47)	25 (1-55)	19 (1-48)	25(1-52)	15.889,<0.001

Table 4. Correlations of ASI-3 data

		FTND	Beck Depression Inventory	Beck Anxiety Inventory	Physical ASI-3	Cognitive ASI-3	Social ASI-3	Total ASI-3
FTND	r		0.234	0.204	0.115	0.081	0.045	0.104
	p		<0.001	0.001	0.053	0.174	0.450	0.080
Beck Depression Inventory	r	0.234		0.291	0.223	0.262	0.250	0.269
	p	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001
Beck Anxiety Inventory	r	0.204	0.291		0.636	0.552	0.385	0.615
		0.001	<0.001		<0.001	<0.001	<0.001	<0.001

who quit smoking and remained abstinent for six months. Many different ratios, ranging from 29.1% to 45.5%, were reported from other smoking cessation clinics in Turkey [10,11]. Therewithal, another study [18] found a smoking cessation rate of 44.2% for the first year and 48% for the first six months. The reason of these high rates may be related with the calculation methods, as some of the calculations were done based on the patients who continued to follow-up instead of including all patients referred to the clinic. Certainly, the frequency of motivational interviews and patient follow-ups through phone calls may also have contributed to the quit rates. A study performed in Ankara Ataturk Training and Research Hospital, which investigated the reasons of smoking continuation demonstrated a cessation rate of 10.9% [12]. A wide range of smoking cessation rates can be seen when we look at the previous studies in general; more clear and standardized smoking cessation rates should be established by conducting joint and more comprehensive studies using standard measures.

Smoking cessation rates were lower in patients who had moderate and high depression. Some studies surveying the reasons of keeping smoking in patients who had depressive symptoms or high levels of depression, revealed that although smokers with generally high levels of depressive symptoms had some smoking cessation motivation or self-efficacy, they were more motivated to keep smoking [13]. Numerous psychiatric studies are available in the literature pointing to the effects of depression as a barrier to smoking cessation [14,15]. Depression and anxiety sensitivity were positively correlated in our study.

Nicotine dependence correlated positively with anxiety levels. Anxiety and nicotine dependence are paradoxical occurrences that can trigger each other in adolescence [16]. There are two basic hypotheses explaining nicotine dependence and increased risk of some anxiety disorders in early adolescence and early adulthood. The first hypothesis claims that a person becomes dependent on actions involving tobacco use due to its facilitation in coping with anxiety, its sedative effects, its social interaction, and peer pressure in anxious individuals. The other hypothesis says

that smoking (on account of nicotine dependence) increases the incidence, symptoms, and risk of anxiety disorders [17]. A group of researchers pointed out that smoking could lead to anxiety disorders, but anxiety disorders do not increase smoking risk [17]. Our study does not shed light on this topic because it is based on the results, not the reasons. To further elucidate this issue, a wide range of studies targeting young people are needed. However, based on anecdotal reports of smokers and empirical work consistent with these reports, it is possible to emphasize that tobacco and nicotine may have anxiolytic effects.

Anxiety and depression levels were positively correlated with anxiety sensitivity. As nicotine dependence increased, anxiety sensitivity scores increased too. A prospective study on 119 patients indicated that increased anxiety and AS caused an increase in nicotine withdrawal symptoms during the first week of cessation. The same study also claimed that smoking cessation levels had decreased for the first month following an increase in the AS levels [18]. The barriers to motivation of smoking cessation were studied and the possible barriers were defined as panic attack history, daily smoking amount, and high levels of AS. Johnson and his colleagues conducted a study with 123 participants and had two outcomes. One was the significant relationship between AS and anxiety. The other was the association between the increased nicotine withdrawal symptoms and increased anxiety and AS [19]. The intensity of nicotine withdrawal symptoms and the barriers to quit smoking in the early phase of smoking cessation programs bring the following question: "Can we increase the smoking cessation success if we reduce the anxiety sensitivity?" A study reported that smoking cessation group therapy was applied to six participants who were admitted to the AS reduction program and it was reported that reducing AS significantly improved smoking cessation [20]. Similarly, another study conducted among the individuals who managed to quit smoking reported that reduction of AS and use of nicotine replacement therapy caused rapid retraction of nicotine withdrawal symptoms after smoking cessation [21]. A scientific study targeting AS, anxiety, and smoking cessation and including patients who were assessed empirically for six months proved that AS decreased with the treatment of anxiety; this decline was maintained for six months and there was limited evidence that this increased the motivation to quit smoking [20,21].

Our results pointed out that there is a relationship between AS, nicotine dependence and smoking cessation. Additionally, we can state that anxiety sensitivity can be a significant factor in the effort to quit smoking. Based on the current evidence, we can conclude that AS and smoking increase anxiety disorders, depression, and nicotine dependence.

Smoking can assume important regulatory functions in individuals with high levels of anxiety sensitivity. These individuals are particularly smoking to help reduce their anxiety. High anxiety-sensitive smokers can learn to apply smoking to manage their feelings in the short term, when strategies to tackle their problems become inadequate. However, being a smoker may gradually increase nicotine withdrawal symptoms, health impairment, and loss of balance in internal dynamics for various reasons [22,23]. These dissuasive elements also teach the person their concern about being harmed. This concern may provide motivation for smoking cessation in high anxiety-sensitive smokers; however, these people feel the nicotine withdrawal symptoms more intensely as well as increasing depressive and anxious symptoms and therefore, may have a higher risk of not being able to stop smoking. In addition, believing in dissuasive elements of smoking cessation and continuing to smoke in the short term can, paradoxically, create a risk for anxiety disorders in the long term.

Limitations of the Study: Several limitations of the present investigation should be considered. First, it was not possible to obtain data for depression and anxiety diagnoses; evaluations were done with the Beck Depression Inventory and Beck Anxiety Inventory scales. Second, we did not measure the level of nicotine withdrawal or the intensity of withdrawal symptoms after smoking cessation. Third, it may be more effective to examine the withdrawal symptoms throughout the duration of the cessation attempt: smoking cessation outcomes (lapse and relapse) were ignored in the present study. Fourth, since our

work was limited to patients who applied to our clinic, it is not possible to extend our results to the general population. The relationship between anxiety sensitivity and smoking cessation can be further clarified by applying an algorithm that investigates the causes of barriers and motivation losses of patients. And, of course, we could not evaluate the effects of anxiety and depression on smoking cessation, since we did not measure and compare the anxiety and depression scores.

As a result, the relationships between tobacco use, nicotine dependence, anxiety sensitivity, anxiety disorders and depression are complex and unclear. An interdisciplinary approach is needed to assist patients at risk. The results of our study show that anxiety sensitivity is effective in smoking cessation behavior and sheds light on other reasons that may prevent smoking cessation. In light of our results, new approaches to increase the success of smoking cessation can be established with follow-up and treatment studies taking into account the anxiety sensitivity of individuals, in smoking cessation polyclinics and addictive polyclinics.

CONCLUSION

Our results showed that anxiety sensitivity, especially physical and cognitive anxiety sensitivity, made smoking cessation particularly difficult. Anxiety sensitivity was significantly higher in those with high nicotine dependence. An increase in nicotine dependence reduced the success of smoking cessation. This issue made us consider that success in smoking cessation depends mainly on the anxiety sensitivity and its effects on nicotine dependence.

Consistent with our hypothesis, AS was also closely associated with anxiety and depression. The results of our study showed that an increase in anxiety and depression levels significantly reduce smoking cessation success. Additionally, we can say that AS may also prevent smoking cessation through these pathways when taking the undeniable negative effects of anxiety and depression on smoking cessation success into account.

The associations between tobacco smoking, nicotine dependence, anxiety sensitivity, anxiety disorders, and depression are complex and unclear. An interdisciplinary approach is needed to help patients under these risks. At this point, further and more detailed studies are needed to explore the mutual relationship of etiologic factors. Although the effect of smoking on objective mood is complex, these processes can be conceptualized using cognitive analysis. The results of our study indicate that high anxiety sensitivity may be a barrier to smoking cessation.

In light of these findings, it can be suggested that new approaches should be sought to increase the success of smoking cessation using follow-up and treatment studies considering anxiety sensitivities of the patients.

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