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Effectiveness of Cognitive Behavioral Therapy for Smoking Cessation: A Systematic Review

Sigarayı Bırakma Tedavisinde Bilişsel Davranışçı Terapinin Etkililiği: Sistematik Bir Gözden Geçirme

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Abstract

Smoking has become one of the most prevalent problems worldwide that causes significant illnesses even deaths. To specify, it has been found that people suffer from cancers, heart diseases and strokes due to the use of tobacco. As soon as the investigations about this field progressed, researchers discovered the physiological and psychological dependence behind smoking. By the reason of its hazardous consequences, a variety of treatment options are now available. Cognitive Behavioral Therapy (CBT) is accepted as an effective method in treatment of smoking cessation. In this article, it is aimed to review the studies which investigate the effect of CBT on smoking cessation. For this purpose, MEDLINE, PsycINFO and PsycARTICLE databases has been searched and studies that include CBT intervention are selected based on defined inclusion and exclusion criteria. Specifically, the studies in which the participants are not diagnosed with any psychological or physiological disorder, older than 18 years, and does not use any kind of medication were included to the review. 20 studies fitting the including criteria are assessed in detail. As a result, CBT-based treatments can be accepted as a successful method for smoking cessation, especially when combined with medication and NRT.

Keywords: Smoking cessation, cognitive-behavioral therapy, treatment

Öz

Günümüzde sigara tüketimi neden olduğu ciddi hastalıklar hatta ölümler dolayısıyla dünya çapındaki önemli sorunlardan biridir. Örneklendirmek gerekirse tütün ve tütün kullanımının kanser, kalp ve damar bozuklukları ve felç gibi hastalıklara sebep olduğu bilimsel olarak kanıtlanmıştır. Bu konudaki çalışmaların artmasıyla araştırmacılar sigara tüketiminin altında yatan fizyolojik ve psikolojik bağımlılığı da keşfetmiştir. Sigara tüketiminin tehlikeli sonuçlar doğuruyor oluşu sebebiyle birçok tedavi seçeneği mevcuttur. Bilişsel Davranışçı Terapi (BDT), sigarayı bırakma tedavisinde etkinliği kanıtlanmış bir yöntemdir. Bu sistematik gözden geçirme çalışmasında BDT'nin sigara bırakma tedavisinde etkisini inceleyen araştırmaların gözden geçirilmesi amaçlanmıştır. Bu amaçla MEDLINE, PsycArticle and PsycINFO veritabanları taranmış ve belirlenen dahil etme/dışarıda bırakma kriterlerine göre değerlendirme sırasında fiziksel veya psikiyatrik herhangi bir tanısı olmayan ve ilaç kullanmayan 18 yaşından büyük katılımcıların bulunduğu çalışmalar gözden geçirmeye dahil edilmiştir. Kiterleri karşılayan 20 çalışma detaylı olarak değerlendirilmiştir. Sonuç olarak BDT temelli müdahalelerin özellikle de ilaç ve nikotin replasman tedavisi ile birleştirildiğinde sigara bırakma tedavisinde başarılı bir seçenek olduğu görülmektedir.

Anahtar sözcükler: Sigarayı bırakma, bilişsel-davranışçı terapi, tedavi

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SMOKING has become a worldwide problem with serious consequences such as morbidity and mortality (Becoña et al. 2013). Specifically, smoking increases the risk for heart diseases, cancer and stroke (American Cancer Society 2007, Lichtenstein & Glasgow 1992). Additionally, statistics have shown that due to smoking, 6 million people die per year (WHO 2014). But in fact, it is the most preventable cause of morbidity and mortality (Centers for Disease Control & Prevention 2008).

Smoking is classified under the tobacco use disorder in DSM-V (2013), and to get the diagnosis at least two of the following impairments should be present within the last 12-months and lead to significant distress or impairment: taking the tobacco in large amounts that is more than intended, persistent desire or unsuccessful efforts to cut down or control the use, spending excessive times with smoking related activities, cravings or strong desires to use tobacco, due to recurrent tobacco use failing at school, work or home, despite having social or interpersonal problems because of it, continuing to use tobacco, decreased social or occupational activities due to tobacco use, recurrent use of tobacco in physically dangerous situations, continued tobacco use despite the knowledge of its consequences, developing tolerance that is increasing the amount of use in order to reach the desired effect, and experiencing withdrawal (American Psychiatric Association 2013).

In fact, due to nicotine in it, smoking is not only a psychological but also a pharmacological addiction that explains why nicotine addiction has the lowest treatment rates among others (O'Brien & McLellan 1996). A chronic course of cigarette dependence and treatment interventions is evident from the fact that only 1 out of 40 people successfully complete smoking cessation (Şengezer 2016). It has been found that nicotine reaches the brain fastest among substances and travels through central and peripheral nervous systems (Fiore et al 2008, Guimaraes et al. 2014). Effects of nicotine and its travel make physiological changes in body, therefore body becomes addicted to it (American Lung Association 1995). Furthermore, as Dziegielewski and Eater (2000) emphasized, smokers may experience withdrawal symptoms and cravings due to physiological component of nicotine addiction. Writers also mention that not every smoker are nicotine dependent, so, intervention should be considered accordingly.

Most common smoking cessation interventions are Nicotine Replacement Therapy (NRT) such as nicotine patches, gums, nasal sprays; medications such as Bupropion, Varenicline; and non-pharmacological interventions (Fiore et al. 2008). However, it should be taken into the consideration that pharmacological interventions come with the risk of side effects such as skin irritation or more seriously seizures (Cahill et al. 2013). Non-pharmacological interventions could be considered as counselling from quit-lines (Stead et al. 2013), intervention through internet or mobile phone applications (Fiore et al. 2008), motivational interviewing (Lindson-Hawley et al. 2015), and/or cognitive behavioral therapies (Fiore et al. 2008).

Cognitive behavioral therapy (CBT) mainly works on the interaction between emotions, thoughts and behaviors that is saying how one feels or thinks has an effect on the way he/she will behave or the other way around (Beck 2011). In general, CBT takes between 10-20 sessions and aims to identify problem, set goals relatedly, collect data for the formulation of the problem, teach coping skills and problems solving strategies, construct adaptive thoughts and beliefs instead of maladaptive ones and prevent relapse (Somers 2007).

CBT has found to be an evidence-based and highly structured intervention for smoking cessation (Hollon & Beck 2004). And there are several studies that have shown how efficient cognitive-behavioral intervention for the people who want to quit smoking (Rüther et al. 2017). As López-Núñez and colleagues (2016a) suggested that a CBT program for smoking cessation could begin with informing smokers about the tobacco, making sure about smokers' willingness to attend the sessions and quit smoking, and informing them about the process including nicotine fading. Followingly, using the techniques such as stimulus control, cognitive restructuring, coping strategies, contingency management, assertiveness training, communication training and relapse prevention are highly suggested (Cavallo et al. 2007). The importance of the cognitive intervention on smoking cessation is considerably high; because unless people change their positive assumptions about smoking they will feel weak, missing and punished without a cigarette and relapse (Şengezer 2016). Similarly, behavioral therapy will be beneficial for people to quit not only with helping them to cope better with the withdrawal symptoms but also with activity scheduling in which decreasing the stress and increasing the relaxation are aimed at (Kılınç 2010, Argüder et al. 2013).

Table1. Methodological characteristics of CBT studies

Study	Population	Treatment Group	CBT Techniques	Randomization	Independent Assessor	Measurement	Drop-out	Results	E.S.
Cinciripini et al. (1994) MEDLINE PsychINFO	34 smokers (19 men, 15 women) At least 1 pack of cigarettes	Group 1 (CBT) (*n*=17) or Group 2 (control) (*n*=17)	Group 1: scheduled smoking, cessation and relapse prevention based on CBT Group 2: self-help control condition receive "I Quit Kit" (Kit includes questionnaires and tips for quitting)	No	No	Pre-post treatment: Baseline, weeks 1-4, 5&9 weeks and 6&12 months Abstinance rates: 24-hour ppa CO level <7 ppm	?	24-hour abstinance at 5&9 weeks and 6&12 months: Group 1 > Group 2	?
Cinciripini et al. (1996) PsychARTICLE	64 smokers from the community (19 men, 45 women) 3-years of smoking history At least 15 cigarettes per day	Behavioral Treatment alone (BT) (*n*=32) or Behavioral Treatment + Nicotine Patch (BTP) (*n*=32)	BT: Cognitive behavioral techniques for smoking cessation and urge to smoke. (a) time and contingency management, (b) stress inoculation, (c) assertion training, (d) techniques to improve sleep,	Yes	No	Pre-post treatment: baseline, 1, 3, 6, and 12 months follow up Smoking abstinance: 24-hour ppa CO <6 ppm	?	Abstinance at 3, 6, 12 months: BTP > BT	

			exercise, and scheduling of positive events.						
Hall et al. (1998) MEDLINE PsychINFO	199 smokers (89 men, 110 women) At least 10 cigarettes per day 65 of participants have MDD history, 50 participants have recurrent episodes	Nortriptyline + CBT (*n*=51) Nortriptyline + Health Education (HE) (*n*=48) Placebo + CBT (*n*=52) Placebo + Health Education (HE) (*n*=48)	HE: Health related information + plan development to quit CBT: based on Hall et al. (1994) and mood management including working with thoughts and activities	Yes	No	Pre-post treatment: Baseline, at weeks 12, 24, 38, and 64. Abstinance rates: CO level of 10 ppm or less Cotinine level of 341 nmol/L or less	47	Abstinance: Nortriptyline> Placebo For MDD history positive participants: CBT > HE	2.3
Pollak et al. (2007) PsychINFO	181 pregnant women in their 13 to 25 weeks of pregnancy At least 100 cigarettes in their lifetime	CBT (*n*=59) or CBT + NRT (*n*=122)	CBT counseling procedure based on: - motivational interviewing, -social cognitive theory and - transtheoretical model of behavior change	Yes	Yes	Pre-post treatment: baseline, 7 weeks post randomization, 38 weeks gestation, and 3 months postpartum Smoking abstinance: 7-day ppa CO level of <10 ppm	31	Abstinance throughout pregnancy measurements but not at postpartum: CBT + NRT > CBT	?
Schmitz et al. (2007) MEDLINE PsychINFO	154 women who are between 30-70 years of age At least 10 cigarettes per day	Placebo + Standard Treatment (ST) (*n*=37) or Placebo + CBT (*n*=39) or Bupropion + ST (*n*=37) or Bupropion + CBT (*n*=41)	CBT based on relapse prevention model of Marlatt & Gordon (1985) 1)smoking triggers are identified 2)functional analysis 3)working on lapses 4)balancing the lifestyle 5)problem solving	Yes	Yes	Pre-post treatment: baseline, target quit day, end of treatment, follow up at 3, 6, 9, and 12 months Smoking abstinance: 7-day ppa CO <10 ppm Cotinine level < 15 ng/ml	69	Abstinance at end of treatment, follow up at 3, 6, 9, and 12 months: Bupropion + CBT > Bupropion + ST	?
Hall et al. (2009) MEDLINE	402 participant who are older than 50 years old (160 women, 242 men)	Standard Treatment (ST) (*n*=100) or Extended	ST: 12-week of group counseling + NRT + Bupropion	Yes	No	Pre-post treatment: Baseline, weeks 12, 24, 52, 64, and 104	59	Abstinance in two-year period: E-CBT>E-NRT and ST	?

	At least 10 cigarettes per day	CBT (*n*=99) or Extended Combined , E-NRT+E-CBT (*n*=104) or Extended NRT -40 weeks of nicotine gum- (*n*=99)	E-CBT: 11 sessions of cognitive behavioral therapy 1)eliciting motivation 2)mood management 3)weight control 4)social support 5)working with dependence and withdrawal			Smoking abstinance: 7-day ppa CO level of 10 ppm or less Anatabine/anabasine levels of 2 mg/ml or less			
Hernandez-Lopez et al. (2009) PsychARTICLE MEDLINE	81 participants from Spain (29 men, 52 women) At least 5-years of smoking history At least 10 cigarettes per day	Acceptance and Commitment Therapy (ACT) (*n*=43) or CBT (*n*=38)	ACT: value of quitting, willingness and acceptance of thoughts, emotions, and sensations related to quitting CBT: preparation to quit, quit, maintanance and relapse prevention	Yes	Yes	Pre-post treatment: baseline, end of treatment, and follow ups at 3, 6, and 12 months. Smoking abstinance: 30-day ppa CO <5 ppm	38	Intent-to-treat analysis of 12 month follow up: ACT > CBT	?
Rovina et al. (2009) MEDLINE	205 smokers (125 men, 80 women) At least 15 cigarettes per day for the past year	Group A: Bupropion + 15 min. brief individual counseling (*n*=94) or Group B: Bupropion + Nonspecific supportive,& motivational group therapy (NSGT)(*n*=35) or Group C: Bupropion + CBGT (*n*=40) or Group D: Only CBGT	CBT procedures to - change thoughts, beliefs and behaviors about quitting and - working on negative affect	Yes	No	Pre-post treatment: baseline, end of therapy, follow up at 3, 6, 9, and 12 months Continous abstinance: CO <10 ppm	21	Abstinance at end of therapy: B > A > C > D At 12 months: C > A > B > D	?

		(*n*=36)							
Hendricks et al. (2010) PsychINFO	199 participants who are older than 50 years of age (117 men, 82 women) At least 10 cigarettes per day	Extended CBT (E-CBT) (*n*=99) or Standard Treatment (ST) (*n*=100)	ST: Bupropion, nicotine gum and counseling E-CBT: further take individual counseling sessions: 1)motivation to quit 2)mood management 3)weight control 4)social support 5)dealing with withdrawal symptoms	Yes	No	Pre-post treatment: Baseline, weeks 12, 24, 52, 64, 104. Smoking abstinance: 7-day ppa CO level of 10 ppm or less Anatabine/anabasine levels of 2 mg/ml or less	20	7 day ppa at week 64: E-CBT > ST Abstinance self-efficacy over week 52: E-CBT > ST	?
Alterman et al. (2011) MEDLINE	240 participants who met diagnosis of Nicotine dependence (DSM-IV-TR) (122 men, 118 women) At least 1 pack of cigarettes per day	Low-intensity treatment (LI) (*n*=80) or Middle-intensity treatment (MI) (*n*=80) or High-intensity treatment (HI) (*n*=80)	LI: 8 weeks of NRT + instructional videotapes + 1 advice&education (A&E) session with a nurse practitioner (NP) MI: additional 3 weeks of A&E sessions HI: in addition to aforementioned treatments 12 weeks of individualized CBT	Yes	No	Pre-post treatment: baseline, at weeks 9, 26 and 52 Smoking abstinance rates: Breath CO lower than 9 ppm Cotinine level < 200 ng/ml	?	High Intensity treatment gave highest smoking abstinance	?
Hall et al. (2011) MEDLINE	406 participants (247 men, 159 women) At least 10 cigarettes per day	ST (*n*=81) or Drug (*n*=81) or Placebo + Drug (*n*=81) or CBT + Drug (*n*=80) or CBT + Placebo (*n*=83)	For the first 12 weeks all participants get NRT + Bupropion + Counseling For extended treatment there are 5 conditions CBT: motivational intervention, -working on dysphoria (mood	Yes	No	Pre-post treatment: Baseline, weeks 12, 24, 52, 64 and 104 Smoking abstinance rates: 7-day ppa CO level of 10 ppm or less Cotinine level of 60 ng/ml or less	68	7-day ppa: At weeks 64 and 104 CBT > others	?

			management), -dealing with dependence and withdrawal, -social support and -weight gain						
Wittchen et al. (2011) MEDLINE	467 smokers (226 men, 241 women) Being current regular smokers	Bupropion (*n*=108) or Nicotine Replacement Therapy (NRT)(*n*=105) or CBT (*n*=175) or Motivational Interviewing (MI) (*n*=81)	MI + CBT: additional four or five counseling sessions + CBT procedure for smoking cessation (quit day preparation, dealing with withdrawal, relapse prevention etc.) + CBT self-help manual + Homework exercises	Yes	No	Pre-post treatment: baseline, at weeks 2, 4, 12 (posttreatment) Smoking abstinance: 7-day ppa (point prevalence abstinance)	65	Abstinance at the end of treatment: BUP > NRT > CBT > MI	?
Park et al. (2014) MEDLINE	30 men with moderate level nicotine dependence based on the Fagerström Test Daily smokers	Virtual Cue Exposure Therapy (CET) (*n*=15) or CBT (*n*=15)	CBT treatment included: 1)education about smoking cessation 2)working with withdrawal symtpoms 3)dealing with high risk situations 4)cognitive reconstruction 5)stress management	No	No	Pre-post treatment: baseline (week 0), end of treatment (week 4), follow up (week 12) Smoking abstinance: Expiratory CO level of at least 6	?	Abstinance at the end of treatment (week 4): 10 participant in CET, 11 participant in CBT At week 12: 7 participant in CET, 8 in CBT	?
Secades-Villa et al. (2014) PsychINFO MEDLINE	92 treatment seeking daily smokers (33 men, 59 women) who met the criteria for nicotine dependence (DSM-IV-TR)	CBT (*n*=39) or CBT + Contingency Management (CM) (*n*=43)	CBT intervention: 1)informing about tobacco 2)behavioral contract 3)self monitoring 4)stimulus control	Yes	No	Pre-post treatment: Baseline, post-treatment, 1-month and 6-month follow-up Treatment retention, point-prevalance	11	Treatment retention: CBT + CM > CBT Abstinance at post-treatment, 1 and 6 month follow-up:	.423

	At least 10 cigarettes per day		5)dealing with withdrawal symptoms 6)physiologic al feedbek 7)training in alternative behaviors 8)social reinforce-ment of abstinance 9)relapse prevention + CM			abstinance and continuous abstinance: 7-day ppa CO <4 ppm Cotinine level < 80 ng/ml		CBT + CM > CBT	
Yalcin et al. (2014) MEDLINE	350 partici-pant (176 men, 174 women) At least 10 cigarettes per day	Control Group (*n*=175) Study Group (*n*=175) i) Behav-ioral Counseling (BC) ii) BC + NRT iii) BC + Bupropion iv) BC + Varenicline	Both study and control groups get the ST (40-min session of workshop) Control group: 150 min of individualized face to face treatment for 6 months Study group: 630 min of group and 100 min of individualized face to face treatment for 6 months (anger management and stress control program): 1)identifying triggers and clues of anger and stress, 2)identificatio n of emotion-al, behavioral and physical, responses to it 3)relaxation techniques, 4)coping strategies, 5)stress manage-ment, 6)cognitive	Yes	No	Pre-post treatment: Pre-test, post-test (after treatment), 3 and 6 months follow up. Smoking abstinance: CO level of 10 ppm or less	22	Study group's Trait Anger Scale and Hopeless Subscale scores decreased, Self-Confident Subscale scores increased No change in Control group's Quit level: Study group> Control group	?

			restructuring, 7)enhancing social communica-tion						
Lee et al. (2015) PsychINFO	277 inner city pregnant women (first trimester) Smoke one puff a cigarette in the 30 days prior to recruitment	Cognitive Behavioral Counseling Group (CBC) (*n*=140) or Best Practice Group (BP) (*n*=137)	CBC: 1)working on cognitive-behavioral barriers of quitting 2)developing individualized quit plan 3)identifying postpartum barriers and triggers and 4)developing coping skills BP: 1)asking about smoking 2)advising to stop smoking 3)assessing motivation to quit 4)assisting with strategies and resources 5)arranging specific follow-up	Yes	No	<u>Pre-post treatment:</u> Baseline, prenatal follow-up, 1 month and 5 month postpartum follow-up <u>Smoking abstinance:</u> 7-day ppa Cotinine levels <10 mg	63	7-day ppa: CBC > BP	.15
Weidberg et al. (2015) MEDLINE	123 treat-ment seeking smokers who met diagnosis of Nicotine dependence (DSM-IV-TR) (51 men, 72 women) At least 10 cigarettes per day	CBT (*n*=47) or CBT + CM (*n*=69): -smoking abstinance is reinforced - progres-sive reductions in cotinine is reinforced	CBT: 6-week 1 hour sessions -information about tobacco -a behavioral contract -self monitoring and graphical representa-tion of cigarette smoking, -nicotine fading, -stimulus control, -strategies for controlling nicotine withdrawal symptoms, physiological feedback consumption,	Yes	No	<u>Pre-post treatment:</u> intake, end of treatment, 6-month follow up <u>Smoking abstinance:</u> Self-report Breath CO level < 4 ppm and Cotinine test < 80 ng/ml	11	End of treatment: CBT + CM > CBT No significant difference at follow up	?

			-training in alternative behaviors, -social reinforce-ment of objectives completion and absti-nence, and -relapse prevention strategies						
López-Núñez et al. (2016a) PsychINFO MEDLINE	92 treatment seeking smokers (33 men, 59 women) At least 10 cigarettes per day	CBT (*n*=49) or CBT + CM (*n*=43)	CBT: -behavioral contracts, -self-monitoring of consumption, -nicotine fading, -strategies for controlling withdrawal symptoms, -physiological feedback consumption, -and relapse prevention strategies. CM: nicotine abstinance was rein-forced with increasing the magnitude of reinforce-ment with a voucher program	Yes	No	<u>Pre-post treatment:</u> baseline, 6-month follow up <u>Smoking abstinance:</u> Self-report Breath CO level < 4 ppm and Cotinine test < 80 ng/ml	10	Continuous abstinance: CBT + CM > CBT 6-month abstinance: CBT + CM > CBT	?
López-Núñez et al. (2016b) PsychINFO	Treatment seeking 154 smokers who met diagnosis of Nicotine dependence (DSM-IV-TR) (59 men, 95 women) At least 10 cigarettes per day	CBT (*n*=48) or CBT + CMA (CM for Abstinance) (*n*=51) or CBT + CMS (CM for Shaping Cessation) (*n*=55)	CBT based on Becoña and Vázquez, (1997), Secades-Villa et al. (2009) studies 1)informing participants about tobacco 2)behavioral contract 3)self-monitoring 4)stimulus control 5)dealing with withdrawal symptoms	Yes	No	<u>Pre-post treatment:</u> Baseline, 6-month follow up <u>Smoking abstinance:</u> 7 day ppa CO level of 4 ppm or less Cotinine level of 80 ng/ml or less	16	In-treatment smoking abstinance: Both CBT+CM procedures > CBT alone	.17

			6)physiological feedback 7)working on alternative behaviors 8)social reinforcement of abstinance 9)relapse prevention						
Sheffer et al. (2017) MEDLINE	Primarily ethnically, racially minority, and socioeconomically disadvantaged 227 daily smokers (164 men, 63 women)	Standard Treatment (StdT) (*n*=113) or Adapted Treatment (AdT) (*n*=114)	AdT: Standard Treatment adapted for lower SES smokers StdT: CBT for tobacco dependence (6-weekly 1hour group sessions) 1)identifying cue-urge-smoking cycle 2)individualized coping strategies for urges and triggers 3)self monitoring 4)goal setting 5)stress management 6)problem solving 7)conflict management 8)tobacco refusal training 9)enhancing social support 10)relapse prevention	Yes	Yes	Pre-post treatment: Baseline, initial abstinance, 3 and 6 months follow up 1) latency to relapse, 2) initial abstinence, and 3) biochemically confirmed 7-day point prevalence abstinence 3 and 6 months after the quit date.	29	AdT decreased days to relapse for lower SES groups compared to StdT In AdT, lower SES groups maintained abstinance more than in StdT group	?

Method

For the literature review, The PsycINFO, PsycARTICLES and MEDLINE databases were searched with the following keywords in the abstracts of articles: 1) smoking cessation and cognitive behavioral therapy, 2) smoking cessation and cognitive behavioral intervention, and 3) smoking cessation and cognitive behavioral treatment. Among the accessed articles, ones that did not include effectiveness of cognitive behavioral treatment were excluded. Also, regardless of their race, ethnicity or socioeconomic level, smokers who are older than 18 years old, who does not have any diagnosis according to DSM-IV-TR or DSM-V, who does not use related medications and who does not have any serious physical/physiological illness are included in this study. Accordingly, relevant

articles in English are reviewed. Detailed information about the articles are listed chronologically in Table 1 and Table 2.

Results

Characteristics of methodologies of the studies

Study population

Samples of the studies were smokers who are at least 18 years old. The 'smoker' criteria changed from smoking a puff of cigarette in the last 30 days (for pregnant participants) (Lee et al. 2015), to smoking at least one pack of cigarette in a day (Alterman et al. 2011, Cinciripini et al. 1994). But for most of the studies daily smoking of at least 10 cigarettes were considered as a criterion of being smoker. For some studies, in addition to the daily consumption of cigarette, level of nicotine dependence according to the Fagerström Test or DSM-IV-TR was also essential (e.g. López-Núñez et al. 2016, Park et al. 2014). Sample sizes of the studies have ranged from 30 (Park et al. 2014) to 467 (Wittchen et al. 2011).

Treatment and control/comparison group

Cognitive-behavioral theory-based treatments are used in the studies in various ways. However, essential and common components of CBT in the studies were as follow: psychoeducation, dealing with dependence and withdrawal, stimulus control, self-monitoring, mood management, coping skills and relapse prevention.

In some of the studies, efficacy of CBT techniques is compared to contingency management (López-Núñez et al. 2016a, 2016b, Pollak et al. 2007, Secades-Villa et al. 2014, Weidberg et al. 2015). There was one study comparing CBT with Acceptance and Commitment Therapy (ACT) (Hernandez-Lopez et al. 2009). And there was one study in which CBT was compared to Virtual Cue Exposure Therapy (Park et al. 2014). In 9 of the studies, CBT was compared to either Nicotine Replacement Therapy (NRT) or medication (Bupropion, Nortriptyline or Varenicline) or both (e.g. Hall et al. 1998, Rovina et al. 2009).

Assignment to treatment groups

In 18 of the studies, participants were randomly assigned to treatment conditions. Out of total 20 studies, only in two of them (Cinciripini et al. 1994, Park et al. 2014) randomization was not used, although a comparison group existed.

Measurement methods

Since the focus was efficacy of a treatment on smoking cessation, in all studies included in this review smoking status of participants are measured before and after the treatment. So, the main outcome variable was "smoking status/abstinence rate" which was evaluated with pre-treatment/post-treatment method. In most of the studies, main measures were self-report abstinence status, expiratory breath CO level, and urine cotinine test level and agreement between all three was necessary. In this way, participants' smoking cessation status was evaluated with 24-hours, 7-day or 30-day point prevalence abstinence.

Although the main focus was smoking cessation, different measurements were also used in some studies. To give an example; Beck Depression Inventory, Fagerström Test for Nicotine Dependence, State Trait Anxiety Scale and so on (e.g. Hall et al. 1998).

Besides, in 4 of the 20 studies, an independent assessor was present in pre-test, post-test and/or follow up evaluations (Hernandez-Lopez et al. 2009, Pollak et al. 2007, Schmitz et al. 2007 & Sheffer et al. 2017). Among 20 studies reviewed, only in one of them, follow-up assessment was not mentioned (Wittchen et al. 2011). The range of follow-up assessments in other studies were between 1 month (Lee et al. 2015, Secades-Villa et al. 2014) to 104 weeks (Hall et al. 2009; 2011, Hendriks et al. 2011). Follow-up assessments were longer than 1-year in 4 studies (Hall et al. 1998; 2009; 2011, Hendricks et al. 2010).

Content and application of CBT programs

CBT techniques

One of the most frequently used CBT techniques was relapse prevention specifically mentioned in 8 studies (e.g. López-Núñez et al. 2016, Secades-Villa et al. 2014). In 4 of the studies, treatments included mood management strategies (Hall et al. 1998; 2009; 2011, Hendriks et al. 2010). In 3 studies, following five components were commonly used; motivational intervention, mood management, dealing with dependence and withdrawal, social support and addressing weight gain (Hall et al. 2009; 2011, Hendriks et al. 2010).

Table 2. Therapy characteristics of CBT

Study	Duration of Sessions	Number of Sessions	Frequency of Session	Number of Therapists	Number of Members	Group or Individual
Cinciripini et al. (1994)	90-min	8 sessions	Once a week	?	5-7	Group
Cinciripini et al. (1996)	2 hours	9 sessions	Once a week	2 therapists	7-11	Group
Hall et al. (1998)	2 hours	10 sessions	10 sessions over 8 weeks	3 therapists	5-11	Group
Pollak et al. (2007)	25.7 min on average	6 sessions	1st and 2nd session 48 hours apart 3rd session 2-4 weeks apart 4th, 5th, 6th sessions 2-4 weeks apart	?	1	Individual
Schmitz et al. (2007)	60-min	7 sessions	Once a week	2 therapists	4-8	Group
Hall et al. (2009)	20-40 min	11 sessions	2 weeks apart during weeks 10-16 4 weeks apart during weeks 20-36 8 weeks apart during weeks 44-52	?	1	Individual
Hernandez-Lopez et al. (2009)	90-min	7 sessions	Once a week	1 therapist	8-10	Group
Rovina et al. (2009)	1 hour	?	Once a week	1 therapist	10 at most	Group

			for the first month 3 weeks apart for the next 19-week period			
Hendricks et al. (2010)	20-40 min	11 sessions	At weeks 10, 12, 14, 16, 20, 24, 28, 32, 36, 44, and 52	?	1	Individual
Alterman et al. (2011)	45-50 min	12 sessions	Once a week	4 therapists	1	Individual
Hall et al. (2011)	20-40 min	11 sessions	2 weeks apart during weeks 12-20 4 weeks apart during weeks 20-52	?	1	Individual
Wittchen et al. (2011)	20-30 min	4 sessions (5 optional?	Baseline, at weeks 2, 4, 6 (optional) and 12	?	1	Individual
Park et al. (2014)	?	4 sessions	Once a week	1 therapist	1	Individual
Secades-Villa et al. (2014)	1 hour	6 sessions	Once a week	?	5-6	Group
Yalcin et al. (2014)	90 min	5 sessions	Once a week	?	1	Individual
Lee et al. (2015)	45 min for session 1 15 min for session 2 45 min for session 3 15 min for session 4	4 sessions	?	1 therapist	1	Individual
Weidberg et al. (2015)	1 hour	6 sessions	Once a week	?	6	Group
López-Núñez et al. (2016a)	1 hour	6 sessions	Once a week	?	5-6	Group
López-Núñez et al. (2016b)	1 hour	6 sessions	Once a week	?	5-6	Group
Sheffer et al. (2017)	1 hour	6 sessions	Once a week	?	?	Group

Session characteristics

For most of the studies sessions were held once a week, but for some studies sessions were at least two weeks apart (Hall et al. 2009; 2011, Hendriks et al. 2010, Wittchen et al. 2011). The number of the sessions were ranged between 4 (Lee et al. 2015, Park et al. 2014) to 12 (Alterman et al. 2011). Only in 1 study (Park et al. 2014) duration of sessions was not mentioned. For the rest of the studies durations ranged between 20-30 minutes to 2 hours. Among 20 studies 9 of them were held as individual therapies whereas 11 of them were group therapies.

Number of group members and therapists

Generally, the range of group sizes was 5-6. Only in 1 study (Sheffer et al. 2017) group size was not mentioned. For the other studies, the minimum number of members was 4 (Schmitz et al. 2007) and the maximum was 11 (Cinciripini et al. 1996; Hall et al. 1998).

For the number of the therapists, this information was reported only in 8 of 20 studies. The sessions were recruited by 4 therapists in one study (Alterman et al. 2011), 2 therapists in two studies (Cinciripini et al. 1996, Schmitz et al. 2007), 3 therapists in one study (Hall et al. 1998), and 1 therapist in four studies (e.g. Lee et al. 2015).

Findings of the reviewed studies

In terms of the effectiveness of smoking cessation treatment, in 10 of the studies CBT-based intervention was found to be superior to comparison groups. In those studies main comparison was with the control condition in which sometimes Standard Treatment was applied (e.g. Hall et al. 2009, Hendriks et al. 2010), and sometimes Nicotine Replacement Therapy (NRT) and/or medication was used (e.g. Hall et al. 2011) to compare.

In 4 of the studies, CBT was compared to NRT and/or medication which resulted as medication or NRT or their combination with CBT was more effective for smoking cessation compared to CBT alone (Cinciripini et al. 1996, Pollak et al. 2007, Rovina et al, 2009, Wittchen et al. 2011).

There was one study (Hall et al. 1998) where participants were either had Major Depressive Disorder History or not, and CBT treatment was found to be effective for MDD history positive participants compared to health education (control condition). Similarly, in a study CBT based standard treatment was compared to adapted treatment that was tailored for minority lower SES people and in adapted treatment participants from minority and lower SES found to be more abstinent (Sheffer et al. 2017).

Comparing CBT to Acceptance and Commitment Therapy (ACT) (Hernandez-Lopez et al. 2009), ACT gave higher abstinence rates whereas in CBT comparison to Virtual Cue Exposure Therapy (CET), CBT gave almost the same but slightly higher abstinence rates (Park et al. 2014). Moreover, in 4 studies Contingency Management (CM) element was also added to comparison in which abstinence rates were higher in CBT+CM condition compared to CBT alone (López-Núñez et al. 2016a, 2016b, Secades-Villa et al. 2014, Weidberg et al. 2015). Moreover, in 7 of the individual therapies CBT-based interventions were found to be superior to comparison groups (e.g. Alterman et al. 2011), while only 4 of the group therapies CBT was more efficient (e.g. Hall et al. 1998).

Discussion

The aim of this study was to systematically review the articles which included CBT-based smoking cessation effectiveness program. Articles in this present systematic review were published between 1994 and 2017. Of the 20 studies, only 3 were from 1990s while other 17 studies were from 2000s. Mainly, it was clearly seen that cognitive behavioral treatment was a prevalent option for smoking cessation. Comparisons were made with Standard Treatment, Nicotine Replacement Therapy (NRT), active medication (Bupropion, Varenicline or Nortriptyline), contingency management procedures, Acceptance and Commitment Therapy (ACT), and Virtual Cue Exposure Therapy (CET). It is important to emphasize that studies were mainly focused on the relapse prevention. This could explain the importance of the CBT-based treatment options, because techniques such as dealing with withdrawal and dependence, mood management, stimulus control and teaching of coping skill were main components and could be considered as helping to quit psychological dependence. Therefore, the likelihood of maintaining ab-

stinence can increase. To make it clear, not the quitting itself but maintaining the abstinence is the crucial one, and CBT is a successful option for that. To put them all together, from the 20 studies reviewed, it was understood that CBT-based interventions are efficient with their effect on the underlying mechanisms of smoking, especially when combined with other supportive treatment options.

In those 20 studies, rather than group therapies, CBT-based treatments were more efficient when applied as individual therapies. Since there were only two study in which randomization was not used, the representativeness of the study can be considered as high. However, only in 4 of the studies an independent assessor was present. In the future studies, the representativeness, validity and reliability of the reviews will be even higher if more blind assessors are used.

When studies about smoking cessation with a CBT-based program in Turkey were searched, only one study has been found in Turkish Psychiatry Index. Study done by Yeşildal et al. (2014) was based on Allen Carr method to see its effectiveness on smoking cessation. In this study, there were 130 participants and 38% of them reported abstinence at the end of 1-year. This study can be considered as one and only contributor to the Turkish literature about smoking cessation. Therefore, it shows the need for more investigations and contributions to the field. When high smoker population in Turkey is considered, cessation studies are especially needed. Specifically, this systematic review could guide researchers who want to study on smoking cessation and could increase the interest as well as the contribution.

Conclusion

To conclude, the psychological component of the tobacco dependence gains more attention as the burden of life increases. Thus, interventions which aim to work through not only cessation itself but also the maintenance of it become more and more important. This could be reason why CBT-based interventions are found to be successful which include techniques such as coping skills, problem solving techniques, mood management and relapse prevention, due to its contribution to the maintenance of abstinence. It should be taken into the consideration that there is high smoking population not only in Turkey but also in the World and only 1 in 40 people can successfully quit smoking and remain abstinent which makes it more important to treat both psychological and physiological dependence of smoking so that hazardous consequences of it can be prevented. In this study, 20 articles are included based on defined criteria. It could be seen that CBT-based treatments were effective for smoking cessation. This effectiveness gets higher when medication and NRT is also combined with CBT. Interventions like medication and NRT will help people to recover from physiological dependence whereas with CBT-based interventions people's assumption about smoking will change and they will become better at coping with stress and mood management. In this way, they can quit smoking permanently. As awareness about smoking increases and appropriate treatment options are applied, illnesses and deaths due to the use of tobacco can be prevented.

References

Alterman AI, Gariti P, Mulvaney F (2001) Short- and long-term smoking cessation for three levels of intensity of behavioral treatment. Psychol Addict Behav, 15:261-264.

American Cancer Society (2007) Cancer Facts and Figures for African Americans 2007-2008. Atlanta, GA, American Cancer Society.

American Lung Association (1995) Facts about Nicotine Addiction and Cigarettes .Chicago, IL, American Lıng Association.

American Psychiatric Association (2013) Diagnostic and Statistical Manual of Mental Disorders (5th ed.). Washington, DC American Psychiatric Association r.

Argüder E, Karalezli A, Hezer H, Kılıç H, Er M, Hasanoğlu HC (2013) Factors affecting the success of smoking cessation. Turk Toraks Derg, 14: 81-7.

Beck JS (2011) Cognitive Behavior Therapy: Basics And Beyond. 2nd ed. New York, Guilford Press.

Becoña E, Vázquez FL (1997) Does using relapse prevention increase the efficacy of a program for smoking cessation? An empirical study. Psychol Rep, 81:291–296.

Becoña E, Vázquez MI, Miguez MC, Fernández del Río E, López-Durán A, Martínez Ú et al. (2013) Smoking habit profile and health-related quality of life. Psicothema, 25:421-426.

Cahill K, Stevens S, Perera R, Lancaster T. (2013) Pharmacological interventions for smoking cessation: an overview and network meta-analysis. Cochrane Database Syst Rev, 5:CD009329.

Cavallo DA, Cooney JL, Duhig A., Smith AE, Liss TB, McFedridge AK et al (2007) Combining cognitive behavioral therapy with contingency management for smoking cessation in adolescent smokers: a preliminary comparison of two different CBT formats. Am J Addict, 16:469-474.

Centers for Disease Control and Prevention (2008) Smoking-attributable mortality, years of potential life lost, and productivity losses-United States, 2000–2004. MMWR Recomm Rep, 57:1226–1228.

Cinciripini PM, Lapitsky LG, Wallfisch A, Mace R, Nezami E, Vunakis HV (1994) An evaluation of a multicomponent treatment program involved scheduled smoking and relapse prevention procedures: initial findings. Addict Behav, 19:13-22.

Cinciripini PM, Cinciripini LG, Wallfisch A, Haque W, Vunakis HV (1996) Behavior therapy and the transdermal nicotine patch: Effects on cessation outcome, affect and coping. J Consult Clin Psychol, 64:314-323.

Dziegielewski SF, Eater JA (2000) Smoking cessation: Increasing practice understanding and time-limited intervention strategy. Fam Soc, 81:246-255.

Fiore MC, Jaén CR, Baker TB, Bailey WC, Benowitz NL, Curry SJ et al. (2008) Treating Tobacco Use and Dependence: 2008 Update Clinical Practice Guideline. Rockville, MD: U.S. Department of Health and Human Services Public Health Service.

Guimaraes FMCL, Nardi AE, Cardoso A, Valenca AM, da Conceicao EG, King ALS (2014) Cognitive-behavioral therapy treatment for smoking alcoholics in outpatients. Medical Express, 1(6):336-340.

Hall SM, Munoz RF, Reus VI (1994) Cognitive-behavioral intervention increases abstinence rates for depressive-history smokers. J Consult Clin Psychol, 62:141-146.

Hall SM, Reus VI, Munoz RF, Sees KL, Humfleet GL, Hartz DT et al. (1998) Nortriptyline and cognitive-behavioral therapy in the treatment of cigarette smoking. Arch Gen Psychiatry, 55:683-690.

Hall SM, Humfleet GL, Munoz RF, Reus VI, Robbins JA, Prochaska JJ (2009) Extended treatment of older cigarette smokers. Addiction, 104:1043-1052.

Hall SM, Humfleet GL, Munoz RF, Reus VI, Prochaska JJ, Robbins JA (2011) Using extended cognitive behavioral treatment and medication to treat dependent smokers. Am J Public Health, 101:2349-2356.

Hendriks PS, Delucchi KL, Hall SM (2010) Mechanisms of change in extended cognitive behavioral treatment for tobacco dependence. Drug Alcohol Depend, 109:114-119.

Hernandez-Lopez M, Luciano MC, Bricker JB, Roales-Nieto JG, Montesinos F (2009) Acceptance and commitment therapy for smoking cessation: a preliminary study of its effectiveness in comparison with cognitive behavioral therapy. Psychol Addict Behav, 23:723-730.

Hollon SD, Beck AT (2004) Cognitive and cognitive behavioral therapies. In Bergin and Garfield's Handbook of Psychotherapy And Behavior Change , 5th ed (Ed MJ Lambert): 447–492. Hoboken, NJ, Wiley.

Kılınç O (2010) Sigara bırakma tedavisinde davranışçı ve bilişsel yöntemler. In Tütün ve Tütün Kontrolü, 2nd ed. (Eds ZA Aytemur, Ş Akçay, O Elbek):479-484. Ankara, Aves Yayıncılık.

Lee M, Miller SM, Wen KY, Azor Hui S, Roussi P, Hernandez E (2015) Cognitive behavioral intervention to promote smoking cessation for pregnant and postpartum inner city women. J Behav Med, 38:932-943.

Lichtenstein E, Glasgow RE (1992) Smoking cessation: What we have learned over the last decade? J Consult Clin Psychol, 60:518-527.

Lindson-Hawley N, Thompson T, Begh R (2015) Motivational interviewing for smoking cessation. Cochrane Database of Syst Rev, 3:CD006936.

López-Núñez C, Alonso-Pérez F, Pedrosa I, Secades-Villa R (2016a) Cost effectiveness of a voucher-based intervention for smoking cessation. Am J Drug Alcohol Abuse, 42:296-305.

López-Núñez C, Martinez-Loredo V, Weidberg S, Pericot-Valverde I, Secades-Villa R (2016b) Voucher-based contingency management and in-treatment behaviors in smoking cessation treatment. Int J Clin Health Psychol, 16:30-38.

Marlatt GA, Gordon JR (1985) Relapse prevention: Maintenance strategies in the treatment of addictive behaviors. New York, Guilford.

O'Brien CP, McLellan AT (1996) Myths about the treatment of addiction. Lancet, 347:237–40.

Orleans C, Rimer B, Telepchak J, Fleisher L, Keintz M, Boyd N et al (1997) ClearHorizons: A Quit Smoking Guide for Smokers Aged 50 and Older. Philadelphia, PA , Fox Chase Cancer Center,.

Park CB, Choi JS, Park SM, Lee JY, Jung HY, Seol JM et al (2014) Comparison of the effectiveness of virtual cue exposure therapy and cognitive behavioral therapy for nicotine dependence. Cyberpsychol Behav Soc Netw, 17:262-267.

Pollak KI, Oncken CA, Lipkus IM, Lyna P, Swamy GK, Pletsch PK et al (2007) Nicotine replacement and behavioral therapy for smoking cessation in pregnancy. Am J Prev Med, 33:297-305.

Rovina N, Nikoloutsou I, Katsani G, Dima E, Fransis K, Roussos C, et al (2009) Effectiveness of pharmacotherapy and behavioral interventions for smoking cessation in actual clinical practice. Ther Adv Respir Dis, 3(6):279-287.

Rüther T, Kiss A, Eberhardt K, Linhardt A, Kröger C, Pogarell O (2018) Evaluation of the cognitive behavioral smoking reduction program "Smoke_less": a randomized controlled trial. Eur Arch Psychiatry Clin Neurosci, 268:269-277.

Schmitz JM, Stotts AL, Mooney ME, DeLaune KA, Moeller FG (2007) Bupropion and cognitive-behavioral therapy for smoking cessation in women. Nicotine Tob Res, 9:699-709.

Secades-Villa R, Alonso-Pérez F, García-Rodríguez O, Fernández-Hermida JR (2009) Effectiveness of three intensities of smoking cessation treatment in primary care. Psychol Rep, 105:747–758.

Secades-Villa R, García-Rodríguez O, López-Núnez C, Alonso-Pérez F, Fernández Hermida JR (2014) Contingency management for smoking cessation among treatment-seeking patients in a community setting. Drug Alcohol Depend, 140:63-68.

Sheffer CE, Bickel WK, Franck CT, Panissidi L, Pittman JC, Stayna H et al (2017) Improving tobacco dependence treatment outcomes for smokers of lower socioeconomic status: a randomized clinical trial. Drug Alcohol Depend, 181:177-185.

Somers J (2007) Cognitive Behavioural Therapy. Core information document. Vancouver, BC, Centre for Applied Research in Mental Health and Addictions (CARMHA).

Stead LF, Hartmann-Boyce J, Perera R, Lancaster T (2013) Telephone counseling for smoking cessation. Cochrane Database Syst Rev, 8:CD002850.

Şengezer T (2016) Tütün bağımlılığında bilişsel-davranışçı tedavi yöntemleri. Güncel Göğüs Hastalıkları Serisi, 4(1):97-103.

Weidberg S, Landes RD, López-Núñez C, Pericot-Valverde I, González-Roz A, Yoon JH et al (2015) Contingency management effects on delay discounting among patients receiving smoking cessation treatment. Psicothema, 27:309-316.

Wittchen H, Hoch E, Klotsche J, Muehlig S (2011) Smoking cessation in primary care – a randomized controlled trial of bupropione, nicotine replacements, CBT and a minimal intervention. Int J Methods Psychiatr Res, 20:28-39.

Yalcin BM, Unal M, Pirdal, H, Karahan TF (2014) Effects of an anger management and stress control program on smoking cessation: a randomized controlled trial. J Am Board Fam Med, 27:645-660.

Yeşildal A, Oğuz G, Güven M, Sungur MZ, Üstünuçar I (2014) Sigara bağımlılığı tedavisinde bilişsel davranışçı grup tedavisi. Bağımlılık Dergisi, 15(2):76-84.

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