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Development of cognitive behavior therapy apps application on depression management in patients of diabetes mellitus type II[☆]

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Abstract
Introduction: Category 2 diabetes mellitus is a type where insulin resistance or deficiency occur as a result of impaired insulin emission with insulin control. Patients with type 2 diabetes can cause psychological variation, including changes in self-concept and dejection. Cognitive behavioral therapy (CBT) is a non-pharmacological therapy that combines changes in intellect and behavior to be more positive. This article aims to develop cognitive behavior therapy by using android applications on the management of depression in DM type II patients.
Methods: The report review was carried out through electronic database media: ProQuest, EBSCO, PubMed and Google Scholar. The year of article search was 2015−2019 by limiting it to educational journals that utilize English. Found 660 articles that were in compliance with the keywords used, namely cognitive apps therapy behavior and depression.
Results: The major theme obtained from literature studies is the types of cognitive behavioral therapy, cognitive behavioral intervention therapy, the effect of cognitive behavioral therapy and evaluating the use of cognitive behavioral therapy using applications. The four main issues are interrelated with each other in formulating the effectiveness of cognitive behaviors treatment using the application of depression experienced by people with DM Type II. This investigation can be developed into empirical research.
Conclusions: The application of the apps cognitive behavior therapy model can help overcome misery experienced by DM type II sufferers.
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Introduction

Diabetes mellitus (DM) is one of the serious illnesses and is not transmissible with the number of casualty increasingly worrisome. This ailment is called the silent killer since often patients do not realize if he has diabetes and continuous compilation, complications have happened. Diabetes mellitus (DM) is a metabolic disease indicate by an rise in sugar levels due to insulin formulation which causes an imbalance between insulin necessity and production in the body.

One trouble that is a problem for patients with diabetes is the occurrence of difficulty from diabetes, such as coronary arteries and peripheral vascular disease, stroke, diabetic neuropathy, amputation, kidney failure and blindness causing in increased disability, reduced life expectancy and enormous health costs for almost every group.

Diabetes and depression can coexist and have a two-way relationship.[1,2] Depressed subjects have elevated levels of stress hormones, such as cortisol which makes cells resistant to insulin action resulting in insulin resistance and hyperglycemia, whereas poor glycemic control in diabetes affects the hypothalamus–pituitary–adrenal (HPA) axis, activating neurobiological mood disorders which results in depression.[3] According to two meta-analyzes,[4,5] diabetic subjects had a 24% increased risk of depression and depressed adults had a 37% higher risk of developing diabetes, which was even higher with long-term use of antidepressants.[6,7]

Smartphones have been used to facilitate providing health care interventions including treatment of mental health conditions. The number of applications intended to help people deal with depression is increasing rapidly, especially in the commercial market. However, the development, usability, feasibility and efficacy of these applications is rarely developed in the commercial market.[8]

The purpose of this study was to determine the effect of the application of cognitive behavioral therapy in the management of depression in type 2 DM patients. We can describe the systematic review process in Fig. 1.
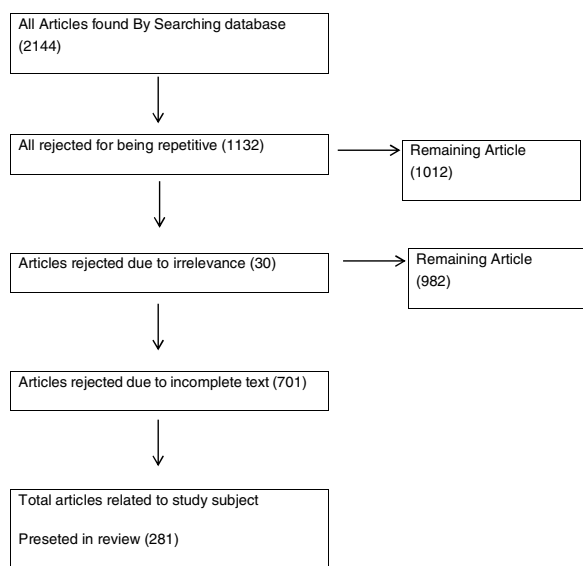

Figure 1 Input and output diagram of primary studies to final synthesis.

Table 1 Information on 281 Application CBT apps in handling depression.

No	Author's name/title/publisher/year	Purpose	Date/source	Methods	Result
CBT apps application in handling depression					
1.	[9]A systematic review of cognitive behavioral activation apps for depression	To identify self-phone applications available especially for depressed patients and to evaluate cognitive behavior therapy and behavioral activation	117 applications were identified in the commercial market and through scientific literature search	Systematic review	Usability of the application being reviewed varies greatly and is rarely accompanied by explicit privacy or security policies. Despite increasing public demand, there are concerns about the lack of proper CBT or BA applications, especially from a clinical and legal standpoint. The application of superior scientific, technological, and legal knowledge is needed to improve the development, testing, and accessibility of applications for people with depression. Introduction

Table 1 (*Continued*)

No	Author's name/title/publisher/year	Purpose	Date/source	Methods	Result
2.	[10]Internet-based cognitive behavior therapy for symptoms of depression and anxiety: a meta-analysis	Study the extent of an internet-based cognitive behavioral therapy (CBT) program for effective symptoms of depression and anxiety.	2334 sample	A meta-analysis of 12 randomized controlled trials.	The effect size of internet-based interventions for anxiety symptoms is greater than the effect size for depressive symptoms; However, this might be explained by differences in the amount of therapist support.
3.	[10] Internet-based cognitive behavioral therapy for subthreshold depression in people over 50 years old: a randomized controlled clinical trial	(1) To find out internet-based and community cognitive behavioral therapy interventions Cognitive behavioral therapy interventions are more valid than staying list control groups; and (2) to determine whether the effects of internet-based cognitive behavioral therapy are different from group cognitive behavioral therapy interventions.	191 women and 110 men with depression.	Cross sectional	In the waiting list control group, we found a pre-post-improvement effect size of 0.45, which is 0.65 in the condition of group cognitive behavior therapy and 1.00 in the internet-based condition of care. Helmert contrast shows a significant difference between waiting lists conditions and both treatment conditions ($p = 0.04$) and there were no significant differences between the two treatment conditions ($p = 0.62$).
4.	[11]Design of an mHealth App for the self-management of adolescent type 1 diabetes: a pilot study	Designing, developing, and testing health interventions for the management of type 1 diabetes in adolescents.	Interviewing teens with type 1 diabetes and their family caregivers. The design principles come from the thematic analysis of the interview. The user-centered design is then used to develop mobile application pillows. In the 12-week evaluation phase, a trial group of 20 adolescents aged 12–16 years, with glycated hemoglobin (HbA1c) between 8% and 10% of the sample. Each participant is equipped with a bant application that runs on the iPhone or iPod Touch and LifeScan glucometer with a Bluetooth adapter for automatic transfer to the application. The outcome measure is the average daily frequency of blood glucose measurements during the trial compared with the previous 12 weeks.	Qualitative	This mHealth diabetes application with the use of gamification incentives shows an increase in the frequency of blood glucose monitoring in adolescents with type 1 diabetes

Table 1 (*Continued*)

No	Author's name/title/publisher/year	Purpose	Date/source	Methods	Result
5.	[12]Correlation of HbA1c and major depressive disorder in type 2 diabetic patients	To evaluate the relationship between major depression and the glucose control index in type 2 diabetes mellitus	134 Pasien DM type 1 dan Type 2	Cross sectional	Groups of patients with and without depression have the same age and BMI. Correlation analysis revealed no significant relationship between the HAM-D score and HbA1c level. Depression scores were significantly higher in diabetic patients with hypertension ($p = 0.0001$) and on insulin therapy ($p = 0.005$). There is a significant positive relationship between HAM-D score and duration of disease ($p < 0.01$).
6.	[13]Randomized controlled trial of cognitive behavioral therapy for adherence and depression (CBT-AD) in patients with uncontrolled type 2 diabetes	To test cognitive behavioral therapy for adherence and depression (CBT-AD) in type 2 diabetes. We hypothesize that CBT-AD will improve adherence; depression; and, secondly, hemoglobin A1c (A1C).	87 adult patients with unipolar depression and uncontrolled type 2 diabetes receive increased medication as usual (ETAU), including medication adherence, self-monitoring of blood glucose (SMBG), and lifestyle counseling; a provider letter documents the psychiatric diagnosis. Those randomized for intervention also received 9–11 CBT-AD sessions	RCT	CBT-AD is an effective intervention for adherence, depression, and glycemic control, with long-lasting and clinically meaningful benefits for diabetes self-management and glycemic control in adults with type 2 diabetes and depression
7.	[14]Health Behavior models for informing digital technology interventions for individuals with mental illness.	Aiming at the perspective of the importance of applying theories and behavioral models to developing digital technological interventions to address mental and physical health problems among people with mental illness.	Summarize leading theories about human behavior, highlight key theoretical constructs, and identify opportunities to inform digital health interventions for people with mental illness.		Behavioral theory offers advantages for guiding the use of digital technology. Future researchers must explore how theoretical models can effectively advance efforts to develop, evaluate, and disseminate digital health interventions that target individuals with mental disorders.

Table 1 (*Continued*)

No	Author's name/title/publisher/year	Purpose	Date/source	Methods	Result
8.	[15]What works best for whom? Cognitive behavior therapy and mindfulness-based cognitive therapy for depressive symptoms in patients with diabetes	The purpose of this study is to identify variables that are predicted differentially responding to CBT or MBCT (e.g., prescriptive predictors).	91 adult outpatients with type 1 or type 2 diabetes and comorbidities depressive symptoms	Cross sectional study	Analysis shows that education is the only factor that differently predicts decline in depressive symptoms immediately after the intervention. In post-treatment, individuals with achievement of higher education responds to MBCT better, compared to CBT.
9.	[16]Mobile health monitoring to characterize depression symptom trajectories in primary care	This research examines whether to use iteratively cellular health assessment to determine the trajectory of symptoms is a potentially useful method for classifying severity of depression.	344 primary care patients with depression were identified and recruited as part of a mobile health program symptom monitoring and self management support. Depressive symptoms are measured weekly through interactive voice response calls (IVR) using Patient Health Questionnaire (PHQ-9). Analysis of the IVR PHQ-9 weekly trajectory scores from baseline to week 6 were used for subgroups of patients according to the same trajectory. Multivariable linear regression was used to determine whether the trajectory predicted a 12-week PHQ-9 score after adjusting for value base and 6 week PHQ-9 score.	Cross sectional	The optimal path analysis model includes 5 non-intersecting tracks. Patient subgroups are assigned for each track has an initial PHQ-9 average of 19.7, 14.5, 9.5, 5.0, and 2.0, and respectively a decrease in average in PHQ-9 for six weeks 0.3, 2.0, 3.6, 2.3 and 1.9. In the regression analysis, each trajectory is predicted to be significantly 12-week PHQ-9 score (using modal trajectory as a reference) after adjusting for baseline and 6 week PHQ-9 score.

Table 1 (*Continued*)

No	Author's name/title/publisher/year	Purpose	Date/source	Methods	Result
10.	[17]Does a mobile phone depression-screening app motivate mobile phone users with high depressive symptoms to seek a health care professional's help?	To find out how effective the screening method is in motivating users to discuss the results obtained from the application with health care professional. Does the mobile depression screening application motivate users with high depression? Symptoms to seek health care professional advice?	2538 Apple App store provide us (aged 18 or over) in 5 nations, i.e., Australia, Canada, New Zealand (NZ), United Kingdom (UK), and United States (US), are recruited straight through the application download sheet. The members then filled out the Patient Health Questionnaire (PHQ-9), and they depression screening score	Studi kohort, prospektif, Single observational from the free mobile depression application developed at English and released on the Apple App store.	322 peserta ditemukan memiliki gejala depresi tinggi dan tidak pernah didiagnosis dengan depression, and accept suggestions for discussing their results with health care professionals. Around 74% of them completed follow; about 38% of self-reported consult their health care professionals about them depression score. Only a positive attitude toward depression as a real disease is associated with an increase in follow-up response rate (odds ratio (OR) 3.2, CI 1.38–8.29).

Methods

Literature source comes from online search of journal database through free articles in PDF format through: Pubmed, Proques, Geogle Schoolar, Plosone and EBSCO, Other sources are from Texbook, National Health Report, Thesis and Dissertation and other sources. The literature collected is an English-language scientific journal based on topics raised in the last 5 years of publication. The amount of literature found with the search engine with keywords (diabetes and depression) AND (cognitive behavioral therapy) and advanced search using keywords (behavioral and cognitive therapy apps) AND depression with the last 5 years of publication.

Results and discussion

A systematic review of Aplikasi CBT apps in handling depression Depresi is summarized in Table 1.

Conclusion

Cognitive behavioral therapy (CBT) has been shown to reduce depression in adults with mild to moderate depression. To overcome many of the disorders associated with these treatments, efforts have been made to provide climate change therapy via the Internet.

Conflict of interests

The authors declare no conflict of interest.

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