

REVIEW ARTICLE

The Theory of Planned Behavior and Transtheoretical Model of Change: a systematic review on combining two behavioral change theories in research

Chinun Boonroungrut¹ and Huang Fei²

¹ Ph.D. Candidate (Psychology), School of Psychology, Central China Normal University, China

² Ph.D. School of Psychology, Central China Normal University, China

Corresponding author: Chinun Boonroungrut Email: chinunb@mails.ccn.u.edu.cn

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Abstract

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This systematic review aimed to explore how researchers combined two behavioral change theories: the Theory of Planned Behavior (TPB) and the Transtheoretical Model of Change (TTM). Study I used data collected from the Web of Science by search through keywords, titles and abstracts. Total 53,865 key terms were extracted and analyzed by Bibliography Network Analysis to explore the research trend. Study II reviewed full-text articles to find 2 models utilization in EBSCO database. According to the PRISMA guidelines, this systematic review, under its exclusion criteria, included totally 9 remained articles.

The results showed that the combination of theories TPB and TTM were in 5 different methods: 1) Explore and explain health behavior comprehensively, 2) Use to classify related health behaviors into different stages, 3) use to develop survey questions, 4) Use to predict health behavior changed and 5) Making new modules. In conclusion, this review could be the researchers' applying guidelines totally 5 different methods of both theories combining.

Based on the present study, the review of effectiveness in combining theories or how the researchers measured and conducted theoretically revealing analyses or meta-analysis was suggested for the future review.

Keyword: planned behavior, transtheoretical model, theory combining, behavior change

ทฤษฎีพฤติกรรมตามแผนและทฤษฎีลำดับขั้น ของการเปลี่ยนพฤติกรรม: งานทบทวนวรรณกรรม อย่างเป็นระบบในการรวมสองทฤษฎีการปรับพฤติกรรม ในการวิจัย

ชินัน บุญเรืองรัตน์¹ และ หวง เฟย์²

¹ Ph.D. Candidate (Psychology) คณะจิตวิทยา มหาวิทยาลัยหัวจง ประเทศจีน

² Ph.D. คณะจิตวิทยา มหาวิทยาลัยหัวจง ประเทศจีน

บทคัดย่อ

ชินัน บุญเรืองรัตน์ และ หวง เฟย์ ทฤษฎีพฤติกรรมตามแผนและทฤษฎีลำดับขั้นของการเปลี่ยนพฤติกรรม:
งานทบทวนวรรณกรรมอย่างเป็นระบบในการรวมสองทฤษฎีการปรับพฤติกรรมในการวิจัย
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งานทบทวนวรรณกรรมอย่างเป็นระบบในครั้งนี้มุ่งศึกษาวิธีที่นักวิจัยรวมและนำเสนอทฤษฎีการปรับพฤติกรรม
ไปใช้คือ ทฤษฎีพฤติกรรมตามแผน (TPB) และทฤษฎีลำดับขั้นของการเปลี่ยนพฤติกรรม (TTM) การศึกษาที่ 1
รวบรวมข้อมูลจากฐานข้อมูล Web of Science โดยอาศัยคำสำคัญ, ชื่อเรื่อง และบทคัดย่อ คำทั้งหมด 53,895
คำถูกวิเคราะห์โดยโครงข่ายชะนีวรรณกรรมเพื่อหาแนวโน้มในการศึกษา การศึกษาที่ 2 ได้ทบทวนบทความฉบับ
เต็มทั้งหมด 9 บทความโดยใช้หลักเกณฑ์การคัดเข้าและคัดออกตามแนวทางการทบทวนวรรณกรรมอย่างแบบ
ระบบแบบ PRISMA บทความทั้งหมด 9 บทความตรงตามหลักเกณฑ์และถูกนำมาวิเคราะห์

ผลการศึกษาพบว่ารูปแบบการรวมทั้ง 2 ทฤษฎีไว้ด้วยกันมีดังนี้ 1) ใช้เป็นพื้นฐานในการอธิบายพฤติกรรม
2) ใช้เพื่อจัดลำดับขั้นของพฤติกรรมที่เปลี่ยนแปลง 3) ใช้เพื่อพัฒนาแบบสอบถาม 4) เพื่อใช้ทำนายพฤติกรรมที่
จะเกิดขึ้น และ 5) เพื่อสร้างโมเดลอธิบายพฤติกรรมใหม่ สรุปผลการทดลอง การศึกษาในครั้งนี้พบการรวมทั้ง 2
ทฤษฎีเข้าไว้ด้วยกันทั้งสิ้น 5 รูปแบบที่สามารถใช้ประยุกต์เป็นแนวทางในงานวิจัยต่อไป

คำสำคัญ: พฤติกรรมตามแผน ลำดับขั้นของการเปลี่ยนพฤติกรรม การรวมทฤษฎี การปรับพฤติกรรม

Introduction

The investigation of the determinants of behavior are multi-disciplinary and complex issues in health education, disease prevention, and social psychology including financial behavior research. Two widely recognized theories of behavior change which were first used in healthcare have been applied as the traditional models: Ajzen and Fisherbein's theory of planned behavior (TPB) and Prochaska and Diclemente's transtheoretical model of behavior change (TTM) since 1980s.¹

While few studies showed the results arguably against the principle of both theories, their applications have spread and described categorized stages in various areas of researches especially in medical prevention, nursing and physical activities.²⁻³ The TPB stages can be used to predict planned behavior describe intention to change behavior under the three major components; attitude, subjective norm and perceived behavior control (PBC).⁴ In terms of the similarity and contrast, the TTM is a several discrete stages-based model that explains individual timing and changing behavior.

The Theory of Planned Behavior (TPB) was developed from the Theory of Reasoned Action

(TRA) that described how people acted and formed their behavioral intention.⁵ Three components are underneath a person's intention to changed behavior. It is defined by engaged motivation behavior. Engaged behavior is evaluated positively held to be determined by attitudes; positive or negative behavior evaluation, subjective norm; acceptable social perception and perceived behavioral control that predict rational behavior (Figure 1). Ajzen⁶ pointed that PBC increased the working enactment of successful changing behavior that reflected to accurately actual control and easy performance. So, PBC plays roles both direct with behavior intention and indirect with the effective behavior.⁷ Moreover, actual behavior control was studied and added to explain between PBC in those targeted behaviors.⁸ Many studies also confirmed PBC as the 3rd component of TPB and added into the TRA to show more accurately in predicting behavioral changing intention.⁹ According to some currently published articles in social sciences, an application of TPB, not only in healthcare, but also in online course adoption¹⁰, credit card consumer¹¹ and financial and saving behavior.¹² Those studies had been addressed and supported usefulness of this theory and its predicting of the intended behavior.

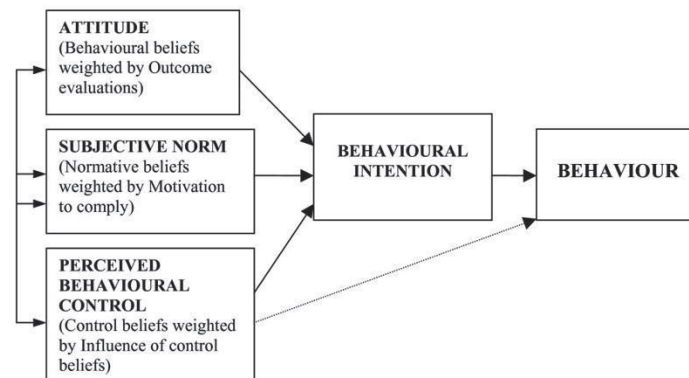


Figure 1 Ajzen's most based-referenced model: the theory of planned behavior

The Transtheoretical Model of Change (TTM) was employed first in healthcare, and speedily used in health psychology and mental health.¹³ Generally, mechanisms of behavioral changing that described how individuals move or change through discrete stages were proposed by this stage theory. The TTM elucidates 5 stages: Precontemplation stage (PC); period that no intention or consideration of any change within 6 months, Contemplation stage (C); beginning to start questioning or performing consideration but not yet decide to change within the next 6 months, Preparation stage (P); setting the plan or preparing to change behavior within the next 30 days, Action stage (A); initiating a new goal of behavior less than 6 months ago and Maintenance stage (M); maintaining or consolidating changed behavior for a period of time more than 6 months ago.¹⁴ According to the stage

structure, the dynamic movement from one stage to another stage should be identified, and people can realize the presumption of stage change.¹⁵⁻¹⁶ TTM model have confirmed behavior change that is a process, not an event. Moreover, there are 10 identified processes of change categorized into 5 cognitive and 5 behavioral processes or strategies and techniques: Consciousness Raising, Social Process, Dramatic Relief, Environment Reevaluation, Self-Reevaluation, Self-Liberation, Counterconditioning, Stimulus Control, Contingency Management and Helping Relationships (Table 1).¹⁷ Prochaska¹⁸ pointed that behavioral processes of change were more relevant in the active stages for behavior change. Similarly, the most references of TTM model were in the healthcare; however, some studies have demonstrated theoretically in financial behavior and educational or training program.^{14,19}

Table 1 Relationship between 5 stages of change and 10 processes of change

Change stages:	Precontemplation	Contemplation	Preparation	Action	Maintenance
Change process:	Consciousness raising				
	Dramatic relief				
	Environmental re-evaluation				
	Social liberation				
		Self-reevaluation			
			Self-liberation		
				Contingency management	
				Counterconditioning	
				Stimulus control	
				Helping relationships	

Despite empirical support of both theories, a part of their usefulness, the two models have been criticized in their component structures and implying such as subjective norm in TPB shares smaller affect in intention relation than another component. Another argument lined on TTM and its failing to specific shifting from one stage to the next stage including lack of predictive validity.^{7, 20} Several meta-analyses tested the TTM that could be pseudo-stages of an underlying continuum.²¹ Overall, in fact, the different social cognitive variables could show different influentially depending on the stage reached. However, most researches have shown the benefit of applying each model, a dozen of researches combined two models to study especially in healthcare. Some studies examined the relationship as the architecture of the TPB defined within the stage of TTM. In detail, some studies attempted to elaborate the discontinuity patterns of its latent meaning including to hypothesize

the predictive relationship from the TPB construct in each TTM stage of change.^{4,21} Some revealed findings on attitude and intention were predictive with attitude in the PC stage and intention in the A and M stages. Subjective Norm predicted relationship in the movement out of the PC stage only.²² Lippke and Nigg²¹ showed that subjective norm and intention of PC stage were lower than C stage, and C stage showed lower in all components in TPB; attitude, subjective norm and PBC significantly. Furthermore, PBC was predicted by the behavioral processes, and attitude was predicted by both cognitive and behavioral processes of change of TTM.⁹

This study aims to review systematically the researches' combining and utilizing of both TPB and TTM and to explore how the researchers used TPB together with TTM theories in their research methods.

Methods

Search Strategy and Selection Criteria

Two databases were searched without date restriction: Web of Science (WoS); webofknowledge.com in All Database type of Thomson Reuters® (study I: mapping network to explore the research trend from key terms) and EBSCO database; Education Research Complete, Psychology & Behavioral Science, PsyARTICLES and PsycINFO (study II: review full-text articles to find the models' utilization). The last date searched was in April 2017. English language was the search limitation. Boolean logic keyword searching technique was applied in each database. "The Theory of Planned Behavior" OR "The Theory of Planning Behavior" OR "TPB" were inputted in searching algorithm for exploring the Theory of Planned Behavior. "The Transtheoretical Model" OR "TTM" were used for exploring the Transtheoretical Model of Change. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were applied for included and excluded criteria.²³

Initially, this review was approached by the eligible reviewers' inclusive agreements under the following criteria: (1) Journal article published in English language, (2) combining at least the TPB and the TTM models, (3) inclusion of all types of researches methodology including primary studies, but except a systematic review or meta-analysis defined by title and method, (4) inclusion of any area of studying with all kinds and ages of participants, and (5) abstract with full-text articles accessed.

Screening and Data Extraction

A reviewer screened following deduplication titles for exclusion. A pair of reviewers screened and reviewed for eligible articles based on abstracts and full-text respectively. All three reviewers had resolved disagreements and unmatched details. Administrative details were not blind to reviewers. Data were extracted about studied field, theories used, participants and methodology, model influencing effectiveness and key discussion. In these processes, the second and third reviewers double-checked the extracted data. After all, three reviewers made solved agreement, then we conducted a narrative synthesis.

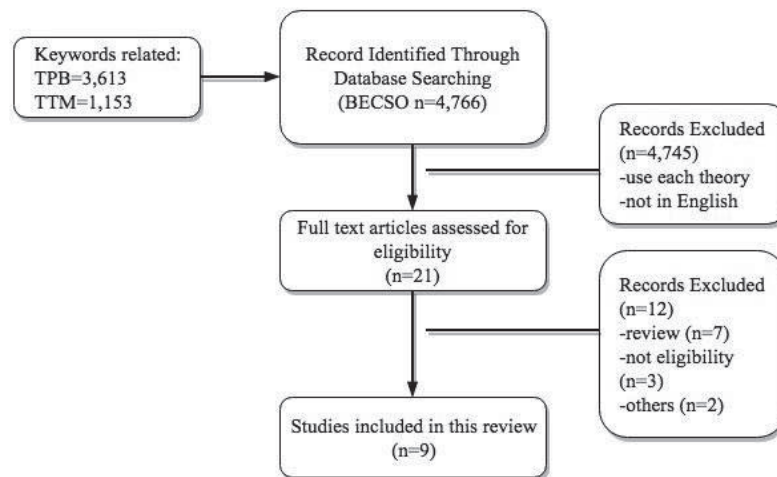


Figure 2 PRISMA applied methods for included and excluded articles from EBSCO in the study II

Procedures

Using data from WoS All Database with the key search between TPB and TTM were mapped in VOSviewer Mac OS version for making identification of the keywords, title and abstract network to find the trend of studying.²⁴ The articles combining at least two of models, TPB and TTM from WoS were included to be screened and extracted together with the articles from EBSCO database in systematic review. The articles with the same data published in different journals or in the same journal would be counted as only 1 article.

Results

In the study I, 1,936 and 2,019 articles were found related to TPB and TTM respectively in ISI-WoS All Databases. Totally, 53,895 key terms were extracted; VOSviewer showed 771 thresholds when used 25 occurrences a term referenced. The most relevant terms at rate 60% were default; 463 terms to be selected in its analysis. Four main clusters

analyzed were outputted (Figure 3): (1) actions or behavioral studies with research methods including intervention related to healthy and unhealthy behavior such as cancer, cardiovascular disease, exercise and dietary (2) planning or intention among a variety group of people such as college students, families and consumers with paths and model structure studies (3) surveys or questionnaires with some statistical analysis tests (4) physical activity. The results in overlay visualization analysis with year references had shown that TTM model has appeared in the database since late 2005 with studying in different stages of changing behavior; however, the trend of TTM has been decreasing. In the other hand, the application trend of TPB has been reversing since late 2009, against TTM. From the network analysis, researchers have been interested in these two models between 2006 – 2012, extending the TPB model or structural equation modeling with PBC have pointed out, and randomized controlled trial with systematic review showed relations with TTM. Counting and Analyzing

only the researches combining TPB and TTM, 3,030 key terms were matched with 66 thresholds using 10 occurrences a term. There were 3 clusters shown

clearly separated: (1) variables and questionnaire (2) behavior change theories both TPB and TTM (3) stages and another social cognitive variables or theories.

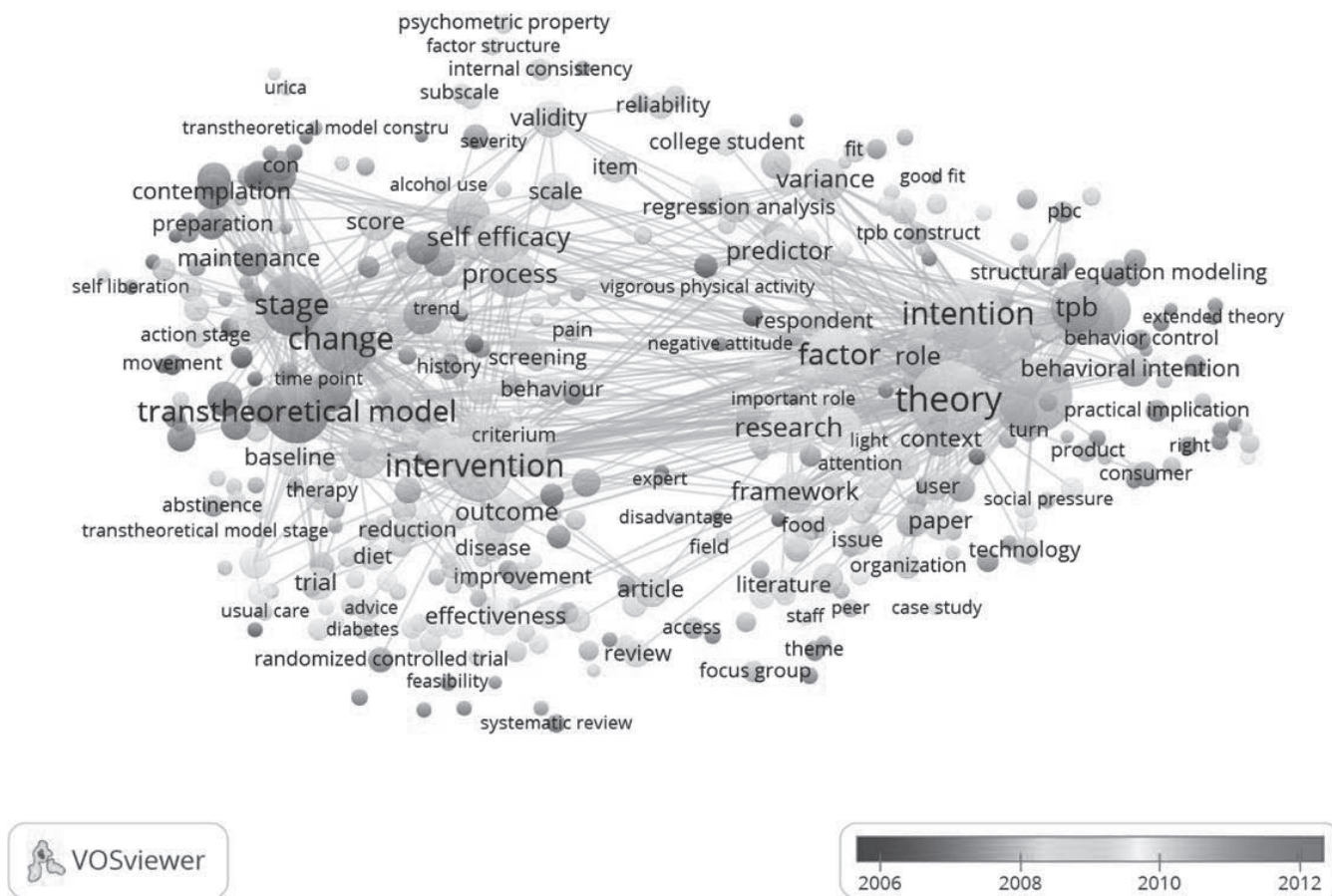


Figure 3 Network analysis from 53,895 TPB and TTM terms using overlay visualization

In the Study II, TPB and TTM were referenced in 3,613 and 1,153 articles respectively searching from EBSCO database between 1986 – 2017. Twenty-one articles combining both theories or at least these 2 mentioned theories were found between 1999 – 2016.

Excluding 7 meta-analysis and systematic reviews, 3 articles not match eligibility articles and 2 inaccessible articles in full-text extracting, totally 9 articles were included into this systematic review.

Table 2 Brief review of the research methods and effectiveness of combining TPB and TTM

Author(s) Year	Area of Studying	Study Aim	Participants (N)	Research Type	TPB & TTM Related Key Outcomes	Tool(s)/ Theory used	Note
Paek, Jun Bae ²³	Anti-smoking	Explore theories used in website	67 websites	S/C	- Found increasing knowledge/ perceived benefit/self-efficacy and subjective norm	a,b,c,d	*
Rhodes and Plotni-koff ²⁶	Physical activity	Compare two designs of studies in physical activity	703 people	S/C, L	- S/C design showed upward co-coefficients values then longitudinal study - showed medium correlation among theories	b,c,d,h	***
Hirai, Harada ⁴	Cancer Memo-graphy intention	Integrate cancer worry model	641 Japanese females	S/C	- TTM&TPB with e can be a predictive validity of the model. - TTM stages were good in classification in follow up in 1 year. - TPB explains well in intention.	b,c,e	**, ****
Reger, Cooper ²⁷	Walking & Health promotion	Test wheeling walk intervention	1,472 adults	EX	- TPB&TTM theories based media campaigns are effective in physical activity - PBC and intention are noted in posttest change.	b,c	***
Wyker and Davison ³	Plant-based diet	Integrate Predicting Plant-based diet model	204 college students	S/C	- intention is effective in all 1st 3 TMM stages. - attitude and PBC is more effective in preparation.	b,c,f,g	**, ****
Palmeira, Teixeira ²⁸	Weight health behavior	Predicting weight loss	148 over weight women	EX	- weight management better predictive than exercise - Self-efficacy in TTM&SDT is the strongest predictor but TTM and TPB share medium association with short exercise.	b,c,d,i	***
Hirai, Komura ²⁹	Cancer alternative medicine (CAM)	Explore behavioral mechanism	521 Japanese cancer patients	S/C	- new model from TTM&TPB can show positive in CAM in expectation, pros and nega- tive in norm of staff and cons.	b,c	** ****
Rhodes, Plotni-koff ²	Physical activity	Predicting physical activity intention	887 Canadian workers	S/C	- cognitive processes and attitude distinguished nonintenders from the others - behavioral processes distin- guished successful adopters from others	b,c,h	***
Tavares, Plotni-koff ³⁰	Physical activity	Predicting physical activity in employed woman	1,183 woman	S/C	- self-efficacy and intention can predict physical activity behavior well in woman without young children.	b,c,d,h	***

Note: a; health belief model, b; transtheoretical model, c; theory of planned behavior, d; social cognitive theory, e; perceived health competence with cancer worry (Japanese version), f; consuming more fruits and vegetables (FV), g; plant-based diet (PBD), h; protection motivation theory (PMT), i; self-determination theory (SDT)

S/C; survey design or/and Cross-sectional Study, L; longitudinal study, EX; experimental study

*, exploring the use of the theory(ies), **, using model as classification rules, ***; use as based theories, ****; combining or making a new theory

In reviewing the BESCO articles related to the included criteria, almost full-text extracted articles were in the same published period that analyzed from WoS in the study I, approximately by 2012. The combined theories articles in this database relate to health behavior especially in physical activity, cancer screening, dietary and smoking behavior respectively. Moreover, social cognitive theory and protection motivation theory were the theory researchers always applied together with TTM and TPB in the articles related to physical activity. Four different types of usage both theories including how they combined them into the new models were found:

- (1) *Exploring the use of the theories*: researchers explored and reviewed the numbers of theory use in some planned change behavioral activities like smoking prevention website. Stages of TTM were not applied in this type of theory use. It was counted as a theory same as TPB and another theory; however, invention strategy categories were made by the researchers according to the theories variables of TTM. It seemed to overlap with other health model better than TPB. Interestingly, use of intervention strategies indicated that TPB were applied more than TTM (only one-third from all) in both prevention and cessation purposes.
- (2) *Using model as classification rules*: 5 stages of TTM were used to be the classification rules of studied behavioral issue to indicate the different status of each behavioral change process. First three stages of TTM were only used for explanation intention without action. In the database, cancer screening behavior

used TTM to identify the samples' intention stage to concerning the screening as a habit. TPB variables were used to compare across the utilization, not used for sample classification.

- (3) *Using as theory based*: researchers used at least two theories as the theory based. In this review, there were various types of questionnaires that researchers determine and refer to the variables of the both theories such as TTM weight management constructs questionnaire and researchers' developed questionnaires based the theories. No stage including less concerning of change stages were noted in those articles. This kind of usage is the most preferable studied combining method among the researchers.
- (4) *Combining to make a new model*: some studies combined each theory with the other models. Especially TPB variables were based used to explain intention to change behavior in many contexts. In this review, researchers made the new models analyzed by structural equation modelling together with TTM stages of changes classifying in their presented final results.

Among the full-text exacting articles, there was no clear usage referred to TTM 10 processes of changes; only one article explored the contents in antismoking website. The results from many articles in this review had shown that the effectiveness of using these theories were medium to high in describing and predicting with regression to their studied outcomes. In addition, there was no the exactly consensus to

confirm the effectiveness of using these theories because of researchers' different combining methods; however, Precontemplation stage and self-efficacy in TTM, perceived behavioral control and intention in TPB were referenced positively that most noted in their researches.

Discussion and recommendations

Although the use of TPB or TTM was applied in various fields, for example, education and financial behavior, the combination of two theories together was still limited in healthcare the same as the theory founders' first objectives such as TTM in avoiding smoking behavior.^{10,31-32} So, these two theories including extending models seemed to be fit with therapeutic life style change: exercise or chronic diseases in the both databases. Unfortunately, Courneya and Bobick⁹ indicated that there were only two articles combining two theories on exercise topic in 2000. Increasingly, the number of articles in physical activity became the top studied topic that used combining theories to study as the based theories, but the increasing rate was lower comparing with another field of study that used each theory separately. Three authors, Rhodes, Ronald and Plotnikoff, were the group of article authors who the most users of at least the two theories based in this review.^{2, 26}

Apart from the four types of usage in the database, there was another type found in another database. This group of researchers made a new model from combining two theories together, different from the fourth usage types in how TPB was predicted by TTM processes of change, not only the 5 stages of change. Courneya and Bobick⁹ integrated the processes and stage of change into TPB as the immediate determinant of intention and behavior change.

TPB shares Eight of ten in interrelationship between processes of change and stages of change. The results showed that perceived behavioral control could be predicted by behavioral processes and attitude could be predicted by both behavioral processes and cognitive processes. Vertically, some agreements on PBC and self-efficacy still were addressed such as the similarity of self-efficacy with PBC or just in only a part of underlying control belief and pro & con in TTM as a part of attitude in TTM. However, this systematic review extracted the small numbered matched articles. It doesn't cover the effectiveness and the comparing between each theory, it explored only the way of researchers' usage of both theories.

In conclusion, although each theory was acceptable among the researchers to explain how behavior was changing, the two theories held the different purposes on causation between TPB and stages or processes in TTM. The extracted articles combining both theories together and shown in this review from BESCO database had confirmed that they were all related to healthcare especially physical activity. Four types of usages were found from BESCO databases together with another different type of combining from the other database. Based on the present results, the review of effectiveness in combining theories or how the researchers measured and conduct theoretically revealing analyses or meta-analysis was suggested for the future review.

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