

Postprint of a Review on the Development of the Transtheoretical Model and Related Information Behavior Research

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Abstract

[Objective/Significance] The Transtheoretical Model (TTM) is widely applied in health behavior change research. This paper reviews the developmental evolution of the Transtheoretical Model and related human information behavior research, aiming to better understand the associations and influence mechanisms of information behavior in health behavior promotion. [Method/Process] Using literature analysis, this paper reviews the developmental trajectory of the Transtheoretical Model, focusing on content related to human information behavior and empirical research that integrates both, and preliminarily summarizes the types of information and information behaviors involved at each stage of the health behavior change process. [Results/Conclusion] This paper provides a relatively systematic review of the Transtheoretical Model and human information behavior, offering references for future exploration of the mechanisms through which information types and information behaviors operate in different change stages, thereby facilitating empirical research and strategy formulation.

Full Text

A Review of the Development of the Transtheoretical Model and Related Information Behavior Research

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Abstract:

[Purpose/Significance] The Transtheoretical Model (TTM) is widely applied in health behavior change research. This paper reviews the development of TTM and related human information behavior research to better understand the association and influence mechanisms of information behavior in health behavior

promotion.

[Method/Process] Using literature analysis, this paper reviews the developmental history of TTM, focusing on content related to human information behavior and empirical studies combining the two, and initially summarizes the types of information and information behaviors involved in each stage of health behavior change.

[Result/Conclusion] This paper provides a systematic overview of TTM and human information behavior to offer reference for future exploration of the role and mechanisms of information types and information behaviors in different change stages, thereby aiding empirical research and strategy formulation.

Keywords: Transtheoretical model, information behavior, information needs, health behavior promotion

Classification Number: G250

The report of the 19th National Congress of the Communist Party of China [1] proposed implementing the Healthy China strategy, improving national health policies, providing comprehensive and full-cycle health services for the people, and prioritizing people's health in the national development strategy. Healthy lifestyles and habits help maintain physical health and avoid sub-health conditions. Despite economic and social development leading to greater health knowledge dissemination and increased health awareness, various unhealthy behaviors persist in daily life, such as smoking, alcohol abuse, lack of exercise, and overnutrition, all of which urgently need to be changed. In today's mobile internet era, the development of information technology has fostered a rich and diverse information environment, with a surge in health-related information. Understanding the role of information and information behavior in health behavior change is a question worth exploring.

Even during TTM's theoretical development stage, researchers noted the role of information in the model: adequate information guides people to make appropriate responses to stimuli [5]. This paper attempts to review research on TTM and human information behavior to achieve a clearer understanding of their integration, thereby better clarifying and leveraging the role of information and information behavior in health behavior promotion and improving empirical research.

2. Development History of TTM

Over the 40 years since its initial theoretical exploration, TTM has roughly experienced different developmental stages including preliminary theoretical exploration, model establishment, and development. Through empirical testing, its measurement and evaluation system has gradually improved.

In 1979, J.O. Prochaska analyzed 18 psychology-related theories—including psychoanalysis, psychodynamics, existentialism, humanism, experiential therapy, interpersonal therapy, cognitive therapy, systems theory, and multiculturalism—in his monograph. After synthesis and integration, he formed a theoretical

approach to behavior change, hence the name “transtheoretical,” which became the preliminary theoretical foundation of TTM [3]. In 1983, Prochaska and C.C. DiClemente conducted empirical research on smoking cessation based on preliminary theoretical studies, formally proposing TTM [4], which divides health behavior promotion stages into pre-contemplation, contemplation, preparation, action, and maintenance. Since the preliminary theoretical exploration in 1979, TTM has undergone more than 40 years of development and become an important model for promoting health behavior change.

In the theoretical integration process, Prochaska identified five basic processes of change: consciousness raising, catharsis, choosing, conditional stimuli, and conditional control. In 1982, based on smoking cessation experiments, Prochaska and DiClemente made foundational theoretical summaries for TTM, conducting preliminary exploration and trials for its eventual establishment and proposal, forming the prototype of TTM change stages [5]. In this research, they pointed out that mastering adequate information helps improve self-awareness and find solutions to complex problems, while also noting that the external environment influences self-perception and intervention effectiveness. This shows that even in TTM’s embryonic stage, researchers recognized information’s role in the model, making forward-looking predictions and hypotheses for future integration with information research.

In 1983, TTM was formally proposed, comprising five change stages and ten corresponding change processes. The five stages are pre-contemplation, contemplation, action, maintenance, and relapse. The ten change processes are consciousness raising, self-liberation, social liberation, self-reevaluation, environmental reevaluation, counterconditioning, stimulus control, reinforcement management, dramatic relief, and helping relationships [4]. Research indicates that while all ten change processes may appear in different stages, each stage has distinct characteristic processes.

From 1991-1992, Prochaska and DiClemente found that previous research overemphasized component analysis of change stages while neglecting cluster analysis, thereby overlooking the preparation stage [7]. In studies by DiClemente et al. [8] and Prochaska et al. [9], the preparation stage was formally added to TTM, resulting in the now widely accepted TTM (see Figure 1 [Figure 1: see original paper]) and its mature stage division.

After more than ten years of theoretical exploration and development, TTM matured and became widely applied in health behavior promotion research, gaining high authority. Subsequent theoretical exploration and improvement of TTM relatively focused on perfecting the model’s measurement and evaluation system, predictive validation, and expanded development. For example, Prochaska et al. combined empirical studies of 12 unhealthy behaviors, discovering changing trends in decisional balance across different stages, providing reference for identifying appropriate intervention timing [11]. In 1996, Velicer et al., based on TTM, pointed out that measurement methods in traditional health behavior change research lacked precise definitions and statistical capabilities [12],

proposing a standard measurement model (Criterion Measurement Model) with three branches: positive evaluation strength, negative evaluation strength, and habit strength, which improved measurement methods. Subsequently, Velicer et al. in 1999 used smoking cessation data to validate 40 predictions from the 1994 study [13], providing empirical support for systematically studying transition characteristics across change stages.

In 2008, Prochaska conducted new research and analysis on decision-making in TTM-based behavior change, affirming that modern information technology plays a positive role in correct and effective decision-making when applying TTM to health behavior promotion [14].

3. Review of TTM and Information Research

During TTM's theoretical exploration stage, Prochaska et al. [5] emphasized and highlighted information's role throughout the model. In 1997, Prochaska and Velicer specifically discussed TTM's role and application in health behavior change, more explicitly pointing out the relationship between health behavior and information behavior: how to stimulate interest in health behavior, how to make decisions to perform health behavior, and how to promote maintenance after health behavior change are all closely related to information behavior [15].

Information behavior includes basic content such as information needs, information seeking, information giving, and information use. This section reviews literature linking TTM with information research to further explore the integration and application of information and information behavior in TTM.

Thus, this paper searched Chinese and foreign databases using "transtheoretical model" and "information behavior" as themes, finding relatively few related studies combining the two. After comprehensive analysis, representative empirical studies were selected for review.

In 2006, Israeli scholars J. Bar-Ilan et al. studied the role and function of information in long-term weight maintenance processes among 50 Israeli women aged 25-55 [17], providing innovative summaries and explorations for establishing integrated models combining TTM and information behavior. They proposed a cyclic model of weight loss-maintenance and related information behavior, shown in Figure 2 [Figure 2: see original paper]. Based on the real health behavior context of "weight gain," this model sets stages including "becoming motivated and intentional," "deciding," "taking action," and "maintaining," with different choices possible at each stage and regression possible, highlighting "cyclic" characteristics and reflecting researchers' vivid understanding of health behavior change as a continuous, spiral process.

The reference value of this study for exploring TTM and information research integration lies in its use of T.D. Wilson's definition of information behavior [18] as a foundation and Buckland's classification of information [19] to distinguish different information types. As shown in Figure 2, the "weight loss-maintenance"

process involves different information types including background information, motivational information, enabling information, reinforcement information, and information for building internal patterns. This helps identify information's role and function in health behavior intervention processes, thereby better understanding the types and functions of information collected, processed, used, and retained during weight loss (or maintenance) events. The study points out that attention should be paid to interaction between individuals and their environment during health behavior change, especially the process of individuals creating personal information fields based on available information and resources in specific contexts. Additionally, this study clarifies that in the pre-contemplation stage, individuals with unhealthy behaviors may be aware of problems but engage in information avoidance, ignoring relevant information. Although this study had a relatively small sample and focused on a single behavior, it made extremely beneficial explorations for combining TTM and information behavior, especially integrating information classification into health behavior promotion processes, emphasizing interaction of information behaviors across stages and construction of personal information fields, representing pioneering, milestone significance.

Beyond information type classification, some researchers have noted the diversity of information behaviors in health behavior change processes. N. Hirvonen et al., using Finnish male groups as samples, focused on studying information needs, information seeking, and certain information avoidance behaviors in physical activity and exercise [20]. This research focused on human-information interaction during health behavior change, providing detailed classification of information acquisition methods including active seeking, active scanning, non-directed monitoring, proxy services, and avoiding. The study examined information needs, acquisition, and avoidance across different stages, pointing out that customized information strategies should be adopted according to different stages to improve intervention effectiveness. This research helps more comprehensively understand different information behaviors existing in health behavior change processes, and combined with information type classification, further enriches and clarifies human-information interaction and utilization in health behavior change.

Domestic research on the combination of "TTM" and "information behavior" has received relatively little attention, focusing more on exploring specific health behavior changes based on TTM in the medical health field, with less concern for information behavior within it. Retrieval found that Chinese scholar Cao Jindan has paid more attention to the field of medical information management, conducting considerable research on the combination of TTM and information behavior and affirming TTM's application value. In 2017, Cao Jindan supervised doctoral student Li Guiling in proposing the "Information Behavior Impact on Health Behavior Change Theoretical Model" [21]. This model uses TTM-related psychological considerations such as "change processes," "decisional balance," and "self-efficacy" as mediating variables between information behavior and change stages, with "information behavior" as the independent variable and "change

stage” as the dependent variable. The model integrates information behavior and health behavior in a “function-structure” pattern, being comprehensive and focusing on psychological dimension changes during change processes.

Roughly bounded by 2010, with the development of information technology, popularization and optimization of mobile internet, and increased smartphone usage, research exploring mobile phone applications as carriers and implementation methods for combining TTM and information behavior has increased.

L.T. Cowan et al. analyzed the matching degree between exercise apps in Apple’s App Store “Health” category and behavior change theory [22], providing direction for mobile app development and health behavior change theory (such as TTM) integration. The positive role of mobile apps in health promotion behavior has been preliminarily confirmed: A. Hamper found that mobile technology’s high penetration, high presence, and high-tech advantages help intervene according to users’ different change stages, integrating cognitive, behavioral strategies, and physical activities, facilitating users’ healthy habit formation [23]; N. Matias et al. focused on the combination of mobile health and behavior change theory, confirming that intervention measures based on theory or clearly described theoretical structures can effectively change related behaviors through remote mobile health [24], while also noting that personalized recommendation information and innovative interactive technology help motivate individuals to pay attention to their health status. These studies provide verification and exploration for applying TTM and information behavior integration in the mobile internet era, highlighting TTM’s applicability.

4. Prospects for TTM and Information Research

After nearly 40 years of development, TTM has gradually matured and been widely applied in health behavior promotion empirical research, possessing high authority. Throughout its development, researchers have noted and emphasized the role of information and information technology. Health behavior promotion has strong contextual characteristics, with people interacting with and utilizing specific information in these contexts, while information grounds are precisely where people exchange and use information.

The place where J. Bar-Ilan et al. established the cyclic model of weight loss-maintenance and related information behavior [17], though relatively focused on female weight loss behavior with certain applicability limitations, emphasizes research subjects’ information behavior in establishing personal information fields and conducts pioneering research on information roles and classification, dividing them into background information, motivational information, supportive information, reinforcement information, and other types, helping classify and summarize various information in health behavior promotion processes.

While emphasizing information classification, it is necessary to distinguish research subjects’ information behaviors. The study by N. Hirvonen et al. [20] distinguished information needs and behaviors across different stages of phys-

ical exercise, especially classifying information acquisition methods into active seeking, active scanning, non-directed monitoring, proxy services, and information avoidance, providing beneficial exploration for studying the combination of health behavior promotion and information behavior.

Li Guiling's "Information Behavior Impact on Health Behavior Change Theoretical Model" [21] proposed mediating variables of information behavior's impact on change processes, helping understand the mechanism of how information behavior influences health behavior, though it has certain ambiguities, focusing information behavior research relatively more on the pre-contemplation and preparation stages, awaiting further expansion.

Inspired by the above research, this paper organizes information types and information behaviors involved in relevant empirical research according to TTM's change stages and specific processes, focusing on human-information interaction and specific information behaviors during health behavior change processes, thereby forming a diagram of information types and information behaviors involved in each TTM stage, shown in Figure 3 [Figure 3: see original paper], to more intuitively and systematically display the interaction and connection between health behavior promotion and information behavior.

Based on the health behavior promotion context, as shown in Figure 3 [Figure 3: see original paper], in the pre-contemplation stage, research subjects relatively lack information needs related to health behavior promotion, obtaining background information passively through non-directed monitoring. Meanwhile, due to not yet awakening awareness of changing unhealthy behaviors and lacking information needs, information needs at this stage are figuratively expressed as "0." This stage also involves certain information avoidance behaviors, ignoring relevant background information.

As consciousness awakens and individuals enter the contemplation stage, research subjects realize the need to change unhealthy behaviors. At this stage, information needs achieve a transformation from 0 to 1, meaning preliminary information needs emerge, but the amount of information needed is relatively limited, figuratively represented as "1." Subjects begin seeking background, motivational, and supportive information useful for changing unhealthy behaviors; background, motivational, and supportive information passively obtained in the information environment may also be adopted. Subjects' information interaction behavior is no longer simply passively receiving information in the environment but begins actively constructing personal information fields. The support and motivation provided by information promote subjects to conduct re-evaluation, and after evaluation, they enter the preparation stage. At this stage, subjects more actively perform information seeking behaviors, obtaining more motivational and supportive information directly related to health behavior change, with information needs further increasing, achieving a transformation from limited (1) to abundant (N).

Adequate information supports subjects in decision-making, moving from the

preparation stage to the action stage. At this stage, as they begin changing unhealthy behaviors, information needs further increase compared to the previous stage, using “N+1” to indicate that information needs at this stage are greater than the “N” of the previous stage. Subjects tend to seek supportive and reinforcement information to consolidate and maintain change trends.

After the action stage, subjects are expected to experience behavioral reinforcement, improved counterconditioning ability, enhanced stimulus control ability, and improved helping relationships, gradually entering the maintenance stage—the mature stage of behavior change. At this stage, as unhealthy behaviors have transformed into healthy behaviors, subjects’ information needs are relatively stable, mainly requiring reinforcement information. Specific information behaviors shift from purpose-driven, more active information seeking to relatively peaceful information browsing.

Thus, based on the TTM framework, existing research can confirm that research subjects may gradually establish personal information fields through active or passive information acquisition, supporting personal decision-making, achieving changes in self-efficacy, self-awareness, and self-knowledge structures during specific processes, and triggering health behavior promotion processes.

It should be noted that the information types and information behavior diagram (Figure 3) presented in this paper only summarizes existing research. Currently, there is no relatively systematic empirical research actually exploring specific information behaviors during health behavior change processes and the information types that research subjects’ information behaviors interact with. More specifically, throughout the health behavior change process, actual changes in information needs at different stages, the proportion of information behaviors, preferences for information acquisition methods, etc., all require systematic and detailed research plans for in-depth study.

During the literature review, the author found that the health behavior change processes studied by TTM often have long-term characteristics, and possible regression between stages extends the time required to explore the complete change process. Meanwhile, information behavior research requires recording subjects’ searching, browsing, and other information behaviors, as well as recording the information content interacted with, which has certain complexity and requires certain professional training for research subjects to achieve accurate and comprehensive recording as much as possible. Therefore, compared with the long-term health behavior change process and the relatively complex information behavior recording research model, there are certain obstacles to exploring the role and impact of information behavior during health behavior change processes. The author speculates this is also why such research is currently relatively scarce. This paper hopes that through literature review, forming the information types and information behaviors in different stages in Figure 3, it can provide certain reference and inspiration for comprehensive exploration of TTM and information behavior.

In TTM's development history and empirical studies combining it with information behavior, considering some researchers' psychology backgrounds, the specific role and mechanism of information have not been deeply explored.

Through reviewing TTM and human information behavior research, this paper summarizes information types and information behaviors involved in various stages of health behavior promotion, hoping to provide reference for future exploration of changes in information needs across different stages, the proportion of information behaviors, preferences for information acquisition methods, and the mechanism of how information behavior influences change processes, achieving deep integration of TTM and human information behavior research, thereby facilitating planning and formulation of health behavior promotion strategies, creating a good information environment with theoretical support, providing support for designing and developing theoretically grounded health promotion mobile applications, promoting healthy habit formation, improving public health levels, and enhancing quality of life.

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Author Contributions:

Zhang Miaomiao: Proposed the research topic, planned the research framework, and revised the paper;

Ding Yi: Collected literature and wrote the paper, created figures.

Note: Figure translations are in progress. See original paper for figures.

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