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Prior knowledge determines interest in learning in physical education: A structural growth model perspective

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ABSTRACT

Research has shown that interest in knowledge facilitates students' academic achievement in learning. Because individual interest is often based on how much one knows, in other words existing or prior knowledge, studying adolescents' interest in health-enhancing physical activity and its benefits should address the relation between the interest and their existing or prior physical activity knowledge. Understanding this relationship may help us facilitate students to not only develop interest in knowing more about but also actual adopt a healthy, active lifestyle. This study used a large-sample structural equation design to identify the relationship between middle school students' interest in physical activity knowledge and their prior physical activity knowledge, and to assess the change of this relationship over time. Guided by the declarative-procedural knowledge framework, latent growth models were developed and tested on data collected from a random sample of 3882 students from ten middle schools. The latent growth curve model indicated that, 1) on average, students experienced a significant interest decline in both procedural and declarative knowledge; 2) prior knowledge helped slow the decline and facilitated interest growth in knowledgeable students. The results suggest that existing knowledge determined the interest change.

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1. Introduction

Due to unprecedentedly high rates of hypokinetic diseases, it has become a consensus that mastery of physical activity knowledge can assist individuals in making healthy lifestyle decisions, which in turn will improve their health (Sallis et al., 1986a, 1986b). Research findings suggest that knowledge about active lifestyle and physical activity is a strong predictor for healthy lifestyle development (Dominick, Dunsiger, Pekmezi, & Marcus, 2013; Nguyen, Gordon, & McCullough, 2011; Sallis et al., 1986a, 1986b; Staiano et al., 2012; Tolvanen, Lahti, Miettunen, & Hausen, 2012). Therefore, to achieve a healthy lifestyle, people should become knowledgeable about the benefits of physical activity, healthy diet, and healthy lifestyles.

In physical education, it is expected that school students learn knowledge, skill, and behavior for a healthful, active lifestyle (U.S. Institute of Medicine, 2013). The learning of physical activity knowledge, however, is influenced by many factors. As one major factor, interest in knowledge motivates students to learn. However, a lack of interest in knowledge has been identified as a concern in American public schools (Jones, Howe, & Rua, 2000). It has been reported that interest in scientific knowledge gradually declines during middle school years (George, 2000). As a domain of scientific knowledge, knowledge about physical activity is related to physical movement and its benefits to human health and performance (Whitehead, 2010). However, the condition of students' interest in physical activity knowledge and its changing trajectory are largely under investigated. Consequently, it is not clear that to what extent the interest in physical activity knowledge will facilitate or hinder the development of the knowledge itself and behavior.

Declining interest in physical activity knowledge may lead to the development of undesired behavioral changes in adolescents. Facing nationwide obesity epidemic, it is urgent to navigate middle school students' interest in physical activity knowledge and to possibly change the trajectory of their interest in the knowledge. The purpose of this study was to identify the relationship between changes in interest in physical activity knowledge and existing physical activity knowledge. Specifically, the study was attempted to determine the role of prior

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knowledge of physical activity in predicting changes of interest in physical activity knowledge.

2. Theoretical framework

2.1. Conceptualization of interest

According to the domain learning theory (Alexander, Jetton, & Kulikowich, 1995), interest in the content to be learned plays an increasingly strong role in motivating learners moving from the acclimation learning stage to the competence and proficiency stages. Learner motivation in these learning stages is likely to rely on personal or individual interest in the content and the extent to which the individual's prior knowledge supports the interest (Chen & Hancock, 2006). The role of prior-knowledge in interest growth and learning achievement has been documented in many classroom studies (e.g., Alexander, Kulikowich, & Schulze, 1994; Cook, 2006). It can be hypothesized that prior knowledge serves as a necessary and sufficient condition for the development of learners' interest in continuing to learn the knowledge further.

Cognitive psychologists (Alexander et al., 1994; Dai & Sternberg, 2008) believe that interest is where motivation and cognition meet to impact learning. As Dai and Sternberg (2008) put it, "To be interested in something is to have a subjective feeling for it (affect), to be drawn to it (conation), and to have some degree of knowledge about the object or activity in question (cognition)" (p. 14). In addition, a strong interest in a knowledge domain can facilitate students to adopt different learning strategies to further learn new knowledge (Shen, Chen, Tolley, & Scrabis, 2003). Thus, helping students become interested in a knowledge domain is critical to their learning.

As a psychological construct of motivation, interest is multi-dimensional. It exists on both cognitive and affective dimensions (Hidi, Renninger, & Krapp, 2004). In other words, interest actively interacts with an individual's cognition and conation during the person-object/task interaction (Hidi, 1990). From a temporal perspective, interest could be conceptualized as personal and situational. Personal interest is a relatively stable motivation state that drives a learner to interact with a task of personal preference (Hidi, 2001). In other words, this interest is personal in that it is an individual's disposition of enduring preference for a particular object or activity. Personal interest is acknowledged as the basis for intrinsic motivation for its "important directive role in intrinsically motivated behavior in that people naturally approach activities" (Deci & Ryan, 1985, p.34). The existence of personal interest relies in large part on prior knowledge (Hidi, 1990; Schiefele, 1991). From this perspective, personal interest in any knowledge domain motivates the individual to learn not only because it provides compatibility between personal preferences and knowledge to be learned, but also because it prepares the individual with a necessary existing association between mental readiness and anticipation of achievement (Krapp & Prenzel, 2011).

Situational interest, on the other hand, is a highly temporal motivation state created by an individual's instant appreciation of appealing characteristics in a task that the individual is being or is about to be engaged in. In educational settings, situational interest often "arises spontaneously due to environmental factors such as task instructions" (Schraw, Flowerday, & Lehman, 2001, p. 211). Therefore, motivation driven by situational interest is also highly intrinsic. Although situational interest can also be utilized to facilitate students' learning, it is highly spontaneous, transitory, and environmentally activated (Krapp, Hidi, & Renninger, 1992). Therefore, situational interest does not derive from or rely on one's prior knowledge about the task. Nevertheless, the boundary between situational interest and personal interest is not rigid. Repeatedly evoked by some environmental stimuli, one can internalize situational interest and eventually develop it into a long lasting individual interest (Hidi & Harackiewicz, 2000).

Research on interest in particular knowledge domains is characterized by a topological model conceptualizing interests in terms of three personally defined scopes of knowledge (Haeussler, 1987; Haeussler & Hoffmann, 2000). The first scope of interest is the focus on a narrow topic in a knowledge domain. For example, a student may hold strong interest in knowledge about circulating angiogenic cells, a narrowly defined topic in the domain of exercise physiology. The second scope is the interest in a particular context where a narrowly defined topic is presented. For instance, a student can display a strong interest in the physically-active environment/context the teacher created to help the student understand the topic of circulating angiogenic cells. The third scope is the interest in particular actions in discovery. For example, a student is interested in exploring how the level of circulating angiogenic cells responds to acute and/or chronic exercise and relates to cardiovascular diseases. This scope of interest usually goes beyond what the classroom instruction can offer and is strongly associated with the individual's subjective beliefs or values about the knowledge being learned.

Extended from the above conceptualization of interest and its relation with prior knowledge, it can be assumed that although students' interest in knowing general science or knowledge about physical activity is declining, they may be still interested in knowing specific, personally meaningful knowledge components such as how to follow scientifically sound principles in exercise or the context in which they can use physical activity knowledge to enhance their own health. The above conceptualization of interest in relation to knowledge scopes implies that personal interest can also be understood in two dimensions, interest in knowing factual information (declarative knowledge) and interest in taking actions (procedural knowledge). Exploring and developing this conceptualization is particularly important in the field of physical education because factual/declarative knowledge is only relevant when it can be internalized into executable forms, that is, procedural knowledge.

2.2. Knowledge and interest

Knowledge refers to one's understanding of a given domain in either a declarative (factual) or procedural (skillful execution) form (Alexander, Schallert, & Hare, 1991). Declarative knowledge is conceptual understanding about facts (i.e., knowing what), whereas procedural knowledge is conceptual understanding about applying the factual knowledge (i.e., knowing how) (Lawless & Kulikowich, 2006). Associated with procedural knowledge is conditional knowledge, which is the conceptual understanding about conditions required for one to successfully act upon declarative knowledge (i.e., knowing when and why). Thus, in the framework of declarative/procedural knowledge, students who are particularly interested in activities of using physical activity knowledge are attracted to procedural knowledge. Additionally, due to the fact that physical activity knowledge is one specific knowledge domain, students' interest in declarative and procedural knowledge about physical activity could be highly correlated.

Scholars have investigated the relationship between knowledge and interest. Students with high personal interest in a knowledge domain are likely to continue to acquire additional knowledge in that domain, because they are naturally drawn to the subject and willing to spend more time and effort on knowing more about the subject (Tobias, 1994). In turn, increased knowledge in a domain is likely to strengthen the interest, because the expanded knowledge affords the individual to extend the knowledge base on which interest is developed and sustained. Alexander et al. (1994) once described the linear interest-knowledge relationship: the relationship is weak in students with low and intermediate levels of knowledge and is becoming stronger with knowledge growth and is stronger in knowledgeable students. Studies conducted on various populations and domains have confirmed this relationship (see Carnine & Carnine, 2004; Morris, Tweedy, & Gruneberg, 1985; Schneider & Bjorklund, 1992; Willingham, 2007).