치의과학박사 학위논문

# Effects of motives for selecting a major on approach to learning and mental health: a multiple-mediation analysis

## 전공 선택에 대한 동기가 학습 접근 및 정신 건강에 미치는 영향: 다중매개모형 중심으로

2023년 8월

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# Effects of motives for selecting a major on approach to learning and mental health: a multiple-mediation analysis

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이 논문을 치의과학박사 학위논문으로 제출함
2023년 5월

서울대학교 대학원
치의과학과 치의학교육학 전공

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신용민의 치의과학박사 학위논문을 인준함
2023년 7월

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# Abstract

**Background:** The field of dental education is highly competitive and demanding, leading to significant stress and mental health issues among dental students. This pressure can cause students to rely on surface learning strategies instead of truly understanding the material. It's important to identify struggling students and offer them educational and psychological support by understanding the differences between successful students who excel academically and thrive in their school and those who struggle. To this end, the present study endeavors to identify the latent mechanisms that underlie the relationships between goals and motives for their studies and the characteristics related to learning approaches and mental health across two studies.

**Methods:** Study 1 involved 226 dental students who completed four questionnaires designed to measure motives for selecting and pursuing their studies, a deep approach to learning, mindsets, and academic engagement. Covariance-based structural equation modeling was utilized to analyze the mediation effects of academic engagement on the relationship between the students' motives and a deep approach to learning, as well as to determine the influence of mindsets on the motives. In Study 2-1, the same 226 dental students from Study 1 completed three questionnaires measuring the motives for their studies, sense of coherence, and depression. Partial least squares structural equation modeling was employed to analyze the relationship between students' motives and depression through sense of coherence. Lastly, to replicate and extend the findings of Study 2-1, Study 2-2 recruited a total of 371 participants, consisting of 240 dental students and 131 medical students. These participants completed the same measures as Study 2-1, along with additional measures assessing experiential avoidance and mental well-being. The same statistical analysis used in Study 2-1 was employed to analyze the relationship between the students' motives and depression and mental well-being through sense of coherence and

experiential avoidance.

**Results:** Study 1 revealed the significant relationships of growth mindset with careerism, personal growth, and humanitarianism among the students' motives. Moreover, this study found that a fixed mindset was associated with careerism, expectation-driven motive, and default motive. Furthermore, academic engagement only fully mediated the significant positive relationship between personal-intellectual development motive and a deep approach to learning, whereas careerism negatively predicted the learning approach without the mediator. In Study 2-1, personal-intellectual development motive was found to negatively predict depressive symptoms through an increase in sense of coherence, whereas expectation-driven motive and default motive positively predicted depressive symptoms through a decrease in sense of coherence. According to the results of the Study 2-2, personal-intellectual development motive was found to negatively predict depressive symptoms and positively predict well-being through an increase in sense of coherence. In contrast, expectation-driven motive and default motive positively predicted depressive symptoms and negatively predicted well-being through a decrease in sense of coherence and an increase in experiential avoidance. Notably, humanitarianism positively and directly predicted well-being only.

**Conclusions:** These findings underscore the significance of promoting personal growth motive and humanitarianism, along with implementing educational and psychological interventions for dental students with careerism, expectation-driven motive, and default motive. Such interventions should incorporate components that facilitate the cultivation of a growth mindset and sense of coherence, while concurrently mitigating a fixed mindset and experiential avoidance.

**Keyword:** Motives for selecting a major, Deep approach to learning, Mindsets, Sense of coherence, Experiential avoidance, Mental health

Student Number: 2019-38300

# Contents

# Introduction

Dental education is widely acknowledged as a rigorous and demanding educational pursuit that necessitates comprehensive academic training, extensive clinical exposure, and a significant level of commitment and devotion to patient care. Not only do top-performing students academically enter dental schools, but a high level of achievement is also expected of them upon admission, which is considered a standard and therefore leads to a highly competitive and stressful environment. Moreover, the complex nature of evaluations, grades, and workload exerts substantial pressure on dental students, and as they advance through their academic curriculum, the stress associated with these factors typically intensifies (Elani et al., 2014). Indeed, previous research has shown that dental students exhibit higher levels of anxiety, depression, obsessive-compulsive disorder, and interpersonal sensitivity compared to students in other disciplines or the general population (Cooper et al., 1987; Uraz et al., 2013; Wexler, 1978). Additionally, as students progress to higher academic levels, the increasing physical and psychological demands linked with academic requirements can hinder their engagement and mastery of the learning content, leading them to adopt surface learning strategies such as rote memorization instead of striving to comprehend and internalize the material (Lee et al., 2020). Nevertheless, while some students excel academically and thrive in the school environment, others face difficulties with academic pursuits and overall student life. Understanding this dichotomy could provide valuable insights for identifying struggling students at an early stage and offering them timely and tailored support. It could also offer dental schools an opportunity to positively impact such students.

Motivation has long been a conventional subject of inquiry in the fields of psychology and education, characterized by sustained scrutiny of its multifaceted effects on learning and mental health (Baeten et al., 2013; Reeve, 2012; Ryan & Deci, 2019). It exerts a

significant influence on an individual's behavior and determines the level of exertion and persistence they apply to achieve a goal (Ryan & Deci, 2000a). In the domain of healthcare education, the comprehension of the elements correlated with students' motivation assumes paramount significance. Such understanding can inform the critical determinants of successful school life in a rigorous and challenging dental education curriculum, as well as the development of effective strategies for promoting students' engagement, well-being, and ultimately, academic achievement.

The present study focuses on the goals and motives that drive individuals to choose and pursue healthcare studies, among various motivational factors. Healthcare-related students, including dental and medical students, have various motives for their pursuit of higher education. According to empirical research, these motives encompass a range of factors, such as the prospects of employment opportunities and high income, a desire to help and care for others, intellectual curiosity, family expectations, and so forth (Banabilh, 2013; McManus et al., 2006; Scarbecz & Ross, 2002; Sulong et al., 2014). Goals and motives for their studies play a critical role in shaping learning strategies, academic performance, and mental health (Ntoumanis et al., 2009; Kusurkar et al., 2013a; Kusurkar et al., 2013b). Moreover, initial academic motivation and goals have a consistent impact on the aforementioned outcomes (e.g., Corpus et al., 2020; Holding et al., 2020).

The establishment of personal goals and motives is inherently driven by individual needs, serving as a means of satisfying those needs and providing the impetus for their accomplishment (Dweck, 2017). These individual needs encompass both physiological and psychological needs. For instance, medical students from middle to low-income countries may require a greater degree of satisfaction of their physiological and stability needs in comparison to their high-income counterparts due to their socio-economic status (Goel et al., 2018; Maslow, 1943). Consequently, in nations with middle to low-income levels, motives for studying medicine, such as promising

income prospects, parental expectations, and employment stability, wield greater influence relative to their wealthier counterparts (Goel et al., 2018).

Physiological needs alone do not dictate the goals and motives of students; psychological needs, including autonomy, relatedness, and competence, also play an indispensable role (Kasser et al., 1995). Specifically, the broad range of experiences that individuals encounter in their pursuit and fulfillment of these psychological needs exerts a profound influence on their mental representation, shaping their future goal orientation and approach to achieving them (Dweck, 2017). Those who succeed in fulfilling their psychological needs are more inclined to set intrinsic goals that align with their personal aspirations, such as personal growth or social contribution. The satisfaction of these needs invests an individual's life experiences with significance, enabling active participation in valuable and purposeful activities and enhancing overall well-being (Chalofsky & Krishna, 2009; Crego et al., 2020; Martela et al., 2018). Conversely, those who experience frustration in meeting their psychological needs are liable to pursue extrinsic goals that serve as substitutes for unmet needs, such as wealth or social status, which can ultimately impede the satisfaction of authentic needs (Ryan & Deci, 2019).

The present theoretical explanations are supported by a validated corpus of empirical research that predominantly focus on non-healthcare students. Specifically, the research has shown that there is a significant connection between intrinsic goals and favorable educational outcomes, as well as positive psychological outcomes, such as intrinsic academic motivation, deep approach to learning, academic achievement, and subjective well-being (Côté & Levine, 1997; Kasser, 2016; Monnot & Beehr, 2022; Wilding & Andrews, 2006). In contrast, it has been demonstrated that extrinsic goals have a positive correlation with undesirable outcomes, such as extrinsic academic motivation, surface approach to learning, and mental illness (Vansteenkiste et al., 2004; 2006; Kashdan & Breen, 2007).

Drawing upon the theoretical considerations and empirical

findings expounded above, there exists a likelihood that the association between the motives and purposes of healthcare students' admission and their learning and mental health shall replicate the findings of the earlier studies conducted on non-healthcare students. Therefore, it is possible to discern with ease whether dental students exhibit strengths or risk factors in their learning or mental health by examining their admission motives and goals. However, healthcare education, encompassing dental and medical domains, has paid comparatively little attention to the underlying motives and goals of students. That is, the related literature predominantly focuses on categorizing and assessing the prevalence of admission motives among students (e.g., Goel et al., 2018; Herz & ElAyouti, 2021).

To illustrate, Goel et al. (2018) examined the differences in motives for choosing a medical major among students based on the economic level of their respective countries, while Herz and ElAyouti (2021) identified the differences in motives for dental school admission among students based on criteria such as gender and apprenticeship plans and experiences. These studies provide educational implications regarding students' goals and motives according to demographic characteristics. However, the exploration of how these motives relate to academic and psychological outcomes for dental and medical students remains limited.

Some research has investigated the effects of the motives on students' learning and mental health (e.g., Győrffy et al., 2016; Kim et al., 2016; Pagnin et al., 2013). Kim and colleagues (2016) demonstrated that medical students driven by intrinsic motives related to career choice exhibited superior performance in terms of GPA, admissions interviews, and academic interest compared to those motivated by extrinsic factors. Additionally, Pagnin et al. (2013) reported that while career choice motivated by illness or death experiences significantly correlated with burnout. However, these studies have not directly investigated the mechanisms through which the motives for students' choice of major predict academic and mental

health outcomes.

The primary objective of this inquiry is to investigate the intricate connections among admission motives, approaches to learning, and mental health outcomes (i.e., depression and mental well-being) of dental students. To accomplish this goal, the present study aims to identify the distinct effects of each goal and motive on students' characteristics related to learning and mental health, with the purpose of determining which motives have significant impacts on the learning and mental well-being of dental students. Previous studies, particularly those founded on self-determination theory, have classified various goals and motives into intrinsic and extrinsic categories to ascertain their influences. However, upon scrutinizing certain research that examines the impacts of students' respective purposes and motives, it is evident that each goal and motive, even if they belong to the same intrinsic or extrinsic category, has unique effects.

For instance, Zhoc et al. (2019) found that, while both wealth-oriented and fame-oriented goals can be categorized as extrinsic goals, the former was negatively related to self-control, whereas the latter was positively correlated with self-control. Their research also indicated that among the three intrinsic goals, namely family-oriented, career-oriented, and society-oriented future goals, the society-oriented future goal exhibited the strongest relationship with both self-control and distal learning outcomes. Regarding mental health, Győrffy et al. (2016) demonstrated that a low level of altruistic motive may constitute a risk factor for burnout. Hence, it is imperative to comprehend each influence of students' motives and goals, for although there may exist similarities among intrinsic or extrinsic goals, there may be divergences in individual outcomes.

Furthermore, the present study endeavors to identify the latent mechanisms that underlie the relationships between the motives and the dependent variables by utilizing a structural equation modeling-based mediation model. As mentioned above, the scarcity of research pertaining to the fundamental mechanism that underpins these

relationships, including studies that encompass non-healthcare students, is notable. The identification of these mechanisms may offer crucial insights for performing or developing targeted interventions. To this end, this study explores the interplay among variables that have theoretical connections but remain unexplored.

In terms of students' learning, based on previous research, extrinsic goals have been found to impede deep engagement with learning materials, while intrinsic goals are linked to increased effort and persistence in learning (Vansteenkiste et al., 2004; Wilding & Andrews, 2006). Although several factors may contribute to this relationship, the current study aims to examine the mental frames of students with specific motives and goals. Mindset is one of the primary psychological factors that influences motivation (Haimovitz et al., 2011; Nalipay et al., 2021). Individuals tend to selectively accept and interpret information that aligns with their mindset, which can impact their responses (Crum et al., 2013).

Depending on one's mindset, individuals may perceive their intelligence as either malleable and open to improvement (i.e., growth mindset), motivating them to pursue mastery of new skills and knowledge, or as stable and unchangeable (i.e., fixed mindset), motivating them to demonstrate their existing abilities or avoid being perceived as incompetent (i.e., performance goal orientation) (Dweck and Molden, 2017; Yu & McLellan, 2020). Personal goals are also closely related to such motivational factors, as research has shown that mastery goal orientation is associated with intrinsic goals, while performance goal orientation is linked to extrinsic goals (Lee et al., 2010). However, notwithstanding the fact that both mindset and personal goals share similarities with such motivational factors, there is a dearth of research on the relation between personal goals and motives for academic pursuits and mindset. Therefore, this study aims to identify the relationship between students' admission motives, mindset, and learning approach, with the purpose of providing crucial evidence for effective interventions that can lead to positive academic outcomes.

From a mental health perspective, the present study also focuses on the mediating role of sense of coherence as a protective factor, and experiential avoidance as a risk factor, in the relationship between the motives for studying and mental health. Sense of coherence is related to an individual's propensities to perceive life events in a meaningful way, comprehend, and manage them, and it has been recognized as a protective factor for various mental health issues (e.g., Ito et al., 2015; Schäfer et al., 2018; Tselebis et al., 2001). Conversely, experiential avoidance refers to the tendency to avoid negative emotions, thoughts, and sensations, and it represents a significant risk factor for mental health problems (Bardeen & Fergus, 2016; Hayes et al., 2012b). Furthermore, sense of coherence exhibits a significant association with the satisfaction of basic psychological needs whereas experience avoidance is linked to their thwarting, much like personal goals and motives (Ma et al., 2020; Wang et al., 2023); however, the mediating role of these factors remains understudied. Therefore, the aim of this study is to investigate the relationship between admission motives, the aforementioned protective and risk factors of mental health, and psychological health outcomes. This research has employed an exploratory approach and was conducted over two studies to ensure both the replication and extension of the findings.

# Literature Review

## 1. Motives for attending university

The reasons underlying students' decision to enroll in university, or their Motives for Attending University (MAU), are closely related to their individual aspirations and goals for the future, including intrinsic pursuits such as personal development, and extrinsic objectives such as attaining elevated social status (Ryan & Deci, 2000a). Côté and Levine (1997) identified five factors of MAU, which can be broadly classified into intrinsic, extrinsic, and uncertain reasons for attending university: 1) Personal–intellectual development motivation (PER) involves an interest in personal growth, intellectual development, and understanding the complexities of life and the world (Côté and Levine, 1997); 2) Humanitarian motivation (HUM) pertains to concerns related to helping others and improving the world and the system (Côté and Levine, 1997); 3) Careerist–materialist motivation (CAR) reflects the view of the university as a means of achieving a successful career, higher socioeconomic status, and other materialistic goals (Côté and Levine, 1997); 4) Expectation–driven motivation (EXP) is related to meeting the expectations and pressures of family and friends to attend university and earn a degree (Côté and Levine, 1997); and 5) Default motivation (DEF) refers to the state in which students attend university without a clear reason and consider their admission as a better option than other alternatives (Côté and Levine, 1997).

Empirical evidence indicates that students possessing intrinsic MAU, such as PER and HUM, exhibit more favorable educational outcomes in the future compared to students with other forms of MAU. For instance, Côté and Levine (1997) discovered that both PER and CAR in the first year of college positively predicted self–management and self–motivation skills in the third year of college. Similarly, PER and HUM in the first year of college were found to positively predict academic achievement in the third year of college.

Conversely, DEF in the first year of college negatively predicted the self-motivation skills and academic achievement two years later. Additionally, Hyytinen et al. (2022) provided significant insights into the relations of PER and HUM with intrinsic motivation, CAR and EXP with extrinsic motivation, and DEF with the absence of motivation, revealing that study-related burnout is negatively related to PER but positively related to DEF, while GPA is positively correlated with PER but negatively with DEF.

The present study utilizes the rationale grounded in self-determination theory (SDT) to explore the influence of dental students' MAU on their learning behavior and mental health. Although the theoretical underpinnings of Côté and Levine's concept of MAU differ from those of SDT, their conceptual similarities are highly significant. Specifically, while Côté and Levine's concept delves into the motives behind enrollment and academic pursuits, SDT addresses individuals' overall goals and motives. However, both concepts share a commonality in explaining intrinsic and extrinsic goals as well as the absence of any goals. Especially, SDT offers a robust framework for the classification of goals and motives, their impacts on various outcomes, and the underlying factors contributing to their development.

Moreover, the aforementioned findings of prior research on the impact of MAU on learning and mental health are consistent with those based on SDT. Previous research has revealed that individuals who prioritize intrinsic goals (e.g., personal growth, community contribution, and affiliation) tend to have intrinsic motivation, while those who prioritize extrinsic goals (e.g., fame, financial success, and recognition) are more likely to be motivated extrinsically (Sheldon & Kasser, 1995). Moreover, compared to extrinsic goals, intrinsic goals are associated with better academic performance, deeper engagement in learning, and enhanced well-being (Ryan & Deci, 2019; Vansteenkiste et al., 2004; Vansteenkiste et al., 2006; Wilding & Andrews, 2006).

Therefore, SDT can furnish a strong and comprehensive

theoretical foundation for the outcomes of this research. The forthcoming section will review the effects of individual motives for academic pursuit on learning and mental health, drawing on the theoretical framework of SDT.

## 2. Self-determination theory

SDT is a comprehensive theoretical framework that encompasses a wide range of human properties, such as personal basic needs, motivation, and life goals (Ryan & Deci, 2019). Within this framework, numerous studies on human development and wellness have been conducted (e.g., Neufeld et al., 2020; Taylor et al., 2014). SDT is a macro-theory that comprises six mini-theories, including Cognitive evaluation theory (CET), Organismic integration theory (OIT), Basic psychological needs theory (BPNT), Causality orientation theory (COT), Goal content theory (GCT), and Relationship motivation theory (RMT) (Ryan & Deci, 2019). The reason why SDT comprises these mini-theories, which can provide various explanations for human characteristics, is due to its continuous refinement and supplementation based on empirical research. Given that the present study focuses on the effect of the reasons for dental studies on approach to learning and mental health, BPNT, OIT, and GCT will be further explained among the six mini-theories mentioned above.

### 2.1. Basic psychological needs theory

BPNT, a mini-theory of SDT, encompasses the characteristics of personal wellbeing and flourishing, as well as their precursors (Ryan & Deci, 2019). According to BPNT, the fulfillment of the basic psychological needs of individuals is crucial for their psychological growth and development (Ryan & Deci, 2000b). The satisfaction of these needs, which are universal and inherent across cultures, promotes psychological well-being, whereas their thwarting can

result in various forms of psychopathology in severe cases (Chen et al., 2015; Vansteenkiste & Ryan, 2013).

BPNT identifies three fundamental needs: autonomy, relatedness, and competence. Autonomy pertains to the need to experience volition in one's actions, thoughts, and emotions. When this need is satisfied, one experiences a sense of integrity; however, when frustrated, one experiences psychological pressure and helplessness. Relatedness is the need to feel connected to and valued by others. Social alienation, exclusion, and loneliness thwart relatedness. Competence refers to the need to be a proficient individual or to enhance and expand one's abilities, skills, and talents. If this need is thwarted, one experiences a sense of incompetence and failure (Ryan & Deci, 2017).

Individuals have inclinations to fulfill the three basic needs and to avoid their frustration. The satisfaction or frustration of these needs results in various outcomes. Support for these needs nurtures intrinsic motivation and internalization, which denotes the assimilation or acceptance of ambient values or practices (i.e., extrinsically motivated activities) (Ryan & Deci, 2017). Moreover, support for these needs from others (e.g., parents, teachers) during childhood or adolescence is positively associated with the development of executive function (Bindman et al., 2015), desirable academic outcomes such as engagement and achievement (Vasquez et al., 2016), and school-related subjective well-being (Tian et al., 2014). In contrast, need frustration predicts diverse forms of dysfunctional behavior and ill-being, including anxiety and depression (Wei et al., 2005), aggression (Kuzucu & Şimşek, 2013), burnout (Li et al., 2013), and dishonesty (Kanat-Maymon et al., 2015).

## 2.2. Organismic integration theory

OIT has expanded the dichotomous categorization of motivation, which distinguishes between intrinsic and extrinsic motivation,

through the introduction of a diverse range of motivational facets (Ryan et al., 1985). This range encompasses the entire spectrum of motivation, ranging from the purely self-driven intrinsic motivation to the complete absence of motivation as represented by amotivation. Additionally, the spectrum encompasses four distinct classifications of extrinsic motivation (Ryan et al., 1985).

The degree of autonomy determines the various and heterogeneous types of extrinsic motivation or regulatory style. As the least self-determined form of motivation, external regulation entails that an individual is driven by extrinsic pressures, penalties, and incentives. Consequently, the underlying rationales for engaging in the behavior remain uninternalized (Vansteenkiste et al, 2006). Introjected regulation refers to the behavioral regulation that is internally driven by various pressures, as manifested in contingent self-worth, self-aggrandizement, and the avoidance of negative emotions such as anxiety, guilt, or shame. The regulation of behavior is partly internalized, yet not fully assimilated as one's own. Consequently, the associated conduct does not originate from an individual's intrinsic sense of self, leading to feelings of compulsion or coercion (Vansteenkiste et al., 2006). Furthermore, introjected behavior is susceptible to fragility, particularly when confronted with setbacks or blows to the ego, and poses potential hazards to well-being (Ryan & Deci, 2019).

External and introjected regulations are considered to be controlled forms of extrinsic motivation, whereas identified and integrated regulations are considered to be more self-determined and autonomous manifestations of this type of motivation. Identified and integrated regulations are internalized to a substantial degree such that individuals willingly and intentionally engage in tasks, even when they are not inherently enjoyable, because they acknowledge the worth and value of the task. Consequently, these regulatory types are more sustainable than controlled motivations as individuals persist in the absence of external assistance because they are driven by a sense of purpose and value (Ryan & Deci, 2019). The primary

distinction between identified and integrated regulation lies in the extent to which behavior is internalized and integrated into an individual's sense of self. Identified regulation entails a conscious recognition and endorsement of the importance and value of an activity. In contrast, integrated regulation, as the most autonomous type, involves not only a recognition and endorsement of the activity's value but also a congruence with other core interests and values (Ryan & Deci, 2019).

The transition from external regulation to autonomous self-regulation is attainable through the process of internalization, which involves integrating social norms and practices into self-regulation (Ryan & Deci, 2019). The activation of this process is contingent upon the satisfaction of basic psychological needs. Specifically, individuals are motivated to adopt the values, beliefs, and behaviors promoted by others out of their innate yearning for autonomy, competence, and connectedness with others and their society (Vansteenkiste et al., 2006).

## 2.3. Goal content theory

Individuals possess unique future goals, and their attitudes towards life and subsequent behaviors vary in accordance with their goals (Ryan & Deci, 2019). GCT within SDT departs from the work of Kasser and Ryan (1993; 1996), and research based on this theory has consistently shown that the differential influence of various life goals or aspirations impacts well-being and behavior in systemic ways (Deci & Ryan, 2000; Monnot & Beehr, 2022). According to GCT, life goals can be classified as intrinsic (e.g., personal growth, close relationships, and community contribution) and extrinsic (e.g., fame, wealth, and attractiveness) (Kasser & Ryan, 1993; 1996). Intrinsic goals are associated with a focus on inherent propensities such as self-enhancement and self-transcendence, while extrinsic goals reflect the pursuit of external rewards and recognition from others (Ryan & Deci, 2019). The formation of these goals is influenced by

various factors, ranging from internal (e.g., personal beliefs and values) to external factors (e.g., family or socio-cultural environment).

The formation is closely related to the satisfaction or deprivation of basic psychological needs in early childhood. In particular, the strong pursuit of extrinsic goals results from the deprivation of basic psychological needs, while the pursuit of intrinsic goals is facilitated by the satisfaction of these needs (Kasser et al., 1995). This is because a lack of basic need satisfaction can lead individuals to seek need substitutes, which can foster the pursuit of strong extrinsic goals as substitutes (Deci & Ryan, 2000). Consequently, extrinsic goals such as reputation or financial success become a source of identity and self-worth (La Guardia, 2009). Moreover, those who pursue extrinsic goals tend to perpetuate the lack of basic need satisfaction, consistently pursuing extrinsic goals as their need substitutes, rather than satisfying their intrinsic needs. As a result, these tendencies lead to goals in the wrong direction that have nothing to do with their needs, resulting in ill-being rather than well-being (Deci & Ryan, 2000).

## 3. MAU and learning

### 3.1. Growth mindset

In accordance with Crum et al. (2013), it has been established that individuals engage in a selective acceptance and interpretation of information that aligns with their mental frame, or mindset, and correspondingly respond to it. It has also been observed that people possess diverse mindsets in multiple domains, such as intelligence (Dweck et al., 1995), personality (Yeager et al., 2011), stress (Crum et al., 2013), and emotion (Tamir et al., 2007). The current study focuses on the mindset for intelligence among the various mindsets.

A mindset for intelligence provides students with two contrasting views on the malleability of intelligence. Students who adopt a growth

mindset (also known as an incremental theory) believe that intelligence can be enhanced over time through sustained effort. Conversely, students with a fixed mindset (or an entity theory) consider intelligence to be a fixed and unalterable trait (Dweck et al., 1995). A multitude of prior studies have consistently shown that a growth mindset can lead to positive outcomes, including higher resilience, school engagement, and cognitive abilities (Wang, Gan et al., 2021; Yeager & Dweck, 2012; Zeng et al., 2016). Conversely, a fixed mindset has been associated with negative outcomes, such as poor mental health and lower grades (Blackwell et al., 2007; Schleider et al., 2015).

The effects of two distinct mindsets on outcomes are linked to self-regulatory processes (Burnette et al., 2013). Specifically, individuals possessing a growth mindset demonstrate a willingness to embrace, learn, and endeavor to master challenging and difficult tasks. They derive pleasure from their growth and view mistakes or failures encountered during the learning process as opportunities for self-improvement. Conversely, individuals with a fixed mindset tend to perceive mistakes or failure as inherent flaws, consequently avoiding challenges. Additionally, they tend to base their self-worth on external accomplishments, which drives them to act flawlessly at all costs to appear intelligent (Ng, 2018; Schroder, 2020).

## 3.2. Academic engagement

Academic engagement (AE) is defined as involvement in academic activities with a positive and fulfilling study-related state of mind (Schaufeli et al., 2002). Unlike temporary motivation or a flow state, which is a short-term peak experience of being fully immersed in certain activities, AE is a stable and long-lasting affective-cognitive state that is not limited to a specific task or behavior (Hallberg & Schaufeli, 2006; Schaufeli et al., 2006). The concept of AE originated from "work-related engagement" in organizational psychology, and shares the same sub-component of

work-related engagement, which involves three components: vigor, dedication, and absorption (Schaufeli et al., 2002). Vigor refers to high levels of mental resilience and willingness to exert considerable effort in one's schoolwork, while dedication indicates a sense of significance, enthusiasm, inspiration, and identification with academic tasks. Finally, absorption is characterized by high levels of concentration and engrossment in educational activities, leading to the loss of the perception of time and excitement about one's work.

Previous research has demonstrated AE as a strong predictor of positive educational and psychological outcomes, particularly academic achievement. For example, Carmona-Halty et al. (2021) demonstrated that AE mediated the relationship between study-related positive emotions and academic performance. Likewise, Casuso-Holgado et al. (2013) confirmed a positive and strong association between AE and GPA in the context of health science education. Phan's (2016) four-wave study revealed that absorption at Time 2 had a positive influence on achievement at Time 4 in longitudinal studies on academic achievement. Furthermore, AE predicts other positive outcomes, including deep learning approaches (Palos, 2020), academic adjustment (Wang, Xu et al., 2021), and well-being (Cadime et al., 2016).

AE is susceptible to changes brought about by internal and external factors. The identification of these factors is crucial for interventions aimed at enhancing AE. Examples of intra-individual antecedents of AE include psychological capital and intrinsic motivation (Siu et al., 2014), perfectionism (Zhang et al., 2007), self-efficacy (Ouweneel et al., 2013), achievement goal orientation (Wang, Xu et al., 2021), and self-regulation (Zhang et al., 2016). Additionally, extra-individual antecedents, specifically social antecedents, of AE encompass parents' and teachers' support (Peng et al., 2022) and a supportive study climate (Slåtten et al., 2021).

## 3.3. Approach to learning

Approaches to learning pertain to the distinctions in students' attitudes and learning behavior (Biggs et al., 2001). There exist two typologies of approaches to learning, which are referred to as 'deep approaches' and 'surface approaches' (Biggs et al., 2001; Marton & Säljö, 1976). The deep approach to learning (DAL) is rooted in intrinsic motivation and involves a strategy to comprehend learning contents, search for the meaning of the contents, and integrate those ideas with personal experiences (Biggs, 2001). On the other hand, the surface approach to learning (SAL) relies on extrinsic motivation and is typified by rote learning and rehearsal of formal knowledge to reproduce facts without comprehending the learning contents (Biggs, 2001). The adoption of either DAL or SAL is influenced by educational intervention and environment, such as the learning task, curriculum and assessment, and instructional strategies, as well as personal characteristics, such as academic motivation and intelligence quotient (Baeten et al., 2013; Biggs, 1987; Chamorro-Premuzic & Furnham, 2008; Lee et al., 2020; Piumatti et al., 2019). Although students may adjust their approach to learning between DAL or SAL based on their situation, they typically possess a primary approach that remains stable throughout their learning process (Biggs, 1987; Entwistle & McCune, 2004).

In the healthcare field, where professionals cater to individuals with healthcare needs through their specialized, rigorous education and training, DAL is deemed as an ideal approach to learning (Abraham et al., 2006; Lee et al., 2020). DAL is facilitated by intrinsic motivation and employs a strategy that enhances memorization of factual details and boosts academic performance (Delva et al., 2002; Feeley & Biggerstaf, 2015; Marton & Säljö, 1976). Therefore, this study aims to focus on DAL as an exemplary learning behavior based on motivation among dental students.

## 3.4. The relationship between MAU and growth mindset

Individuals pursue goals in order to fulfill their needs. During the

pursuit of these need-fulfilling goals, mental representations, which consist of beliefs or mindsets, are formed based on various experiences and interactions with the environment (Dweck, 2017). Dweck (2017) proposed that these mental representations guide future goals and ways to achieve them. Building on her ideas, this study posits that the reasons and goals for attending dental school may have a significant relationship with mindset. Specifically, this study focuses on a mindset for intelligence as the psychological factor related to MAU. There is empirical evidence supporting the postulate. Mindsets and basic psychological needs, which form the basis of personal goals, are significantly influenced by social factors, such as interactions with significant others. For example, Lou and Noels (2020) demonstrated that feedback from significant others that promotes a growth mindset (e.g., "Persistent efforts will improve your ability") positively predicts both growth mindset and basic psychological needs satisfaction after failure. This finding indicates that social support that meets basic psychological needs can promote a growth mindset, whereas social support that frustrates basic psychological needs can facilitate a fixed mindset. Thus, the growth mindset may have a positive relationship with intrinsic goals resulting from basic psychological needs satisfaction, while the fixed mindset may have a positive association with extrinsic or absence of goals resulting from basic psychological needs frustration.

The hypothesized relationship is also supported by previous research on the association between the mindsets and attitude and behaviors in learning. In achievement-related contexts, for instance, individuals with a growth mindset tend to view effort positively and strive to master challenges for the purpose of improving their competence. In contrast, those with a fixed mindset view effort negatively and believe that their intellectual abilities are immutable, leading them to pursue performance goals to demonstrate their competence (Dweck & Molden, 2017). Similarly, individuals with intrinsic goals endeavor to master their tasks and enhance their competence to achieve their aspirations of self-actualization and

personal growth, whereas those with extrinsic goals aim to outperform others for reputation and rewards, which makes them feel competitive (Kasser, 2016; Vansteenkiste et al., 2006). In addition to these established relationships, personal goals and mindsets of similar valence, such as intrinsic–growth or extrinsic–fixed, predict similar outcomes in other contexts, including student well–being (e.g., Reeve, 2012; Zeng et al., 2016), burnout (e.g., Cazan, 2015; Kim, 2020), and academic achievement (e.g., Yeager et al., 2022; Zhoc et al., 2019).

Considering that motives for university study are shaped by past experiences with family, educational settings, and anticipated jobs (Côté & Levine, 1997), this study proposes that the mindset may be interrelated with students' MAU. Therefore, I anticipate that a growth mindset is associated with students who have intrinsic reasons for studying dentistry, while a fixed mindset is associated with those who have extrinsic reasons or no specific reasons.

## 3.4. The relationship between MAU, academic engagement, and deep approach to learning

Personal goals serve as a critical link between the present and the future, guiding individuals to plan and act in a manner that aligns with their values (Miller & Brickman, 2004). In the context of learning, personal goals encourage students to engage more meaningfully in their tasks. However, as previously argued, differences in attitudes and behaviors toward learning are dependent on the types of personal goals that students have. Students with intrinsic goals tend to study for personal growth or enjoyment, while those with extrinsic goals tend to study for recognition or rewards from others (Kasser, 2016; Vansteenkiste et al., 2006). Consequently, students with intrinsic goals are more likely to adopt DAL, while students with extrinsic goals are more likely to adopt SAL. This has been demonstrated in previous studies.

For example, Vansteenkiste et al. (2004) proposed that extrinsic

goal framing in learning (e.g., carefully reading this material helps in securing a well-paid job in the future) would distract learners from their learning tasks, thereby hindering their full engagement in learning, while intrinsic goal framing (e.g., carefully reading this material helps in intellectual growth) would encourage learners to adopt DAL by linking learning activities to their personal growth. Consistent with their hypothesis, in a test on reading comprehension, intrinsic goal framing facilitated students' DAL, resulting in better test performance and persistence compared to students under extrinsic goal framing conditions.

Consistent with these findings, Wilding and Andrews (2006) conducted a cohort study which revealed significant relationships between students' life goals and their approaches to learning. Specifically, the authors found that students with altruistic, or intrinsic, life goals exhibited DAL, whereas those with wealth and status, or extrinsic, life goals were associated with SAL. Moreover, changes in life goals were also found to be associated with changes in approaches to learning. The authors noted that a decrease in a deep approach to learning over time was positively related to a decrease in altruistic life goals, while an increase in wealth and status life goals was positively associated with an increase in SAL.

It is important to note that personal goals may not have a direct influence on DAL. According to Biggs' (1987, 2001) presage-process-product model, DAL is influenced by various factors, including student factors (such as prior knowledge, motivation, and preferred approaches to learning), teaching context (such as objectives, assessment, and climate), and learning processes (such as ongoing instructional activities). Of the student factors, engagement in the learning process is highlighted as an essential precondition for DAL. Therefore, DAL is also regarded as a behavioral dimension for measuring engagement (Goldspink & Foster, 2013; Horstmanshof & Zimitat, 2007). Given that engagement is a psychological and motivational state, it can be inferred that this construct acts as a mediator between personal goals and DAL. In this

study, the mediator of this relationship is referred to as AE.

The literature provides strong theoretical and empirical evidence that intrinsic motivation is a critical factor in fostering or predicting AE. Students with intrinsic motivation tend to find their activities meaningful, enjoyable, and feel a sense of responsibility for their actions (Froiland & Worrell, 2016; Karimi & Sotoodeh, 2020; Saeed & Zyngier, 2012; Skinner et al., 2009). For instance, Saeed and Zyngier (2012) found that students who were intrinsically motivated engaged more authentically in their learning, while extrinsically motivated students engaged more ritualistically. Previous studies have also shown that students with intrinsic goals tend to be intrinsically motivated in their learning, while students with extrinsic goals tend to be extrinsically motivated (Kasser, 2016; Vansteenkiste et al., 2006). Thus, it is expected that intrinsic goals promote AE through intrinsic motivation.

Related studies support this hypothesis, with Karimi and Sotoodeh (2020) showing that basic psychological needs satisfaction positively predicted AE via intrinsic motivation, and Buil et al. (2019) confirming that the components of basic psychological needs, competence and autonomy, had a positive influence on intrinsic motivation and, therefore, promoted AE. As the satisfaction or frustration of basic psychological needs is a prerequisite for the formation of personal goals and motives (Deci & Ryan, 2000), it is expected that students with intrinsic goals will have higher levels of AE than those with extrinsic goals or no goals. Therefore, it is inferred that intrinsic MAU (i.e., PER and HUM) may be positively related to AE, leading to DAL. Conversely, extrinsic MAU (i.e., CAR and EXP) and the absence of MAU (i.e., DEF) may have negative or no relationship with AE, leading to a reduced or no impact on DAL.

## 4. MAU and mental health

### 4.1. Well-being

According to the World Health Organization, health is “a state of

complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 2001; p1). Mental health is an essential component of overall health, encompassing "a state of well-being in which individuals are able to realize their own abilities, cope effectively with the stresses of daily life, work productively, and contribute to their communities" (WHO, 2004; p. 12). This definition indicates that mental well-being is a complex construct that encompasses a range of positive outcomes, such as positive emotional states, accomplishment, and adaptive social relationships. High levels of mental well-being have been found to protect against and facilitate recovery from mental health problems, including depression and anxiety (Grant et al., 2013; Iasiello et al., 2019; Schotanus-Dijkstra et al., 2019). Furthermore, mental well-being has been linked to various beneficial outcomes, including improved physical health, work performance, and economic success (Keyes & Grzywacz, 2005; Sin, 2016; Wright & Cropanzano, 2000).

There exist two traditional approaches to defining well-being in the context of Greek philosophy, namely hedonism and eudaimonia. The hedonic approach views mental well-being as a state of happiness and pleasant emotions, where mental health is optimized by maximizing positive and pleasant feelings and minimizing negative and unpleasant feelings (Lamers et al., 2011). Correspondingly, research on emotional well-being focuses on perceptions of life satisfaction and the balance of positive versus negative affects (Keyes et al., 2008). In contrast, the eudaimonic approach equates mental health with positive functioning in life, where well-being reflects the growth and development of an individual's potential to pursue full functioning (Keyes et al., 2008). Based on this approach, the psychological well-being (PWB) theory (Ryff, 1989) and social well-being (SWB) model (Keyes, 1998) propose multidimensional models of well-being.

Ryff's (1989; Ryff & Keyes, 1995) PWB model encompasses six dimensions: personal growth, purpose in life, self-acceptance, positive relations with others, autonomy, and environmental mastery.

These dimensions reflect the challenges that individuals face as they strive to function fully and realize their potentials (Ryff & Keyes, 1995). While PWB represents how effectively one functions in private life, SWB represents how effectively one functions in community life. Keyes's (1998) SWB model focuses on whether and to what degree individuals are functioning well in their community lives, and consists of five dimensions: social contribution, social integration, social coherence, social acceptance, and social actualization.

In the realm of mental well-being research, the Psychological Well-Being-scale (PWBS) (Ryff & Keyes, 1995) is frequently employed as a measurement tool for the dimensions of PWB. However, the criticism directed towards the latent structure and factorial validity of PWBS items (Abbott et al. 2006) has engendered the development of reliable and valid well-being scales, which can measure multiple aspects of mental well-being (Wammerl et al., 2019). The PERMA theory (Seligman, 2011) is among the recent approaches designed to evaluate mental well-being.

Seligman's (2011) PERMA theory of well-being incorporates both hedonic and eudaimonic views into a holistic and sophisticated model. This theory encompasses five interdependent elements, namely positive emotions, engagement, relationships, meaning, and accomplishment, collectively represented by the PERMA acronym. Unlike previous models that singularly focused on either the hedonic or eudaimonic aspect of well-being such as emotional well-being (Keyes et al., 2008) and psychological well-being (Ryff & Keyes, 1995), Seligman's model provides a comprehensive framework that fully encapsulates the intricacies of human flourishing (Forgeard et al., 2011). In accordance with this model, positive emotions refer to the pleasurable feelings such as joy, pleasure, and gratitude (Seligman, 2011), whereas engagement denotes the psychological state of flow that one experiences when absorbed in tasks or activities, losing track of time and self-consciousness (Seligman, 2011). The concept of relationships involves feeling socially

connected, supported, and satisfied by others (Seligman, 2011), while meaning refers to a sense of meaning and purpose in life derived from something larger than oneself (Seligman, 2011). Finally, accomplishment represents the continuous progression towards personal goals and the concomitant feeling of achievement (Seligman, 2011). It is important to note that these elements are intrinsically valued for their own sake and are not regarded as means to other ends (e.g., accomplishment for positive feeling) (Forgeard et al., 2011). Seligman (2011) highlighted that human flourishing arises from the synergistic combination of these five elements of well-being. For the purpose of this study, the PERMA theory of well-being was utilized as a framework, encompassing both hedonism and eudaimonia, to investigate the nature of human flourishing.

## 4.2. Depression

Depression is a debilitating mood disorder characterized by persistent depressed mood, as well as a loss of interest or pleasure in one's daily activities (American Psychiatric Association, 2013; Paykel, 2008). In addition to these core symptoms, individuals with depression may experience a range of negative changes in sleep patterns (i.e., insomnia or hypersomnia), physical health (e.g., unrelenting fatigue, fluctuations in weight), thoughts and behavior (e.g., hopelessness about the future, suicidal ideation), and cognitive functioning (e.g., impaired concentration), which can impede their ability to function effectively in social, academic, or professional contexts (American Psychiatric Association, 2013).

Depression is typically preceded by serious life stressors. While anyone can experience depression as a result of such stressors, they alone are not sufficient to fully account for depression (Paykel, 2008). Rather, preexisting vulnerability factors such as genetic contribution and abuse in childhood, can be critical in determining the severity and recurrence of the symptoms (Brown et al., 1994; Hollon, 2020). Although there is little relationship between depressive symptoms

and stress events themselves (Paykel, 2003), those with vulnerability may develop depression as a pathological form, which can persist even after the resolution of the stressful problems and the passage of time.

Major depressive disorder is a prototypical manifestation of pathological depression, featuring five or more symptoms, including depressed mood or anhedonia, that endure nearly every day for at least two weeks. These symptoms include "depressive mood," "a lack of interest or pleasure," "insomnia or hypersomnia," "loss or gain of appetite and weight," "psychomotor agitation or retardation," "fatigue or loss of energy," "feelings of worthlessness or inappropriate guilt," "recurrent suicidal ideation or a suicide attempt," and "decreased ability to think or concentrate" (American Psychiatric Association, 2013).

Major depression is a leading contributor to suicide (WHO, 2021). The severity of depressive symptoms is strongly correlated with suicidal ideation and attempts in both genders, with the latter being more prevalent in women who experience an earlier onset of depression and possess a greater number of psychiatric comorbidities (Brådvik, 2018). Additionally, the morbidity and mortality caused by major depression generates substantial socioeconomic costs, including medical expenses, reduced productivity, and loss of manpower (Bloom et al., 2012). Risk factors associated with major depression include childhood abuse and neglect, genetic predisposition, female sex, recent stressful life events (e.g., interpersonal conflicts, financial problems), and a lack of a partner (Otte et al., 2016).

## 4.3. The protective and risk factors for mental illness

### 4.3.1. Sense of coherence as the protective factor

Aaron Antonovsky’s Salutogenetic model posits that health exists on a continuum, ranging from absolute ill health to absolute

health (Antonovsky, 1993). To explain this continuum, Antonovsky introduces the concepts of stressors and resistant resources, which are referred to as generalized resistance deficits (GRDs) and generalized resistance resources (GRRs). GRDs represent stressors that lead to an unhealthy state, while GRRs are the functions and resources necessary for effectively coping with GRDs and achieving a state of health. GRRs include genetic and physical, sociocultural, spiritual, material, and psychosocial factors that are relevant to an individual, group, subculture, and society (Antonovsky, 1987).

In Antonovsky's model, the concept of sense of coherence (SOC) assumes a pivotal role. SOC refers to an individual's overall tendency to view life as structured, manageable, and meaningful, as well as to identify and utilize GRRs to resolve GRDs and promote health and well-being (Eriksson & Lindström, 2006; Mittelmark et al., 2017). The theoretical explanation of SOC involves three dimensions: comprehensibility, manageability, and meaningfulness. Comprehensibility, as the cognitive dimension, denotes one's perception that internal or external stimuli are structurally and clearly understandable (Antonovsky, 1987). This cognitive capacity enables individuals to identify and comprehend the nature of a problem, which can facilitate better management of stressful situations. Manageability, as the instrumental or behavioral dimension, refers to one's belief in one's capacity or external resources to confront challenges (Antonovsky, 1987). Meaningfulness, as the motivational dimension, reflects one's confidence that the difficulties encountered in life are worthwhile challenges that deserve dedication and commitment, rather than mere unpleasant or burdensome experiences (Antonovsky, 1987). These three aspects of SOC enable individuals to move towards the absolute health end of the health continuum.

Concerning the relationship between SOC and mental health, SOC is recognized as a protective factor against mental illness and a facilitator of well-being. For example, SOC has been found to enable medical staff (Schäfer et al., 2018; Tselebis et al., 2001) and students

(Ito et al., 2015) to cope successfully with stressful situations, leading to lower levels of burnout, PTSD, and depression. Moreover, heightened levels of SOC have been linked to a reduced vulnerability and greater resilience to traumatic events (Braun-Lewensohn et al., 2011; Schäfer et al., 2019). In terms of mental well-being, individuals with elevated levels of SOC have been demonstrated to experience higher levels of life satisfaction, positive affect, and psychological well-being (Krok, 2015; Nilsson et al., 2010; Vainio & Daukantaitė, 2016). This is because a strong SOC allows individuals to utilize both internal and external resources to cope with adversity, and endow their lives with a sense of purpose and significance (Krok, 2015; Vainio & Daukantaitė, 2016).

Antonovsky (1987) asserts that the development of SOC is dependent on life experiences up until the age of 30. The stable disposition of SOC is achieved once it has reached a level of significant strength (Antonovsky, 1987), as supported by numerous studies (e.g., Feldt et al., 2000; Kivimäki et al., 2000). However, research suggests that negative life events, such as accidents, adverse childhood experiences, or divorce, can detrimentally alter SOC, irrespective of the presence of psychopathological symptoms (Braun-Lewensohn & Sagy, 2010; Schnyder et al., 2002; Volanen et al., 2007).

### 4.3.2. Experiential avoidance as the risk factor

Acceptance and commitment therapy (ACT) is a prominent third-wave behavioral therapy, which is founded upon the philosophical and theoretical principles of functional contextualism and relational frame theory (Hayes et al., 2006). This intervention does not seek to modify the internal events of the mind directly. Instead, it endeavors to transform the function of these events and the individual's relationship with them (Hayes et al., 2012a). In essence, the objective of this therapeutic approach is not to eradicate mental illness but to elevate psychological flexibility (Zettle, 2007).

Psychological flexibility (PF) is defined as “contacting the present moment as a conscious human being, fully and without defense, as it is and not as what it says it is, and persisting or changing in behavior in the service of chosen values” (Hayes et al., 2012a, p. 985). The absence of PF, known as psychological inflexibility (PI), can trigger the emergence of psychopathology (Hayes et al., 2006). PI is characterized as "the interplay between language and cognition and the consequent inability to persist or adapt behavior to achieve long-term desirable outcomes" (Hayes et al., 2006, p. 6). Specifically, PI commonly manifests when individuals fuse with their thoughts or emotions and evade undesired internal stimuli, leading to heightened distress, diminished engagement with the present moment, and hindered adherence to personal values (Bond et al., 2011). Opposing the attributes of PF, PI is positively linked to diverse psychological conditions, such as depressive and anxious symptoms (Yao et al., 2022), burnout (Duarte & Pinto-Gouveia, 2017), substance misuse (Luoma et al., 2011), and emotional dysregulation (Cobos-Sánchez et al., 2022).

Experiential avoidance (EA), known as one of the multiple processes of psychological inflexibility, has been posited as a foundational and perilous factor in the emergence of psychopathology (Bardeen & Fergus, 2016; Hayes et al., 2012b). EA is the individual's attempt to suppress, avoid, or modify unwanted private events such as thoughts, feelings, and memories (Bond et al., 2011). Contemporary research has identified EA as a transdiagnostic process in psychopathology, given its association with avoidant behavior patterns towards negative thoughts, emotions, and noxious external stimuli across several psychological disorders (Akbari et al., 2022; Levin et al., 2014). While EA may provide temporary emotional regulation and stabilization, its persistent manifestation hinders effective problem-solving, perpetuating mental health issues (Akbari et al., 2022). For instance, a person who avoids encountering dogs due to fear may not experience the realization that dogs are not as terrifying as they think. In light of these adverse outcomes, EA

constitutes a crucial target for psychological interventions (Hayes et al., 2012b). This study, therefore, focuses on EA as a risk factor for mental health.

## 4.4. The relationship between MAU, mental health, sense of coherence, and psychological inflexibility

The personal goals and motives are closely linked to mental health outcomes. Intrinsic goals are associated with a greater level of subjective well-being (Monnot & Beehr, 2022), better vitality, self-actualization, and physical health (Kasser & Ryan, 1996), higher self-esteem, positive affect, and life satisfaction (Niemiec et al., 2009), as well as fewer incidences of depression, anxiety, and behavioral problems (Kasser & Ryan, 1993). Conversely, extrinsic goals are associated with a higher level of stress, anxiety, and depression (Kashdan & Breen, 2007; Kasser & Ryan, 1993, 1996), and a lower level of well-being and happiness (Muñiz-Velázquez et al., 2017). In the college context, students who prioritize extrinsic goals are likely to abandon activities that fulfill their psychological needs, which in turn leads to an increase in their frustration levels regarding their need satisfaction, resulting in negative affect and depression (Holding et al., 2020). Furthermore, students with extrinsic goals tend to experience more stress than those with intrinsic goals, primarily due to the increased sense of competition with their peers (Vansteenkiste et al., 2004).

Based on the theoretical framework of SDT pertaining to mental health, the satisfaction of basic psychological needs stands out as a critical factor influencing attitudes towards and responses to stress (Weinstein & Ryan, 2011). A need-supportive environment, exemplified by parental and educational figures, manifests in the recognition and acceptance of an individual's thoughts and feelings, the provision of appropriate feedback, and the allowance of individual preference and value-based decision-making (Ntoumanis et al., 2009; Skinner & Edge, 2002). Therefore, the development of

autonomy is more effectively facilitated within a need-supportive as opposed to a need-thwarting environment (Deci & Ryan, 1985). Individuals who possess a greater degree of autonomy regulate their behavior according to their own interests, preferences, values, and goals, and view stressful events as challenging tasks that can be controlled and overcome, rather than as threats (Hodgins & Knee, 2002; Ntoumanis et al., 2009). Additionally, such individuals accept and employ both positive and negative emotions as sources of information in order to discern the situation and make judgments regarding coping strategies and actions (Gratz & Roemer, 2004; Roth et al., 2019). In consequence, they accept and integrate negative experiences into their lives, actively coping with them rather than attempting to avoid them (Ntoumanis et al., 2009; Roth et al., 2019; Weinstein & Ryan, 2011).

On the contrary, an environment that thwarts individuals' psychological needs is characterized by high levels of authority, oppression, coercion, and conditional regard (Ntoumanis et al., 2009). Those who experience frustration of their psychological needs in such an environment tend to feel a lack of control, low self-esteem, and helplessness, thereby limiting their ability to utilize their resources. Consequently, they tend to respond with an overreaction, heightened fear and anxiety even in the face of minor stressors, and engage in avoidant and defensive coping strategies and actions (Ntoumanis et al., 2009; Weinstein & Ryan, 2011). Additionally, they are more prone to avoiding, denying, and suppressing their emotions in order to manage negative emotions that are difficult to handle, thus rendering them vulnerable to mental illnesses such as depression and anxiety (Roth et al., 2019).

In this study, SOC and EA are considered as protective and risk factors for mental illness, respectively, and are perceived as mediators that reflect individuals' attitudes and responses to stress in the relationship between several motives for studying and mental health outcomes. Given the theoretical assumptions and underlying psychological processes, there are several reasons to view SOC and

EA as suitable mediators.

The concept of SOC posits that individuals with a well-developed SOC possess the belief that they can comprehend and manage both internal and external problems, viewing them as challenges that require commitment rather than simply unpleasant occurrences (Antonovsky, 1987). Furthermore, high SOC individuals exhibit active coping strategies, as opposed to avoidance behaviors, when faced with adversity (Kristofferzon et al., 2018). Such characteristics are akin to those found in individuals whose basic psychological needs have been fulfilled, including the capacity for active stress-coping and an appreciation of stress as a challenge.

Additionally, the development of SOC depends on the availability of a need-supportive environment that promotes goal determination and mental health (Ntoumanis et al., 2009; Skinner & Edge, 2002). Namely, the development of SOC is heavily influenced by the support of the social environment, with autonomy playing a crucial role (Sagy & Antonovsky, 2000). Thus, the satisfaction of basic psychological needs not only instills intrinsic values and purpose, but also positively correlates with SOC development. Notably, Yasuma et al. (2020) discovered a positive relationship between SOC development and intrinsic values in adolescents, such as pursuing one's interests and cherishing family and friends, while avoiding causing problems was negatively correlated with SOC development. Therefore, personal goals can be considered significant predictors of SOC.

EA is also significantly associated with basic psychological needs. Support for autonomy is a crucial factor in reducing EA. According to Wang et al. (2023), promoting autonomy support increases the availability of positive energy for self-regulation, leading to vitality and the reduction of EA. This occurs as individuals perceive unpleasant experiences as challenges, rather than stressors, and accept them. Conversely, frustration with basic psychological needs is positively linked to EA.

In line with this, Howell and Demuynck (2023) demonstrated that PI negatively predicts subjective well-being through frustration with

basic psychological needs. Kashdan and Breen (2007) also showed that EA mediates the relationship between materialism as an extrinsic goal and psychological problems. Furthermore, studies have consistently found a negative relationship between the pursuit of meaning and purpose in life and EA (Gámez et al., 2014; Kashdan & Kane, 2011; Yela et al., 2020).

In conclusion, satisfaction with basic psychological needs is positively associated with high SOC and reduced EA. Conversely, frustration with these needs is negatively related to SOC and increases EA. Hence, individuals who possess intrinsic goals and motives that fulfill basic psychological needs are likely to have high SOC and low EA, consequently resulting in a decline in mental problems and an elevation in mental well-being. In contrast, those who possess extrinsic goals and motives that fail to meet basic psychological needs are more likely to experience low SOC and high EA, leading to an increase in mental illness and a decrease in mental well-being.

# The present study

This study aims to examine the relationship between MAU and learning approaches as well as mental health. To achieve this goal, three studies were conducted, of which two focused on the relationship between MAU and mental health. All three studies utilized a mediation model based on structural equation modeling, but the types of structural equation models used differed across the studies, and the participants' majors, scales used, and sample sizes also varied. Therefore, to minimize confusion in understanding the study, this study presents a summary of our research methodology in the table below.

| | Study 1 | Study 2-1 | Study 2-2 |
|---|---|---|---|
| Independent variable | Mindsets, MAU | MAU | |
| Mediator | AE | SOC | SOC and EA |
| Dependent variable | DAL | Depression | Depression and mental well-being |
| Major | Dentistry | Dentistry | Dentistry and medicine |
| Sample size | 226 | 226 | 371 (131 medicine) |
| Statistical analysis | Covariance-based structural equation modeling | Partial least squares structural equation modeling | |

In addition, this study presents a table illustrating acronyms and their corresponding full names, aiming to prevent confusion in understanding the content of this study, as numerous acronyms are utilized throughout the study.

| Acronym | Full name |
|---|---|
| MAU | Motives for attending university |
| PER | Personal–intellectual development motivation |
| HUM | Humanitarian motivation |
| CAR | Careerist–materialist motivation |
| EXP | Expectation–driven motivation |
| DEF | Default motivation |
| AE | Academic engagement |
| DAL | Deep approach to learning |
| SOC | Sense of coherence |
| EA | Experiential avoidance |
| DEP | Depression |
| WB | Well–being |

# Study 1

Study 1 aimed to investigate a model of MAU (PER, HUM, CAR, EXP, and DEF) for predicting DAL through AE and the influence of the two mindsets on MAU. This study tested the following hypotheses:

Hypothesis 1. A growth mindset will positively predict PER and HUM and negatively predict CAR, EXP, and DEF.

Hypothesis 2. A fixed mindset will positively predict CAR, EXP, and DEF and negatively predict PER and HUM.

Hypothesis 3. PER and HUM will positively predict AE, but CAR, EXP, and DEF will negatively predict AE.

Hypothesis 4. PER and HUM will positively predict DAL via AE as a mediator.

Hypothesis 5. CAR, EXP, and DEF will negatively predict DAL via AE as a mediator.

# 1. Method

## 1.1 Participants and procedure

This study was reviewed and approved by the Ethics Committee School of Dentistry, at the University affiliated with the authors (approval No. S-D20210016). 226 students attending the Dental School at a large urban university in South Korea (including 147 clinical course; 110 females; $M_{age}$ = 22.46, $SD_{age}$ = 3.12) participated in this study and received a gift certificate worth $5 as compensation for their participation in the study. The purpose of this study was introduced to the dental students through a community website in which they are enrolled, as well as during class time, while emphasizing the assurance of confidentiality and anonymity for their participation in this research. After filling out the informed consent, the student participants were invited via email during the period from April 2021 to May 2021 to conduct a web-based survey including questionnaires of growth mindset, motives for selecting academic major, engagement and approach to learning. Finally, demographic information (i.e., age, gender, and grade) was gathered. Participants could perform the survey without time limit and took approximately 15-20 minutes to complete the questionnaires.

## 1.2 Measures

### Growth mindset

The Korean version of the Growth Mindset Inventory (Dweck, 2013) was employed to measure beliefs about growth in intellectual abilities by one's effort and learning. The inventory consists of 8-items about the growth mindset (4-items, e.g., "No matter who you are, you can significantly change your intelligence level.") and the fixed mindset (4-items, e.g., "You have a certain amount of intelligence, and you can't really do much to change it."). All items were rated on a 5-point-Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The reliability for the growth

mindset and the fixed mindset subscales were Cronbach's $\alpha$ of .89 and .91, respectively. In this study, I conceptualized growth and fixed mindsets as two individual constructs rather than the opposite poles of a single construct so that the effect of each mindset on MAU was examined separately.

### Motives for selecting academic major[①]

Motives for selecting academic major was measured by the Student Motivation for Attending University (SMAU) Scale (Côté & Levine, 1997). The SMAU scale consists of 23-items which were rated on a 5-point-Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) to evaluates five types of the motivation: 1) Careerist-Materialism (CAR) (5-items, e.g., "My major is a practical means for me to achieve personal success."); 2) Personal-Intellectual Development (PER) (5-items, e.g., "My major is satisfying because it gives me the opportunity to study and learn."); 3) Humanitarian (HUM) (4-items, e.g., "My education should enable me to help people who are less fortunate."); 4) Expectation-Driven (EXP) (5-items, e.g., "I am in my major primarily because I am expected to get a degree."); and 5) Default (DEF) (4-items, e.g., "I often ask myself why I'm in my major."). All items were modified to pertain to dental students. The reliability for each subscale was Cronbach's $\alpha$ of .86 for CAR, .80 for PER, .82 for HUM, .73 for EXP, and .78 for DEF.

### Academic engagement

The Korean Academic Engagement Inventory (KAEI; Lee & Lee, 2012) was used to assess academic engagement. KAEI was developed and validated, based on the engagement concept of Schaufeli and colleagues (2002). The KAEI consists of 16-items with 5-point-Likert scale ranging from 1 (strongly disagree) to 5

① The SMAU was slightly modified, changing the word "University" into "Major" in the relevant items, to evaluate the students' motives for selecting their academic major rather than the university.

(strongly agree) and includes four subscales: 1) dedication (4-items, e.g., "I feel proud when I study."); 2) vigor (4-items, e.g., "I get energy when I study."); 3) efficacy (4-items, e.g., "I have confidence in my studies."); and 4) absorption (4-items, e.g., "Time flies when I study."). Dedication, vigor, and absorption of this scale are the same as the subcomponents of Schaufeli and colleagues' academic engagement, but efficacy is a newly added subfactor reflecting the degree to which people perceive themselves to be good at studying. The reliability for each subscale was Cronbach's $\alpha$ of .85 for dedication, .87 for vigor, .84 for efficacy, and .78 for absorption.

Learning approaches

The Revised Two-Factor Study Process Questionnaire (R-SPQ-2F; Biggs et al., 2001) was used to assess the level of deep approach to learning. To this end, the two deep learning approach subscales of R2-SPQ-2F were selected: 1) Deep Motive (DM) measuring intrinsic interest (e.g., "I find that at times studying gives me a feeling of deep personal satisfaction") and 2) Deep Strategy (DS) measuring the maximization of meaning and time management (e.g., "I find most new topics interesting and often spend extra time trying to obtain more information about them."). These two subscales consist of 5-items each and were scored on a 5-point-Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The reliability for DM and DS were Cronbach's $\alpha$ of .68 and .73, respectively.

### 1.3 Psychometric-Reliability and Validity

As a psychometric property of items indicating the degree to which factor scores are precise, the reliabilities of factors were examined using the factor rho reliability (Raykov, 1997, 2004). The factor rho reliability is defined as a ratio of explained variance to the total variance from the CFA parameters. In CFA model, the factor reliability facilitating the CFA estimates is a preferred method to

compute Cronbach's alpha with unrefined composite scores for the scale (Brown, 2006). As noted in Brown (2015), the CFA results provide evidence regarding how strongly indicators of a latent variable are interrelated (i.e., convergent validity) and how weakly latent variables are correlated (i.e., discriminant validity). Convergent validity was provided by obtaining factor reliabilities greater than 0.70 (Nunnally & Bernstein, 1994) and discriminant validity was provided by obtaining factor correlations lower than .80 (Brown, 2015).

### 1.4 Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM)

Factor analysis is a method of identifying or confirming a structure of underlying constructs (or factors) that are measured by items in a questionnaire. There are two approaches to factor analysis: The one is an exploratory factor analysis (EFA; Pett et al., 2003 for details) and the other is a confirmatory factor analysis (CFA; Brown, 2015 for details). In this study, CFA was applied to confirm the designated factor structure of each measure in dental students.

In addition to confirming the factor structure with psychometric properties, an investigation was conducted to examine the associations between factors in mindsets, MAU, AE, and DAL. In general, SEM consists of two models: The one is a measurement model that was described via CFA and the other is a structural model describing the association among factors and covariates. The associations were identified via the structural model.

### 1.5 Model evaluation and estimation

In both CFA and SEM, the analysis employed robust maximum likelihood (MLR) estimates, using the MLR option in Mplus 8 (Muthén & Muthén, 1998–2017). Next, the analysis assessed the hypothesized models using model fit indices. The model fit indices comprise the absolute fit index, incremental fit index, and

parsimonious fit index (see Table 1 for a detailed list of fit indices and their corresponding criteria). Among the fit indices, the hypothesized models were evaluated by root mean square error of approximation (RMSEA), comparative fit index (CFI), and standardized root mean square residuals (SRMR) with the following criteria for good fit at RMSEA < .06, CFI > .95, and SRMR <.08 (Hu & Bentler, 1999) and adequate (or acceptable) fit at .08> RMSEA > .05 (Browne & Cudeck, 1993) and .95 > CFI > .90 (Bentler, 1990). Descriptive statistics and Pearson correlation analysis were also performed in Mplus and SPSS to describe the characteristics and relationships of all variables used in this study.

The reliability of each scale was ascertained through the computation of Cronbach's alpha and composite reliability (CR), with values exceeding .70 serving as an indicator of satisfactory reliability (Fornell & Larcker, 1981). Convergent validity was substantiated via the estimation of the average variance extracted (AVE), which should yield values of .50 or higher (Fornell & Larcker, 1981; Hair et al., 2010).

Table 1. Model fit indices and criteria

| Model fit indices | | Criteria (Bentler, 1990; Browne & Cudeck, 1993; Hu & Bentler, 1999; Kang, 2013) |
|---|---|---|
| Absolute fit index | $\chi^2$ (CMIN) | p > .05 adequate |
| | $\chi^2$ /df (CMIN/df) | < 3 good |
| | GFI | .90 < good |
| | AGFI | .80 < adequate,<br>.85 < good |
| | RMR | < .05 good |
| | RMSEA | < .06 good,<br>.05 < ~ < .08 adequate, |
| | SRMR | < .08 good |
| Incremental | TLI (NNFI) | .90 < good |

| | | |
|---|---|---|
| fit index | | |
| Parsimonious fit index | NFI | .90 < good |
| | CFI | .95 < good,<br>.90 < ~ < .95 adequate |
| | PGFI | The larger the value than the alternative model, the better |
| | PNFI | |
| | AIC | The closer to 0, the better |

GFI: Goodness of Fit Index, AGFI: Adjusted Goodness of Fit Index, RMR: Root Mean-squared Residual, RMSEA: Root Mean Square Error of Approximation, SRMR: Standardized Root Mean Square Residual, TLI: Tulker-Lewis Index, NNFI: Non-Normed Fit Index, NFI: Normed Fit Index, CFI: Comparative Fit Index, PGFI: Parsimonious Goodness of Fit Index, PNFI: Parsimonious Normed Fit Index, AIC: Akaike Information Criteria

# 2. Results

## 2.1 Descriptive statistics

First, three statistical indicators were examined: 1) Multivariate normality with kurtosis and skewness, 2) multivariate outlier with Cook's distance, and 3) multicollinearity with variance inflation factors (VIFs). Kurtosis and skewness values ranged between −3 and 3 with the exception of one item, 3.022, and thus was not considered problematic. All of the VIFs were less than 7, which indicates multivariate normality without multicollinearity violations. In addition, all of Cook's distances were less than .095, which is smaller than a criterion of 1.00, indicating that there were no multivariate outliers in the dataset. Table 2 presents the demographic data for the final sample of the dataset analyzed in this study.

## 2.2 Confirmatory Factor Analysis

Overall model fit measured by RMSEA (.047 < .06), CFI (.923 > .90), and SRMR (.057 < .080) indicates "good" (or "acceptable") fit, which tells that the factor model was fit well into the present data. Kline (2015) said the minimum number of indicators per factor for CFA models with two or more factors. The final model exceeded the requirements of at least three indicators per factor. Factor loadings that did not meet the required threshold of .45(Brown, 2006, 2015) were deleted, ranging from .498 to .905 (see Table 4). As shown in Table 3, factor correlations were between −.635 and .851, which indicated the discriminant validities among factors. Factor reliabilities were .896 for Mindset_g, .909 for Mindset_f, .839 for CAR, .825 for PER, .844 for HUM, .680 for EXP, .784 for DEF, .809 for engage and .785 for DAL. CR values exhibited a value exceeding .70 for all factors, with the sole exception of EXP. Also, AVE values surpassed the threshold of .50 for all factors, barring

EXP and DAL (see Table 4).

### 2.3 Structural equation modeling

Based on the confirmed factors structure, an examination was simultaneously conducted on the effect of each factor. The overall model fit was in the good or acceptable range. (RMSEA=.050; CFI=.911; SRMR=.069). The effects of growth mindset on both the 3-factors of MAU were significant ($\beta_{CAR}$ = .626 and p<.001; $\beta_{PER}$ = .677 and p<.001; $\beta_{HUM}$ = .514 and p<.001), which can be interpreted that as growth mindset values increase by 1, the CAR, the PER and the HUM increase significantly by .626, .677 and .514, respectively.

The filled model with parameters estimates were depicted in Fig. 1 and listed in Table 5. The effects of fixed mindset on both the 3-factors of MAU were significant ($\beta_{CAR}$ = .336 and p=.017; $\beta_{EXP}$ = .441 and p=.001; $\beta_{DEF}$ = .476 and p<.001), which means that as fixed mindset values increase by 1, the CAR, the EXP and the DEF increase significantly by .336, .441 and .476, respectively. The effects of CAR on the DAL were significant ($\beta_{DAL}$ = −.164 and p=.048), on the other hand, the effects on the engagement were not significant. The effects of PER on the engagement were significant ($\beta_{AE}$ = 1.526 and p=.002), on the other hand, the effects on the DAL were not significant. The effects of HUM, EXP and DEF on the engagement and DAL were not significant. Finally, the effects of engagement on the DAL were significant ($\beta_{DAL}$ = .830 and p<.001), which means that students who were more engaged were more likely to take DAL.

### 2.4 Mediation effects

Table 6 reports unstandardized, standardized, and significance levels of mediation effects for the model. AE did not mediate the association of CAR with DAL while the direct path from CAR to DAL

was significant. AE mediated the association of PER factor with DAL (mediated effect =1.267) while the direct path from PER to DAL was not significant, which means that AE was a full mediation between PER and DAL.

Table 2. Descriptive statistics

| Factor | Variable | Mean | SD | Factor | Variable | Mean | SD |
|---|---|---|---|---|---|---|---|
| mindset_g | mindset_g1 | 3.956 | .918 | CAR | CAR_1 | 4.035 | .795 |
| | mindset_g2 | 3.832 | 1.043 | | CAR_2 | 4.257 | .545 |
| | mindset_g3 | 4.035 | .804 | | CAR_3 | 3.973 | .893 |
| | mindset_g4 | 4.084 | .617 | | CAR_4 | 3.907 | .828 |
| mindset_f | mindset_f1 | 2.226 | 1.015 | PER | PER_1 | 4.066 | .805 |
| | mindset_f2 | 2.199 | .947 | | PER_2 | 4.027 | .911 |
| | mindset_f3 | 2.146 | .957 | | PER_3 | 4.133 | .832 |
| | mindset_f4 | 2.248 | 1.124 | | PER_4 | 3.531 | 1.072 |
| AE | AE_dedi | 15.496 | 10.179 | HUM | HUM_1 | 3.854 | .930 |
| | AE_vig | 10.704 | 14.058 | | HUM_2 | 4.124 | .719 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | AE_eff | 12.429 | 11.148 | | HUM_3 | 4.066 | .850 |
| | AE_abs | 10.257 | 5.748 | | HUM_4 | 3.752 | 1.080 |
| DAL | DAL_1 | 3.504 | .878 | EXP | EXP_1 | 1.752 | .983 |
| | DAL_2 | 3.788 | 1.017 | | EXP_2 | 2.062 | 1.501 |
| | DAL_3 | 3.518 | 1.011 | | EXP_3 | 1.872 | 1.165 |
| | DAL_4 | 2.721 | .838 | DEF | DEF_1 | 1.978 | 1.252 |
| | DAL_5 | 3.336 | .869 | | DEF_2 | 1.686 | .676 |
| | DAL_6 | 3.566 | .945 | | DEF_3 | 1.823 | 1.208 |
| | | | | | DEF_4 | 2.336 | 1.568 |

mindset_g: growth mindset, mindset_f: fixed mindset, PER: Personal-intellectual development motivation, HUM: Humanitarian motivation, CAR: careerist-materialist motivation, EXP: Expectation-driven motivation, DEF: Default motivation, engage: Engagement, DAL: Deep Approach to Learning

Table 3. Factor correlations

| Factor | mindset_f | CAR | PER | HUM | EXP | DEF | AE | DAL |
|---|---|---|---|---|---|---|---|---|
| mindset_g | −.635*** | .378*** | .604*** | .540*** | −.301** | −.339*** | .712*** | .623*** |
| mindset_f | | −.063 | −.384*** | −.388*** | .406*** | .531*** | −.385*** | −.339*** |
| CAR | | | .558*** | .423*** | −.136 | −.209* | .502*** | .328** |
| PER | | | | .719*** | −.236* | −.591*** | .732*** | .630*** |
| HUM | | | | | −.274** | −.437*** | .541*** | .605*** |
| EXP | | | | | | .765*** | −.266* | −.334*** |
| DEF | | | | | | | −.471*** | −.467*** |
| AE | | | | | | | | .851*** |

mindset_g: growth mindset, mindset_f: fixed mindset, PER: Personal−intellectual development motivation, HUM: Humanitarian motivation, CAR: careerist−materialist motivation, EXP: Expectation−driven motivation, DEF: Default motivation, engage: Engagement, DAL: Deep Approach to Learning

*p<.05, **p<.01, ***p<.001

Table 4. Factors loadings, convergent validity, and composite reliability

| Factor | Variable | Standardized loading | CR | AVE |
|---|---|---|---|---|
| mindset_g | mindset_g1 | .841 | .900 | .694 |
| | mindset_g2 | .746 | | |
| | mindset_g3 | .905 | | |
| | mindset_g4 | .832 | | |
| mindset_f | mindset_f1 | .767 | .909 | .714 |
| | mindset_f2 | .857 | | |
| | mindset_f3 | .891 | | |
| | mindset_f4 | .861 | | |
| PER | PER_1 | .782 | .830 | .553 |
| | PER_2 | .805 | | |
| | PER_3 | .767 | | |
| | PER_4 | .604 | | |
| HUM | HUM_1 | .571 | .852 | .597 |
| | HUM_2 | .905 | | |
| | HUM_3 | .831 | | |
| | HUM_4 | .742 | | |
| CAR | CAR_1 | .720 | .848 | .586 |
| | CAR_2 | .891 | | |
| | CAR_3 | .708 | | |
| | CAR_4 | .727 | | |
| EXP | EXP_1 | .498 | .669 | .408 |

| | | | | |
|---|---|---|---|---|
| | EXP_2 | .732 | | |
| | EXP_3 | .664 | | |
| DEF | DEF_1 | .807 | .803 | .513 |
| | DEF_2 | .787 | | |
| | DEF_3 | .729 | | |
| | DEF_4 | .499 | | |
| AE | AE_dedi | .880 | .816 | .530 |
| | AE_vig | .659 | | |
| | AE_eff | .651 | | |
| | AE_abs | .698 | | |
| DAL | DAL_1 | .701 | .786 | .381 |
| | DAL_2 | .573 | | |
| | DAL_3 | .628 | | |
| | DAL_4 | .633 | | |
| | DAL_5 | .562 | | |
| | DAL_6 | .597 | | |

mindset_g: growth mindset, mindset_f: fixed mindset, PER: personal-intellectual development motivation, HUM: humanitarian motivation, CAR: careerist-materialist motivation, EXP: expectation-driven motivation, DEF: default motivation, engage: engagement, DAL: deep approach to learning, CR: composite reliability, AVE: average variance extracted

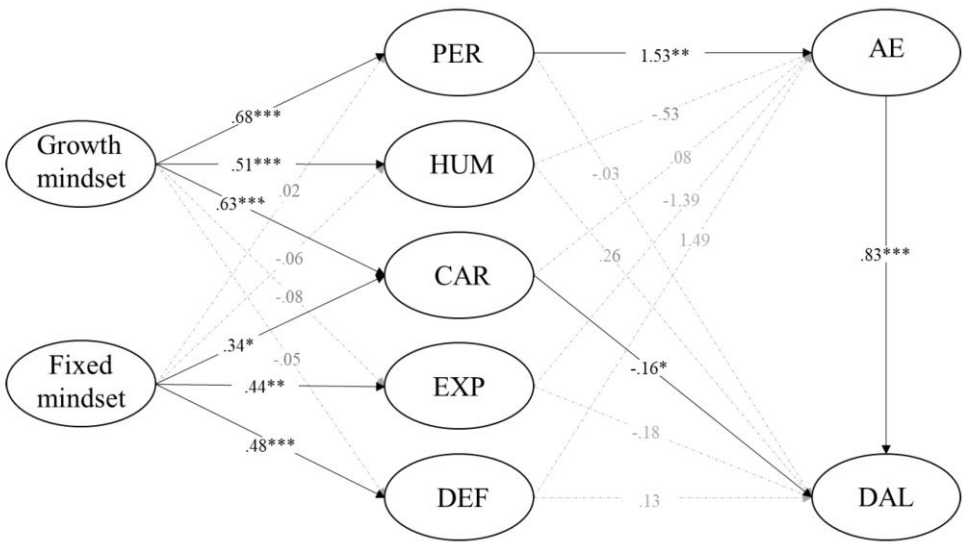
Table 5. Factors loadings of the structural equation model

| Path | Unstandardized coefficient(B) | *SE* | Standardized coefficients($\beta$) | *SE* |
|---|---|---|---|---|
| **mindset_g→PER** | **.566*** ** | **.135** | **.677*** ** | **.134** |
| mindset_f→PER | .019 | .118 | .022 | .136 |
| **mindset_g→HUM** | **.352** ** | **.110** | **.514*** ** | **.131** |
| mindset_f→HUM | −.043 | .088 | −.060 | .126 |
| **mindset_g→CAR** | **.523*** ** | **.133** | **.626*** ** | **.133** |
| **mindset_f→CAR** | **.292*** | **.133** | **.336*** | **.141** |
| mindset_g→EXP | −.049 | .083 | −.081 | .133 |
| **mindset_f→EXP** | **.276** ** | **.097** | **.441** ** | **.134** |
| mindset_g→DEF | −.061 | .127 | −.054 | .113 |
| **mindset_f→DEF** | **.599*** ** | **.138** | **.476*** ** | **.104** |
| **PER→AE** | **6.310** ** | **2.084** | **1.526** ** | **.498** |
| HUM→AE | −2.696 | 1.682 | −.534 | .318 |
| CAR→AE | .399 | .357 | .082 | .084 |
| EXP→AE | −7.969 | 5.234 | −1.388 | .888 |
| DEF→AE | 4.563 | 2.970 | 1.492 | .965 |
| PER→DAL | −.030 | .605 | −.030 | .396 |
| HUM→DAL | .260 | .348 | .218 | .219 |
| **CAR→DAL** | **−.160*** | **.046** | **−.164*** | **.083** |
| EXP→DAL | −.242 | .083 | −.178 | .449 |
| DEF→DAL | .094 | .388 | .130 | .482 |
| **AE→DAL** | **.197*** ** | **.265** | **.830*** ** | **.160** |

mindset_g: growth mindset, mindset_f: fixed mindset, CAR: careerist−materialist motivation, PER: personal-intellectual

development motivation, HUM: humanitarian motivation, EXP: expectation-driven motivation, DEF: default motivation, engage: engagement, DAL: deep approach to learning
*$p$ < .05, **$p$ < .01, ***$p$ < .001. Significant results are marked in bold.

Figure 1. Structural relations of a pathway from mindsets to deep approach to learning




*Note*. *$p$ < .05, **$p$ < .01, ***$p$ < .001. Statistically significant paths are represented by continuous lines.

Table 6. Mediation effects for the structural equation model

| Path | Unstandardized coefficient ($\beta$) | *SE* | Standardized coefficients ($\beta$) | *SE* |
|---|---|---|---|---|
| CAR→AE→DAL | .067 | .067 | .068 | .068 |
| **PER→AE→DAL** | **1.240*** | **.529** | **1.267*** | **.526** |
| HUM→AE→DAL | −.530 | .364 | −.444 | .295 |
| EXP→AE→DAL | −1.567 | 1.142 | −1.153 | .810 |
| DEF→AE→DAL | .897 | .643 | 1.239 | .158 |

*$p$ < .05. Significant results are marked in bold.

## 3. Discussion of Study 1

This study aimed to demonstrate the relationship among the mindsets, MAU, AE, and DAL of dental students and to test the mediating effect of AE on the relationship between MAU and DAL. The results partially confirmed the hypothesis model. In the structural equation model, the growth mindset was associated with CAR, PER, and HUM among the subfactors of MAU, whereas the fixed mindset was related to CAR, EXP, and DEF. Among the relationships between the subfactors of MAU and DAL, AE fully mediated that between PER and DAL, and CAR directly negatively predicted DAL without a mediator.

Similar with previous studies, the current study found that the growth mindset predicted intrinsic motives (i.e., PER and HUM) for attending dental school (Burnette et al., 2013; Nalipay et al., 2021), whereas the fixed mindset predicted extrinsic motives (Burnette et al., 2013) and nonmotive (Biddle et al., 2003; De Castella et al., 2015) (i.e., EXP and DEF). These findings suggested that the reasons for entering dental schools may reflect the mindset of students about their growth in intellectual abilities through effort and learning. Thus, the study inferred that students whose motives for personal growth or for helping others prevail over other motives believe in their potential for intellectual growth and endeavor to improve themselves and master challenging tasks. In contrast, students whose motives for approval from others or without any motives may underestimate their potential tend to focus on demonstrating their competence to others and to avoid challenges (Burnette et al., 2013; Dweck et al., 1995).

Notably, among the subfactors of MAU, only CAR particularly demonstrates a significant relationship with the growth and fixed mindsets. One possible explanation is that CAR represents a complex nature that reflects intrinsic and extrinsic motivation. Students predominantly that possess this motive may produce a mixed profile in their mindset to pursue intrinsic goals, such as a good career and

professional training, or extrinsic goals, such as wealth and prestige, or both (Willner et al., 2023). In turn, this motive may be related to their internal needs and external constraints, which exert an influence on individual future, such that this mixed profiles would be adaptive (Nalipay et al., 2021).

Despite the characteristics of MAU explained by the mindsets, the mediation model of this study illustrates that AE fully mediated only between PER and DAL. Corroborating previous findings on the positive relationships among intrinsic motivation, AE, and DAL (Froiland & Worrell, 2016; Goldspink & Foster. 2013; Horstmanshof & Zimitat, 2007; Renaud-Dubé et al., 2015), the findings of the current study suggest that students attending dental school for personal growth and intellectual development can be academically more immersed than those with other types of motives. Alternatively, HUM is also one of the intrinsic motives, but this variable is related to neither AE nor DAL. Yeager et al (2014) demonstrated that intrinsic self-transcendent motives (e.g., helping people and making a better world) for studying predict deep learning behavior and increased persistence on tedious tasks. Thus, the possibility exists that these findings capture "the tendencies of people" with self-transcendent motives to suppress the urge to quit tasks. Conceivably, the study finds no association among HUM, AE, and DAL, which may be partially due to the stronger correlation of HUM with "self-regulatory strategies" for learning than that of AE, which involves positive feelings about academic activities (Schaufeli et al., 2006).

Apart from this mediational relationship, the study found that CAR is directly negatively associated with DAL. Although this association did not support the hypothesis that CAR negatively predicts AE, the interpretation of the results presents certain empirical and theoretical bases. Previous studies demonstrated the relationships among high levels of materialism and low levels of engagement and intrinsic mastery goal (King & Datu, 2017; Ku et al., 2012). Given that intrinsic motivation and engagement are prerequisite factors for DAL (Biggs, 2001), the materialistic motive

of students renders them less likely to take DAL by dampening one’ s enthusiasm and mastery orientation for learning.

# Study 2-1

Study 2-1 employed an exploratory approach to investigate the extent to which MAU (PER, HUM, CAR, EXP, and DEF) predict depressive symptoms through SOC as a mediator. The rationale for this approach stemmed from the fact that the findings of Study 1 did not support a significant portion of the hypotheses derived from previous research findings. Although these findings are related to the educational context, they confirm that various motives and goals that were previously categorized as either intrinsic or extrinsic may have distinct statistical effects.

Based on antecedent research, intrinsic goals are associated with positive mental health outcomes, while extrinsic goals are associated with negative mental health outcomes (e.g., Kashdan & Breen, 2007; Niemiec et al., 2009). Nonetheless, the specific impact of each goal and motive within each category (i.e., intrinsic or extrinsic) on mental health outcomes is not yet well-established. Therefore, instead of proposing separate hypotheses for each motive, this study puts forth hypotheses for intrinsic and extrinsic goals and motives in their entirety.

Hypothesis 1. Intrinsic MAU (i.e., PER and HUM) will positively predict SOC.

Hypothesis 2. Extrinsic MAU (i.e., CAR and EXP) and the lack of motive will negatively predict SOC.

Hypothesis 3. Intrinsic MAU will negatively predict depressive symptoms via an increase in SOC.

Hypothesis 4. Extrinsic MAU and the lack of motive will positively predict depressive symptoms via a decrease in SOC.

# 1. Methods

## 1.1. Participants and procedure

The present study, including both Study 2-1 and Study 2-2, underwent review and approval by the Ethics Committee of the School of Dentistry, which is affiliated with the authors' university (approval No. S-D20210016). The participants in this study were 226 Korean undergraduates enrolled in the Dental School at a university (including 147 clinical course; 110 women; $M_{age}$ = 22.46, $SD_{age}$ = 3.12) and received a gift voucher worth $5 as compensation for their participation in the study. The objective of this study was communicated to dental students through a community website, in which they are registered, as well as during class sessions, with a particular emphasis on ensuring confidentiality and anonymity for their involvement in this research. After providing the informed consent, the participants were invited through e-mail during the period from April 2021 to May 2021 to perform a web-based survey including questionnaires of motives for selecting academic major, SOC, depression, and demographic information (i.e., age, gender, and grade).

## 1.2. Measures and covariates

### Motives for selecting academic major

This measure was the same as in Study 1.

### Sense of coherence[②]

Sense of coherence was assessed by the Korean version of Sense of Coherence 13-item scale (SOC-13), which is the shortened version of Antonovsky's SOC-29 (Antonovsky, 1987).

② The Korean version of the SOC-13 scale was obtained with permission from the Society for Theory and Research on Salutogenesis (STARS).

This scale is scored 7-point Likert scale ranging from 1(very seldom or never) to 7 (very often) and consists of three dimensions: 1) comprehensibility (5-items, e.g., "Do you have the feeling that you are in an unfamiliar situation and don't know what to do?"); 2) manageability (4-items, e.g., "How often do you have feelings that you're not sure you can keep under control?"); 3) meaningfulness (4-items, e.g., "How often do you have the feeling that there is little meaning in the things you do in your daily life?").

Depression

Depression was evaluated by the Korean version of Patient Health Questionnaire-9 (PHQ-9; Kroenke et al., 2001; Choi et al., 2007) which consists of 9-items on a 4-point-Likert scale ranging from 0 (not at all) to 3 (nearly every day) (e.g., "Feeling down, depressed, or hopeless"), based on the diagnostic criteria for major depressive disorder in the Diagnostic and Statistical Manual of Mental Disorders, fourth edition. Participants rated how often they experienced depression symptoms during past 2 weeks. An increase in the scores on this scale is indicative of a higher severity of depressive symptoms.

Covariates

In this study, age, gender (male=0, female=1), and grade were entered into structural model as covariates.

## 1.3. Statistical analysis

The current study employed Partial Least Squares Structural Equation Modeling (PLS-SEM) to analyze the structural model. Diverging from Covariance Based-SEM, PLS-SEM prioritizes the maximization of unexplained variance in the dependent variables rather than covariance estimation (Hair et al., 2021). The present research appropriately utilized this approach for several reasons, including its suitability for examining structural models for

explanatory, exploratory, or predictive purposes, its capacity to handle complex models without identification issues, its non-parametric approach through bootstrapping, and its ability to conduct mediation analyses (Hair et al., 2021; Henseler, 2018).

Prior to conducting PLS-SEM, item parceling, a clustering technique, was employed to reduce the number of items and model complexity (Nasser & Takashaki, 2003). This technique was only applied to the latent variable of depression, which contained more than five items, to prevent estimation bias arising from multiple parcels (Bandalos, 2002).

To estimate all reflective measurement models and the structural model, SmartPLS 4 software (Ringle et al., 2022) was utilized in the present study. The PLS algorithm and the bootstrapping procedure were implemented with 5000 resamples, the percentile bootstrap confidence interval method, and a significance level of .05. Hair et al.'s (2019) guidelines were followed to assess the reflective measurement model and the structural model.

## 2. Results

Table 7. Descriptive statistics

| Factor | Variable | Mean | SD | Factor | Variable | Mean | SD |
|---|---|---|---|---|---|---|---|
| CAR | CAR_1 | 4.04 | .89 | PER | PER_1 | 4.07 | .90 |
| | CAR_2 | 4.26 | .74 | | PER_2 | 4.03 | .96 |
| | CAR_3 | 3.97 | .95 | | PER_3 | 4.13 | .91 |
| | CAR_4 | 3.91 | .91 | | | | |
| HUM | HUM_1 | 4.12 | .85 | EXP | EXP_1 | 1.75 | .99 |
| | HUM_2 | 4.07 | .92 | | EXP_2 | 2.06 | 1.23 |
| | HUM_3 | 3.75 | 1.04 | | EXP_3 | 1.87 | 1.08 |
| DEF | DEF_1 | 1.98 | 1.12 | SOC | SOC_1 | 21.27 | 4.99 |
| | DEF_2 | 1.69 | .82 | | SOC_2 | 17.78 | 4.01 |
| | DEF_3 | 1.82 | 1.10 | | SOC_3 | 19.09 | 3.88 |
| DEP | DEP_1 | .73 | .67 | | | | |
| | DEP_2 | .33 | .44 | | | | |
| | DEP_3 | .60 | .60 | | | | |

PER: Personal-intellectual development motivation, HUM: Humanitarian motivation, CAR: Careerist-materialist motivation, EXP: Expectation-driven motivation, DEF: Default motivation, SOC: Sense of Coherence, SOC_1: Comprehensibility, SOC_2: Manageability, SOC_3: Meaningfulness, DEP: Depression

Table 8. Latent variable correlations

| Construct | CAR | PER | HUM | EXP | DEF | SOC | DEP |
|---|---|---|---|---|---|---|---|
| PER | .45*** | | | | | | |
| HUM | .35*** | .61*** | | | | | |
| EXP | −.11 | −.22* | −.25** | | | | |
| DEF | −.16 | −.50*** | −.42*** | .57*** | | | |
| SOC | .20** | .46*** | .39*** | −.45*** | −.47*** | | |
| DEP | −.01 | −.20* | −.17 | .48*** | .44*** | −.48*** | |
| Age | .09 | −.13 | −.05 | −.004 | .13* | .09 | .09 |
| Gender | .05 | .17* | .15* | −.05 | −.07 | .01 | −.08 |
| Grade | .01 | −.23*** | −.16** | .07 | .18** | −.14* | .15* |

PER: Personal−intellectual development motivation, HUM: Humanitarian motivation, CAR: Careerist−materialist motivation, EXP: Expectation−driven motivation, DEF: Default motivation, SOC: Sense of Coherence, DEP: Depression
*p<.05, **p<.01, ***p<.001

## 2.1. Preliminary analyses

Means, standard deviations, and correlations are displayed in Table 7 and 8. The correlation analysis indicates the presence of positive correlations between CAR, PER, HUM, and SOC, as well as between EXP, DEF, and DEP. Conversely, PER, HUM, and SOC display negative correlations with EXP, DEF, and DEP.

## 2.2. Evaluation of the reflective measurement models

As a first step in the evaluation process, an examination was

conducted on the factor loadings for all reflective indicators. To ensure that the construct explains over 50% of the variance in the indicator, it is recommended that loadings exceed .708 (Hair et al., 2019). In the present measurement model, any item that did not meet this standard was eliminated, resulting in a range of factor loadings between .736 and .926 (see Table 9). Subsequently, internal consistency reliability was evaluated using Cronbach's alpha and composite reliability, which should fall within the range of .70 to .95 (Hair et al., 2019). The third step involved an assessment of convergent validity using the Average Variance Extracted (AVE) metric, which should surpass .50 (Hair et al., 2019). As demonstrated in Table 7, all reliability estimates fall within the acceptable range, and AVEs were above .50. Finally, the Heterotrait–Monotrait (HTMT) ratio of correlations (Henseler et al., 2015) was employed to gauge discriminant validity. HTMT values of less than .90, or more conservatively .85, indicate the establishment of discriminant validity (Henseler et al., 2015). In this model, all HTMT values were below .85 (see Table 10). These results imply that the reflective measurement model has successfully established indicator reliability, internal consistency reliability, convergent validity, and discriminant validity.

Table 9. Reliability, convergent validity, and VIF

| Construct | Indicator | Loading | Alpha | CR | AVE | VIF |
|---|---|---|---|---|---|---|
| PER | PER_1 | .873 | .812 | .888 | .742 | 1.838 |
| | PER_2 | .882 | | | | 2.131 |
| | PER_3 | .829 | | | | 1.788 |
| HUM | HUM_1 | .857 | .825 | .897 | .744 | 2.228 |
| | HUM_2 | .926 | | | | 2.916 |
| | HUM_3 | .799 | | | | 1.664 |

| | | | | | | |
|---|---|---|---|---|---|---|
| CAR | CAR_1 | .825 | .882 | .916 | .732 | 2.659 |
| | CAR_2 | .885 | | | | 2.082 |
| | CAR_3 | .875 | | | | 3.043 |
| | CAR_4 | .835 | | | | 2.169 |
| EXP | EXP_1 | .784 | .726 | .847 | .649 | 1.559 |
| | EXP_2 | .736 | | | | 1.336 |
| | EXP_3 | .889 | | | | 1.885 |
| DEF | DEF_1 | .884 | .812 | .888 | .726 | 2.051 |
| | DEF_2 | .857 | | | | 1.786 |
| | DEF_3 | .814 | | | | 1.656 |
| SOC | SOC_1 | .877 | .798 | .882 | .713 | 2.187 |
| | SOC_2 | .857 | | | | 2.093 |
| | SOC_3 | .798 | | | | 1.413 |
| DEP | DEP_1 | .849 | .847 | .907 | .765 | 1.964 |
| | DEP_2 | .885 | | | | 2.016 |
| | DEP_3 | .889 | | | | 2.177 |

PER: Personal-intellectual development motivation, HUM: Humanitarian motivation, CAR: Careerist-materialist motivation, EXP: Expectation-driven motivation, DEF: Default motivation, SOC: Sense of Coherence, SOC_1: Comprehensibility, SOC_2: Manageability, SOC_3: Meaningfulness, DEP: Depression

Table 10. Discriminant validity: HTMT

| Construct | CAR | PER | HUM | EXP | DEF | SOC |
|---|---|---|---|---|---|---|
| PER | .49 | | | | | |
| HUM | .39 | .74 | | | | |
| EXP | .15 | .28 | .27 | | | |
| DEF | .18 | .61 | .32 | .76 | | |
| SOC | .22 | .56 | .48 | .59 | .57 | |
| DEP | .04 | .23 | .20 | .60 | .52 | .59 |

PER: Personal–intellectual development motivation, HUM: Humanitarian motivation, CAR: Careerist–materialist motivation, EXP: Expectation–driven motivation, DEF: Default motivation, SOC: Sense of Coherence, DEP: Depression

## 2.3. Evaluation of the structural model

Prior to assessing the structural model, collinearity issues among the exogenous constructs were examined using the variance inflation factor (VIF), which is commonly accepted to be less than 5 (Hair et al., 2019). In the present study, the maximum VIF value was 3.043, indicating that multicollinearity was not a concern (see Table 7).

The path coefficients based on the bootstrapping procedure demonstrated that the PER was positively related to SOC ($\beta$ = .309, 95% CI [.142, .462], p < .001). However, EXP ($\beta$ = −.279, 95% CI [−.394, −.166], p < .001) and DEF ($\beta$ = −.134, 95% CI [−.260, −.018], p = .032) were negatively associated with SOC. In addition, age positively predicted SOC ($\beta$ = .389, 95% CI [.221, .541], p < .001), while grade negatively predicted SOC ($\beta$ = −.322, 95% CI [−.463, −.179], p < .001). Regarding DEP, EXP ($\beta$ = .242, 95% CI [.063, .417], p = .008) had a significant positive effect on this construct, whereas the negative effect of SOC on DEP was also

significant ($\beta$ = −.378, 95% CI [−.515, −.247], p < .001). The other two motives, namely CAR and HUM, showed insignificant effects on both SOC and DEP (see Table 11 and Figure 2).

The results of the model's explanatory power revealed that the explained variance value for the endogenous constructs ($R^2$) was .426 for SOC and .361 for DEP (see Table 11). Based on existing rules of thumb for assessing the explanatory power (weak: .25, moderate: .50, substantial: .75) (Hair et al., 2019), these values fell within the range between a weak and moderate level. Regarding the $f^2$ effect size assessing an exogenous construct's contribution to an endogenous latent variable's $R^2$ value (Table 11), the effect sizes of all significant paths fell within the range between small ($f^2 \geq .02$) and medium ($f^2 \geq .15$; Hair et al., 2019) size effect. These effect sizes were likely due to the motive−related predictors having overlapping effects.

Furthermore, the results indicated that the specific indirect effects of PER ($\beta$ = −.117, 95% CI [−.198, −.047], p = .002), EXP ($\beta$ = .105, 95% CI [.059, .157], p < .001), and DEF ($\beta$ = .051, 95% CI [.007, .105], p = .046) on DEP via SOC were significant based on the examination of the values of the confidence interval that did not involve zero, confirming SOC as a significant mediator (Table 12).

Table 11. Direct effect, $R^2$, and $f^2$

| Construct | $\beta$ | $t$−Value | $p$−Value | 95% CI | $f^2$ |
|---|---|---|---|---|---|
| EC: SOC ($R^2$=.426) | | | | | |
| PER | .309 | 3.843 | .000 | [.142, .462] | .067 |
| HUM | .078 | 1.036 | .300 | [−.064, .225] | .006 |
| CAR | −.050 | .706 | .481 | [−.182, .093] | .002 |
| EXP | −.279 | 4.841 | .000 | [−.394, −.166] | .087 |

| | | | | | |
|---|---|---|---|---|---|
| DEF | −.134 | 2.150 | .032 | [−.260, −.018] | .016 |
| C: Age | .389 | 4.795 | .000 | [.221, .541] | .110 |
| C: Gender | −.166 | 1.583 | .113 | [−.375, .039] | .012 |
| C: Grade | −.322 | 4.358 | .000 | [−.463, −.179] | .073 |
| EC: DEP ($R^2$=.361) | | | | | |
| PER | .086 | .917 | .359 | [−.103, .266] | .006 |
| HUM | .055 | .719 | .472 | [−.098, .205] | .003 |
| CAR | .040 | .418 | .676 | [−.152, .216] | .001 |
| EXP | .242 | 2.644 | .008 | [.063, .417] | .055 |
| DEF | .185 | 1.895 | .058 | [−.012, .375] | .027 |
| SOC | −.378 | 5.520 | .000 | [−.515, −.247] | .128 |
| C: Age | .131 | 1.565 | .118 | [−.050, .281] | .010 |
| C: Gender | −.152 | 1.426 | .154 | [−.352, .068] | .009 |
| C: Grade | −.034 | .379 | .705 | [−.192, .154] | .001 |

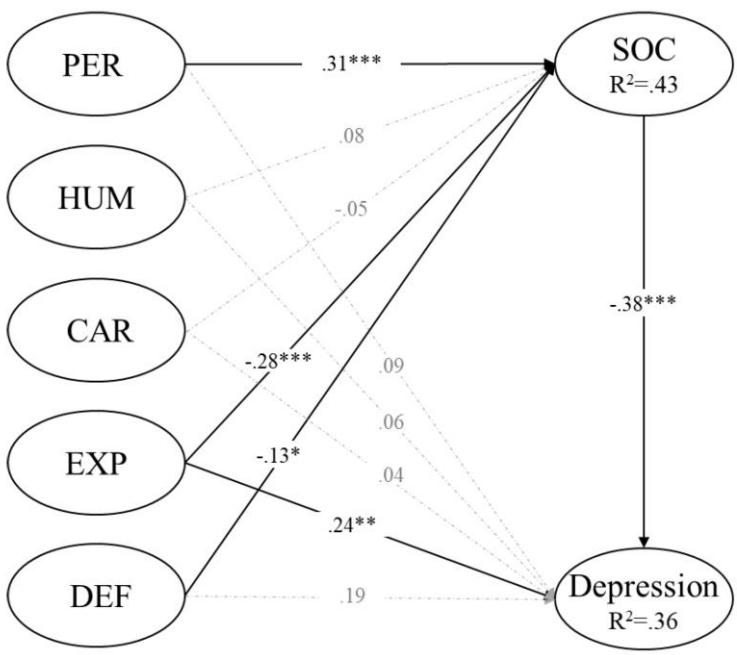
$\beta$: Standardized regression weight, CI: Confidence interval, EC: Endogenous construct, C: Covariates, PER: Personal−intellectual development motivation, HUM: Humanitarian motivation, CAR: Careerist−materialist motivation, EXP: Expectation−driven motivation, DEF: Default motivation, SOC: Sense of Coherence, DEP: Depression

In order to conduct a more comprehensive assessment of the model's out−of−sample predictive capacity, this study calculated the Mean Absolute Error (MAE) values for both the Partial Least Squares (PLS) and Linear Model (LM), as well as the $Q^2$predict

values for the PLS model (Table 13). A $Q^2$predict value that is positive indicates that the prediction errors of the PLS path model are smaller than those of simple mean predictions, thus demonstrating the model's ability to predict outcomes with sufficient accuracy (Shmueli et al., 2019). Furthermore, the greater the number of indicators for which the MAE values are smaller for the PLS than for the LM, the stronger the out-of-sample predictive power of the model (Shmueli et al., 2019).

The findings revealed that all $Q^2$predict values for the SOC and DEP indicators were positive. In terms of MAE values, none of the DEP indicators analyzed in the PLS-SEM analysis produced greater prediction errors than the naïve LM benchmark, suggesting a high level of predictive accuracy. However, one SOC item yielded higher prediction errors when compared with the LM benchmark, indicating a moderate level of predictive power.

Figure 2. Structural results of PLS-SEM (Study 2-1)




*Note*. This figure represents statistically significant paths by continuous lines and their standardized coefficients. Gender, age, and grade are included as covariates. *p<.05, **p<.01, ***p<.001

Table 12. Specific indirect effects

| Paths | $\beta$ | $t$−Value | $p$−Value | 95% CI |
|---|---|---|---|---|
| Indirect effects | | | | |
| PER→SOC→DEP | −.117 | 3.106 | .002 | [−.198, −.047] |
| HUM→SOC→DEP | −.029 | .960 | .337 | [−.096, .022] |
| CAR→SOC→DEP | .019 | .690 | .490 | [−.035, .074] |
| EXP→SOC→DEP | .105 | 4.185 | .000 | [.059, .157] |
| DEF→SOC→DEP | .051 | 1.995 | .046 | [.007, .105] |

$\beta$: Standardized regression weight, CI: Confidence interval, PER: Personal−intellectual development motivation, HUM: Humanitarian motivation, CAR: Careerist−materialist motivation, EXP: Expectation−driven motivation, DEF: Default motivation, SOC: Sense of Coherence, DEP: Depression

Table 13. Predictive relevance

| Construct | $Q^2_{predict}$ | $MAE_{PLS}$ | $MAE_{LM}$ | $MAE_{LM}-MAE_{PLS}$ |
|---|---|---|---|---|
| SOC | | | | |
| SOC_1 | .261 | 3.517 | 3.721 | .204 |
| SOC_2 | .213 | 2.894 | 3.107 | .213 |
| SOC_3 | .293 | 2.638 | 2.601 | −.037 |
| DEP | | | | |
| DEP_1 | .059 | .656 | .538 | .023 |
| DEP_2 | .165 | .402 | .300 | .016 |
| DEP_3 | .184 | .541 | .427 | .021 |

SOC: Sense of Coherence, SOC_1: Comprehensibility, SOC_2: Manageability, SOC_3: Meaningfulness, DEP: Depression

# Study 2-2

In Study 2−1, it was found that only the motives of PER, EXP, and DEF, mediated by SOC, predicted depressive symptoms, while HUM and CAR failed to do so. These results are distinct from previous research, which has shown that prosocial motives and self−transcendence are protective factors for mental illness and predict mental well−being, while materialism predicts mental problems such as depression and anxiety (Farmer & Van Dyne, 2017; Gebauer et al., 2008; Kashdan & Breen, 2007; Wong et al., 2021). Therefore, the present study, Study 2−2, aimed to replicate the findings of Study 2−1. To this end, this study expanded the sample size to include not only dental students but also medical students and confirmed the consistency of the results among students in the wider healthcare domain.

Not only that, but Study 2−2 aimed to expand the results of Study 2−1 by adding mental health−related variables to the statistical model. According to the dual−continual model of mental health (Iasiello et al., 2020), mental well−being is related to, yet distinct from, mental illness. Thus, an individual may experience psychological difficulties and simultaneously maintain a state of mental well−being, and the absence of mental illness does not necessarily indicate the presence of mental well−being (Suldo & Shaffer, 2008). Applying this perspective to the current study, it cannot be assumed that a lower level of depressive symptoms corresponds to a higher level of mental well−being. Moreover, the absence of a significant relationship with depressive symptoms does not necessarily imply the absence of a significant relationship with mental well−being. Therefore, mental well−being has been adopted as the additional dependent variable for this study.

Study 2−2 also included EA as a mediating variable in the statistical model. In Study 2−1, only SOC, a protective factor against mental health problems, was included as a mediating variable. However, using SOC alone has limitations in identifying personal

characteristics that make individuals vulnerable to mental health problems. Thus, including EA, a well-known risk factor for mental health (Bardeen & Fergus, 2016; Hayes et al., 2012b), provides a multidimensional perspective on the characteristics of MAU.

In summary, the aim of this study is to test whether MAU can significantly predict symptoms of depression and mental well-being through SOC and EA. However, similar to Study 2-1, this study takes an exploratory approach to investigate the statistical effects of individual motives. As such, the study proposes hypotheses for both intrinsic and extrinsic goals and motives in their entirety.

**Hypothesis 1**. Intrinsic MAU (i.e., PER and HUM) will positively predict SOC and negatively predict EA.

**Hypothesis 2**. Extrinsic MAU (i.e., CAR and EXP) and the lack of motive will positively predict EA and negatively predict SOC.

**Hypothesis 4**. Intrinsic MAU will negatively predict depressive symptoms and positively predict mental well-being via an increase in SOC and a decrease in EA.

**Hypothesis 5**. Extrinsic MAU will negatively predict mental well-being and positively predict depressive symptoms via a decrease in SOC and an increase in EA.

# 1. Methods

## 1.1. Participants and procedure

The participants were 371 Korean medical and dental students at three universities [240 dental students (151 clinical course); 131 medical students (88 clinical course); 152 women; $M_{age}$ = 22.43, $SD_{age}$ = 3.08] and were provided with a $5 gift certificate as compensation for their involvement in the study. The objective of this study was presented to dental and medical students via a community website, in which they were registered, and also communicated during class sessions, with a particular emphasis on ensuring the confidentiality and anonymity of their involvement in this study. As in Study 2-1, they conducted a web-based survey after providing the informed consent during the period from April 2022 to May 2022. This web-based survey included questionnaires of motives for selecting major, SOC, EA, depression, well-being, and demographic information (i.e., age, gender, major, and grade).

## 1.2. Measures and covariates

Measures of motives for selecting academic major, SOC, and depression were the same as in Study 2-1, with three additional questionnaires included.

### Psychological inflexibility

To assess experiential avoidance, the Korean version of Acceptance and the Action Questionnaire-II (AAQ-II) was utilized (Bond et al., 2011; Heo et al., 2009). The AAQ-II comprises of a 7-item scale, encompassing statements such as “I’ m afraid of my feelings” and “I worry about not being able to control my worries and feelings”. From the 10 items translated by Heo et al. (2009), 7 items proposed by Bond et al. (2011) were selected for this study. Respondents rated their level of agreement with each statement on a

7-point Likert scale, ranging from 1 (never or very rarely true) to 7 (very often or always true). Elevated scores on this measure are indicative of a greater degree of experiential avoidance.

### Mental well-being

The Korean version of PERMA-Profiler (Butler and Kern, 2016; Hwang, 2014) was used to assess mental well-being, which is based on Seligman's model of well-being. The scale comprises three items for each of the main five factors, including Positive emotions (e.g., "In general, how often do you feel positive?"), Engagement (e.g., "How often do you become absorbed in what you are doing?"), Relationships (e.g., "How satisfied are you with your personal relationships?"), Meaning (e.g., "In general, to what extent do you lead a purposeful and meaningful life?"), and Accomplishment (e.g., "How much of the time do you feel you are making progress towards accomplishing your goals?"). Additionally, the scale includes three items to measure General health (e.g., "How satisfied are you with your current physical health?"), three items to measure Negative emotions (e.g., "In general, how often do you feel anxious?"), and one item each to measure Loneliness and Happiness (e.g., "How lonely do you feel in your daily life?" and "Taking all things together, how happy would you say you are?"). Participants responded on an 11-point Likert scale ranging from 0 (never/terrible/not at all) to 10 (always/excellent/completely). In this study, the main five subscales were employed to calculate well-being. Higher scores on this scale correspond to a superior state of well-being.

### Covariates

Age, gender (male=0, female=1), and grade were entered into structural model as covariates.

## 1.3. Statistical analysis

As in Study 2-1, PLS-SEM was performed for the analysis of

structural model. SmartPLS 4 software (Ringle et al., 2022) was used to evaluate all the reflective measurement models and the structural model, using the PLS algorithm and the bootstrapping procedure with 5000 resamples, percentile bootstrap confidence interval method, and significance level of .05. In the present model, item parceling was applied to the two latent variables having more than five items (i.e., experiential avoidance and depression).

# 2. Results

## 2.1. Preliminary analyses

Tables 14 and 15 present the means, standard deviations, and correlations. The correlation analysis reveals positive correlations between CAR, PER, HUM, SOC, and WB, as well as between EXP, DEF, EA, and DEP. In contrast, CAR, PER, HUM, SOC, and WB exhibit negative correlations with EXP, DEF, EA, and DEP.

## 2.2. Evaluation of the reflective measurement models

According to the guidelines proposed by Hair et al. (2019), items exhibiting factor loadings below the threshold of .708 were eliminated, resulting in a range of factor loadings between .725 and .914, as evidenced (see Table 16). The internal consistency reliability of the reflective measurement model was evaluated using both Cronbach's alpha and composite reliability, which fell within the recommended range of .70 to .95. In addition, all AVEs for convergent validity (Table 16) and HTMT values for discrimination validity (Table 17) satisfied the prescribed criteria of AVE values exceeding .50 and HTMT ratios being below .85 (Hair et al., 2019).

Table 14. Descriptive statistics

| Factor | Variable | Mean | SD | Factor | Variable | Mean | SD |
|---|---|---|---|---|---|---|---|
| CAR | CAR_1 | 4.19 | .84 | PER | PER_1 | 4.05 | .88 |
| | CAR_2 | 4.29 | .80 | | PER_2 | 3.98 | .93 |
| | CAR_3 | 4.20 | .79 | | PER_3 | 4.09 | .98 |
| | CAR_4 | 4.07 | .90 | | | | |
| HUM | HUM_1 | 3.67 | 1.08 | EXP | EXP_1 | 1.98 | 1.17 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | HUM_2 | 3.93 | .98 | | EXP_2 | 2.20 | 1.23 |
| | HUM_3 | 3.88 | .99 | | EXP_3 | 2.19 | 1.31 |
| | HUM_4 | 3.53 | 1.11 | | | | |
| DEF | DEF_1 | 2.07 | 1.13 | SOC | SOC_1 | 20.99 | 4.96 |
| | DEF_2 | 1.85 | .95 | | SOC_2 | 17.39 | 4.10 |
| | DEF_3 | 2.02 | 1.18 | | SOC_3 | 18.19 | 4.54 |
| EA | EA_1 | 2.73 | 1.35 | DEP | DEP_1 | .59 | .62 |
| | EA_2 | 3.04 | 1.20 | | DEP_2 | .78 | .66 |
| | EA_3 | 3.15 | 1.33 | | DEP_3 | .64 | .64 |
| WB | WB_1 | 6.45 | 1.77 | | | | |
| | WB_2 | 6.07 | 1.79 | | | | |
| | WB_3 | 6.49 | 2.01 | | | | |
| | WB_4 | 6.47 | 2.03 | | | | |
| | WB_5 | 6.60 | 1.91 | | | | |

PER: Personal-intellectual development motivation, HUM: Humanitarian motivation, CAR: Careerist-materialist motivation, EXP: Expectation-driven motivation, DEF: Default motivation, SOC: Sense of Coherence, SOC_1: Comprehensibility, SOC_2: Manageability, SOC_3: Meaningfulness, EA: Experiential avoidance, DEP: Depression, WB: Well-being, WB_1: Accomplishment, WB_2: Engagement, WB_3: Meaning, WB_4: Positive emotions, WB_5: Relationships

Table 15. Latent variable correlations

| Factor | CAR | PER | HUM | EXP | DEF | EA | SOC | DEP | WB |
|---|---|---|---|---|---|---|---|---|---|
| PER | .38*** | | | | | | | | |
| HUM | .20*** | .46*** | | | | | | | |
| EXP | −.11 | −.21*** | −.18** | | | | | | |
| DEF | −.23*** | −.50*** | −.31*** | .58*** | | | | | |
| EA | −.12* | −23*** | −.10 | .36*** | .39*** | | | | |
| SOC | .15** | .44*** | .32*** | −.38*** | −.46*** | −.60*** | | | |
| DEP | −.12* | −.25*** | −.20*** | .41*** | .40*** | .52*** | −.59*** | | |
| WB | .23*** | .54*** | .41*** | −.30*** | −.41*** | −.51*** | .70*** | −.55*** | |
| Age | −.11* | −.15** | −.13* | −.04 | .06 | .02 | −.05 | .03 | −.05 |
| Gender | .01 | .11* | .12* | −.09 | −.07 | −.05 | .05 | −.09 | .16** |
| Grade | −.09 | −.19 | −.23** | .04 | .07 | .04 | −.12* | .12* | −.13* |

PER: Personal−intellectual development motivation, HUM: Humanitarian motivation, CAR: Careerist−materialist motivation, EXP: Expectation−driven motivation, DEF: Default motivation, EA: Experiential avoidance, SOC: Sense of coherence, DEP: Depression, WB: Well−being, *p<.05, **p<.01, ***p<.001

Taken together, these findings indicate that the reflective measurement model achieved appropriate levels of indicator reliability, internal consistency reliability, convergent validity, and discriminant validity.

Table 16. Reliability, convergent validity, and VIF

| Factor | Indicator | Loading | Alpha | CR | AVE | VIF |
|---|---|---|---|---|---|---|
| PER | PER_7 | .890 | .822 | .841 | .736 | 1.943 |
| | PER_8 | .856 | | | | 1.969 |
| | PER_9 | .827 | | | | 1.697 |
| HUM | HUM_11 | .752 | .820 | .835 | .652 | 1.679 |
| | HUM_12 | .877 | | | | 2.478 |
| | HUM_13 | .863 | | | | 2.316 |
| | HUM_14 | .725 | | | | 1.360 |
| CAR | CAR_2 | .843 | .855 | .912 | .691 | 1.920 |
| | CAR_3 | .901 | | | | 2.297 |
| | CAR_4 | .809 | | | | 2.091 |
| | CAR_5 | .765 | | | | 1.869 |
| EXP | EXP_17 | .861 | .748 | .768 | .665 | 1.611 |
| | EXP_18 | .745 | | | | 1.362 |
| | EXP_19 | .836 | | | | 1.621 |
| DEF | DEF_20 | .880 | .809 | .816 | .723 | 1.949 |
| | DEF_21 | .810 | | | | 1.619 |
| | DEF_22 | .859 | | | | 1.819 |

| | | | | | | |
|---|---|---|---|---|---|---|
| SOC | SOC_1 | .821 | .786 | .804 | .696 | 1.848 |
| | SOC_2 | .842 | | | | 1.907 |
| | SOC_3 | .839 | | | | 1.430 |
| EA | EA_1 | .903 | .878 | .883 | .803 | 2.539 |
| | EA_2 | .889 | | | | 2.475 |
| | EA_3 | .896 | | | | 2.238 |
| DEP | DEP_1 | .905 | .893 | .894 | .823 | 2.643 |
| | DEP_2 | .912 | | | | 2.661 |
| | DEP_3 | .905 | | | | 2.650 |
| WB | WB_1 | .858 | .933 | .936 | .788 | 3.001 |
| | WB_2 | .891 | | | | 3.729 |
| | WB_3 | .914 | | | | 4.053 |
| | WB_4 | .913 | | | | 4.618 |
| | WB_5 | .860 | | | | 3.006 |

PER: Personal-intellectual development motivation, HUM: Humanitarian motivation, CAR: Careerist-materialist motivation, EXP: Expectation-driven motivation, DEF: Default motivation, SOC: Sense of Coherence, SOC_1: Comprehensibility, SOC_2: Manageability, SOC_3: Meaningfulness, EA: Experiential avoidance, DEP: Depression, WB: Well-being, WB_1: Accomplishment, WB_2: Engagement, WB_3: Meaning, WB_4: Positive emotions, WB_5: Relationships

Table 17. Discriminant validity: HTMT

| Construct | CAR | PER | HUM | EXP | DEF | EA | SOC | DEP |
|---|---|---|---|---|---|---|---|---|
| PER | .44 | | | | | | | |
| HUM | .22 | .55 | | | | | | |
| EXP | .12 | .26 | .21 | | | | | |
| DEF | .25 | .62 | .37 | .74 | | | | |
| EA | .12 | .26 | .11 | .45 | .46 | | | |
| SOC | .15 | .52 | .37 | .48 | .56 | .72 | | |
| DEP | .13 | .29 | .18 | .49 | .47 | .58 | .70 | |
| WB | .25 | .61 | .46 | .35 | .47 | .55 | .79 | .60 |

PER: Personal–intellectual development motivation, HUM: Humanitarian motivation, CAR: Careerist–materialist motivation, EXP: Expectation–driven motivation, DEF: Default motivation, EA: Experiential avoidance, SOC: Sense of coherence, DEP: Depression

## 2.3. Evaluation of the structural model

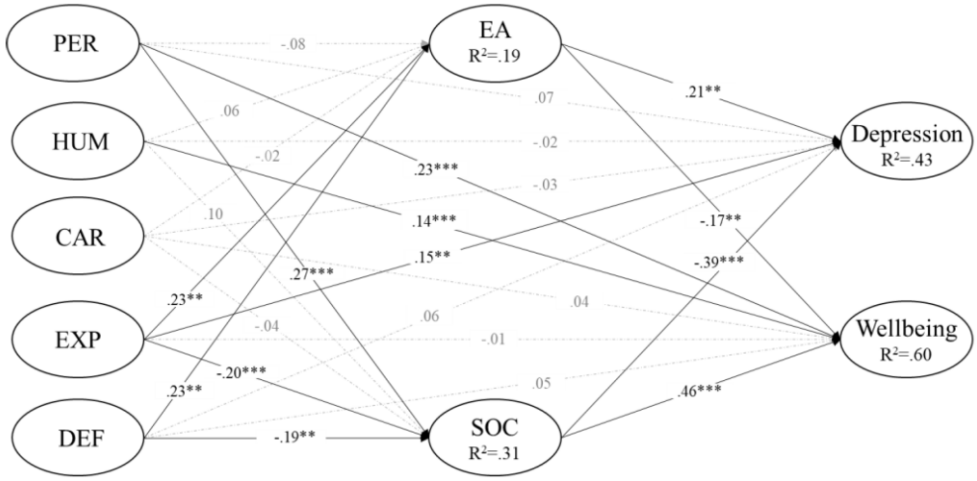
Regarding collinearity problems, the maximum VIF value was 4.618 (see Table 16), indicating that multi–collinearity problems did not exist because the value was less than 5 (Hair et al., 2019).

As shown in Table 18 and Figure 3, pathway coefficients and t values revealed that PER was positively related to SOC ($\beta$ = .274, 95% CI [.153, .387], p < .001). Conversely, EXP and DEF were negatively associated with SOC (EXP: $\beta$ = −.195, 95% CI [−.301, −.096], p < .001; DEF: $\beta$ = −.194, 95% CI [−.315, −.070], p = .002) and positively with EA (EXP: $\beta$ = .226, 95% CI [.081, .363], p = .002; DEF: $\beta$ = .226, 95% CI [.052, .389], p = .009). Regarding the dependent variables, both PER and HUM had a positive relationship with WB (PER: $\beta$ = .229, 95% CI [.128, .320], p < .001;

HUM: $\beta$ = .138, 95% CI [.062, .211], p <.001). EXP ($\beta$ = .153, 95% CI [.054, .256], p = .003) predicted DEP. Of the two mediators, SOC was negatively associated with DEP ($\beta$ = −.392, 95% CI [−.522, −.258], p < .001) and positively with WB ($\beta$ = .458, 95% CI [.340, .554], p < .001), while EA was the opposite with them (DEP: $\beta$ = .211, 95% CI [.083, .343], p = .001; WB: $\beta$ = −.172, 95% CI [−.292, −.059], p = .004). CAR did not significantly predict any variables. Among covariates, only gender positively predicted WB ($\beta$ = .189, 95% CI [.051, .332], p = .009) while the other covariates did not significantly predicted any variables. Additionally, $R^2$ was .314 for SOC, .187 for EA, .433 for DEP, and .595 for WB (see Table 12), indicating these values fell within the range from weak to moderate explanatory power (Hair et al., 2019). The $f^2$ effect sizes of all significant paths (Table 16) fell within the range from small to medium size effect (Hair et al., 2019).

The results (see Table 19) indicated significant total indirect effects of PER, EXP, and DEF on DEP (PER: $\beta$ = −.125, 95% CI [−.199, −.049], p = .001; EXP: $\beta$ = .124, 95% CI [.059, .195], p < .001; DEF: $\beta$ = .124, 95% CI [.052, .197], p = .001) as well as WB (PER: $\beta$ = .140, 95% CI [.065, .213], p < .001; EXP: $\beta$ = −.128, 95% CI [−.200, −.062], p < .001; DEF: $\beta$ = −.128, 95% CI [−.204, −.053], p = .001). Specific indirect effects of PER on DEP and WB confirmed SOC (PER−DEP: $\beta$ = −.107, 95% CI [−.170, −.051], p < .001; PER−WB: $\beta$ = .126, 95% CI [.064, .190], p < .001) as a significant mediator. Also, those of EXP and DEF on them through SOC (EXP−DEP: $\beta$ = .076, 95% CI [.033, .130], p = .002; EXP−WB: $\beta$ = −.089, 95% CI [−.146, −.041], p = .001; DEF−DEP: $\beta$ = .076, 95% CI [.025, .134], p = .007; DEF−WB: $\beta$ = −.089, 95% CI [−.141, −.031], p = .002) and EA (EXP−DEP: $\beta$ = .048, 95% CI [.011, .102], p = .039; EXP−WB: $\beta$ = −.039, 95% CI [−.080, −.009], p = .035; DEF−DEP: $\beta$ = .048, 95% CI [.009, .099], p = .042; DEF−WB: $\beta$ = −.039, 95% CI [−.082, −.007], p = .047) were confirmed.

Figure 3. Structural results of PLS-SEM (Study 2-2)




*Note*. This figure represents statistically significant paths by continuous lines and their standardized coefficients. Gender, age, and grade are included as covariates. *p<.05, **p<.01, ***p<.001

Table 18. Direct effect, $R^2$, and $f^2$

| Construct | $\beta$ | $t$-Value | $p$-Value | 95% CI | $f^2$ |
|---|---|---|---|---|---|
| EC: SOC ($R^2$=.314) | | | | | |
| PER | .274 | 4.543 | .000 | [.153, .387] | .063 |
| HUM | .096 | 1.799 | .072 | [-.009, .200] | .010 |
| CAR | -.044 | .926 | .355 | [-.133, .055] | .002 |
| EXP | -.195 | 3.678 | .000 | [-.301, -.096] | .036 |
| DEF | -.194 | 3.068 | .002 | [-.315, -.070] | .028 |
| C: Age | .043 | .748 | .455 | [-.069, .154] | .001 |
| C: Gender | -.001 | .007 | .995 | [-.181, .175] | .000 |
| C: Grade | -.056 | .904 | .366 | [-.178, .064] | .002 |

| | | | | | |
|---|---|---|---|---|---|
| EC: EA ($R^2$=.187) | | | | | |
| PER | −.083 | 1.154 | .249 | [−.222, .059] | .005 |
| HUM | .060 | 1.014 | .310 | [−.061, .174] | .003 |
| CAR | −.023 | .419 | .676 | [−.133, .078] | .001 |
| EXP | .226 | 3.121 | .002 | [.081, .363] | .040 |
| DEF | .226 | 2.631 | .009 | [.052, .389] | .032 |
| C: Age | .011 | .188 | .851 | [−.108, .135] | .000 |
| C: Gender | −.074 | .795 | .427 | [−.251, .110] | .002 |
| C: Grade | −.004 | .061 | .951 | [−.135, .125] | .000 |
| EC: DEP ($R^2$=433) | | | | | |
| PER | .066 | 1.127 | .260 | [−.055, .175] | .004 |
| HUM | −.016 | .351 | .725 | [−.107, .073] | .000 |
| CAR | −.030 | .631 | .528 | [−.123, .064] | .001 |
| EXP | .153 | 2.968 | .003 | [.054, .256] | .025 |
| DEF | .060 | .827 | .408 | [−.084, .196] | .003 |
| SOC | −.392 | 5.781 | .000 | [−.522, −.258] | .136 |
| EA | .211 | 3.231 | .001 | [.083, .343] | .047 |
| C: Age | −.046 | .928 | .354 | [−.142, .055] | .002 |
| C: Gender | −.110 | 1.385 | .166 | [−.265, .046] | .005 |
| C: Grade | .086 | 1.546 | .122 | [−.027, .193] | .006 |

| | | | | | |
|---|---|---|---|---|---|
| EC: WB ($R^2$=.595) | | | | | |
| PER | .229 | 4.711 | .000 | [.128, .320] | .070 |
| HUM | .138 | 3.635 | .000 | [.062, .211] | .034 |
| CAR | .042 | 1.050 | .294 | [−.039, .123] | .004 |
| EXP | −.014 | .282 | .778 | [−.106, .087] | .000 |
| DEF | .050 | .689 | .491 | [−.106, .182] | .000 |
| SOC | .458 | 8.497 | .000 | [.340, .554] | .261 |
| EA | −.172 | 2.876 | .004 | [−.292, −.059] | .043 |
| C: Age | .050 | 1.092 | .275 | [−.042, .138] | .003 |
| C: Gender | .189 | 2.627 | .009 | [.051, .332] | .021 |
| C: Grade | −.017 | .371 | .711 | [−.111, .072] | .000 |

$\beta$: Standardized regression weight, CI: Confidence interval, EC: Endogenous construct, C: Covariates, PER: Personal−intellectual development motivation, HUM: Humanitarian motivation, CAR: Careerist−materialist motivation, EXP: Expectation−driven motivation, DEF: Default motivation, SOC: Sense of Coherence, EA: Experiential avoidance, DEP: Depression, WB: Well−being

Table 19. Total and specific indirect effects

| Paths | $\beta$ | $t$−Value | $p$−Value | 95% CI |
|---|---|---|---|---|
| Specific indirect effects | | | | |
| PER→EA→DEP | −.018 | 1.050 | .294 | [−.053 .012] |
| PER→EA→WB | .014 | .949 | .343 | [−.010 .050] |
| PER→SOC→DEP | −.107 | 3.453 | .001 | [−.170 −.051] |

| | | | | |
|---|---|---|---|---|
| PER→SOC→WB | .126 | 3.822 | .000 | [.064 .190] |
| HUM→EA→DEP | .013 | .907 | .364 | [−.012 .044] |
| HUM→EA→WB | −.010 | .886 | .376 | [−.036 .012] |
| HUM→SOC→DEP | −.038 | 1.772 | .077 | [−.081 .003] |
| HUM→SOC→WB | .044 | 1.755 | .079 | [−.004 .095] |
| CAR→EA→DEP | −.005 | .399 | .690 | [−.030 .018] |
| CAR→EA→WB | .004 | .371 | .710 | [−.015 .028] |
| CAR→SOC→DEP | .017 | .898 | .369 | [−.022 .055] |
| CAR→SOC→WB | −.020 | .927 | .354 | [−.061 .025] |
| EXP→EA→DEP | .048 | 2.063 | .039 | [.011 .102] |
| EXP→EA→WB | −.039 | 2.114 | .035 | [−.080 −.009] |
| EXP→SOC→DEP | .076 | 3.051 | .002 | [.033 .130] |
| EXP→SOC→WB | −.089 | 3.309 | .001 | [−.146 −.041] |
| DEF→EA→DEP | .048 | 2.037 | .042 | [.009 .099] |
| DEF→EA→WB | −.039 | 1.990 | .047 | [−.082 −.007] |
| DEF→SOC→DEP | .076 | 2.686 | .007 | [.025 .134] |
| DEF→SOC→WB | −.089 | 3.073 | .002 | [−.146 −.031] |
| Total indirect effects | | | | |
| PER→DEP | −.125 | 3.246 | .001 | [−.199 −.049] |
| PER→WB | .140 | 3.633 | .000 | [.065 .213] |
| HUM→DEP | −.025 | .811 | .417 | [−.086 .037] |

| | | | | |
|---|---|---|---|---|
| HUM→WB | .034 | 1.037 | .300 | [−.033 .096] |
| CAR→DEP | .012 | .460 | .645 | [−.043 .063] |
| CAR→WB | −.016 | .574 | .566 | [−.067 .044] |
| EXP→DEP | .124 | 3.574 | .000 | [.059 .195] |
| EXP→WB | −.128 | 3.678 | .000 | [−.200 −.062] |
| DEF→DEP | .124 | 3.338 | .001 | [.052 .197] |
| DEF→WB | −.128 | 3.313 | .001 | [−.204 −.053] |

$\beta$: Standardized regression weight, CI: Bias corrected bootstrap confidence intervals, PER: Personal−intellectual development motivation, HUM: Humanitarian motivation, CAR: Careerist−materialist motivation, EXP: Expectation−driven motivation, DEF: Default motivation, SOC: Sense of Coherence, EA: Experiential avoidance, DEP: Depression, WB: Well−being

In the examination of the out−of−sample predictive power, all the $Q^2$predict values of the indicators of SOC, EA, DEP, and WB were positive (see Table 20). However, two items each of SOC, EA, and WB and all the indicators of DEP in the PLS−SEM analysis yielded greater prediction errors than the naïve LM MAE. This finding showed medium predictive power with respect to WB, but low or lack of predictive power about EA, SOC, and DEP.

Table 20. Predictive relevance

| Construct | $Q^2$ predict | MAE PLS | MAE LM | $MAE_{LM}-MAE_{PLS}$ |
|---|---|---|---|---|
| SOC | | | | |
| SOC_1 | .055 | 3.845 | 3.872 | .027 |
| SOC_2 | .137 | 3.038 | 2.973 | −.065 |

| | | | | |
|---|---|---|---|---|
| SOC_3 | .309 | 3.016 | 2.950 | −.066 |
| EA | | | | |
| EA_1 | .101 | 1.069 | 1.060 | −.009 |
| EA_2 | .054 | .938 | .942 | .004 |
| EA_3 | .122 | 1.007 | 1.000 | −.007 |
| DEP | | | | |
| DEP_1 | .064 | .478 | .466 | −.012 |
| DEP_2 | .158 | .473 | .472 | −.001 |
| DEP_3 | .165 | .458 | .452 | −.006 |
| WB | | | | |
| WB_1 | .225 | 1.249 | 1.257 | .008 |
| WB_2 | .250 | 1.242 | 1.251 | .009 |
| WB_3 | .274 | 1.347 | 1.326 | −.021 |
| WB_4 | .236 | 1.423 | 1.412 | −.011 |
| WB_5 | .185 | 1.359 | 1.385 | .026 |

SOC: Sense of Coherence, SOC_1: Comprehensibility, SOC_2: Manageability, SOC_3: Meaningfulness, EA: Experiential avoidance, DEP: Depression, WB: Well-being, WB_1: Accomplishment, WB_2: Engagement, WB_3: Meaning, WB_4: Positive emotions, WB_5: Relationships

### 2.4. Comparative analysis of the impact of MAU on mental health outcomes: a supplementary analysis comparing dental students and medical students

The current analysis employed the PLS-SEM to examine the potential similarities in the impact of admission motives on mental

health outcomes between dental students and medical students. By employing this approach, the study aims to establish the robust validation of findings within the broader healthcare field. To accomplish this objective, two separate groups were formed: a dental student group and a medical student group. Multiple mediation analysis was conducted on each group.

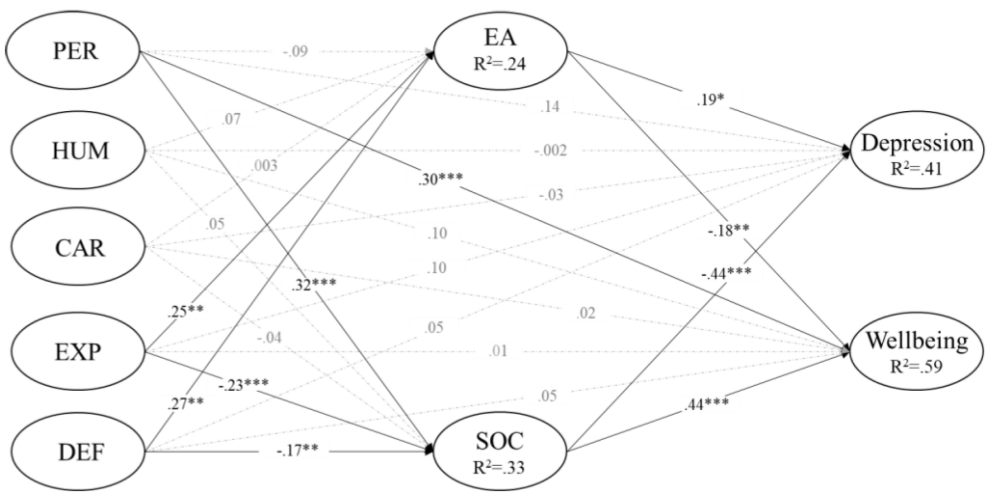
In the analysis conducted on the dental student group (see Appendix 9 and 10 for more detailed findings), the results unveiled specific indirect effects of PER on DEP and WB, with the role of SOC validated as a significant mediator (PER−DEP: $\beta$ = −.138, 95% CI [−.237, −.068], p = .001; PER−WB: $\beta$ = .141, 95% CI [.073, .234], p = .001). Additionally, the effects of EXP and DEF on them were found to operate indirectly through SOC (EXP−DEP: $\beta$ = .098, 95% CI [.040, .167], p = .003; EXP−WB: $\beta$ = −.074, 95% CI [−.146, −.016], p = .001; DEF−DEP: $\beta$ = .072, 95% CI [.010, .159], p = .051; DEF−WB: $\beta$ = −.074, 95% CI [−.146, −.016], p = .023) and EA (EXP−DEP: $\beta$ = .047, 95% CI [.007, .118], p = .088; EXP−WB: $\beta$ = −.046, 95% CI [−.105, −.009], p = .059; DEF−DEP: $\beta$ = .051, 95% CI [.008, .137], p = .098; DEF−WB: $\beta$ = −.050, 95% CI [−.119, −.010], p = .070). However, HUM and CAR did not predict any variables.

The results pertaining to a medical student group revealed specific indirect effects of PER on DEP and WB, with the role of SOC confirmed as a mediator (PER−DEP: $\beta$ = −.074, 95% CI [−.210, −.005], p = .136; PER−WB: $\beta$ = .113, 95% CI [.019, .256], p = .054). Also, the effects of DEF on them were found to operate indirectly through SOC (DEF−DEP: $\beta$ = .069, 95% CI [.008, .200], p = .115; DEF−WB: $\beta$ = −.105, 95% CI [−.253, −.009], p = .072). HUM demonstrated a direct positive relationship with WB ($\beta$ = .134, 95% CI [.004, .276], p = .052) while EXP was directly positively associated with DEP ($\beta$ = .187, 95% CI [.006, .342], p = .032). However, akin to the results of the dental student group, CAR did not predict any variables.

Collectively, the outcomes indicate that intrinsic motives

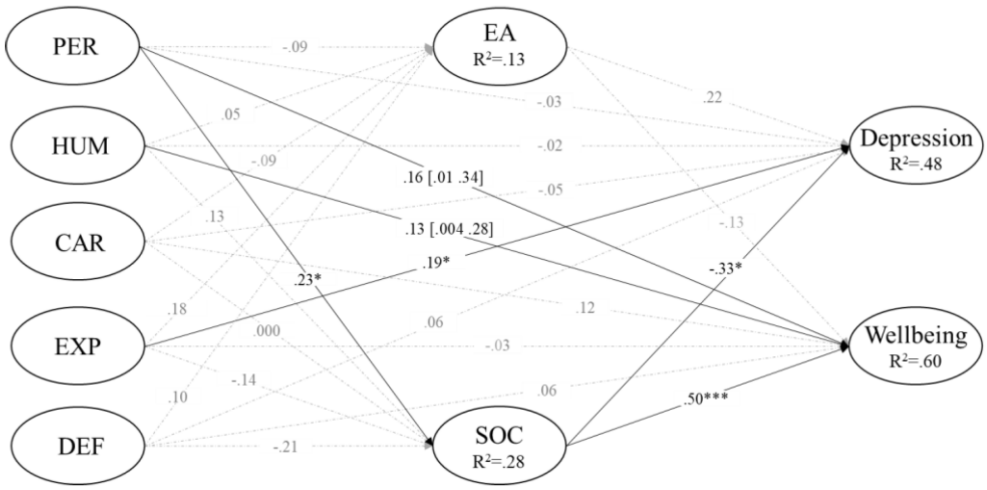
positively impact mental health, whereas extrinsic motives and lack of motives have a detrimental effect on mental health, mediated through SOC and/or EA, among both dental school and medical school student groups. Nevertheless, while the results of the dental student group closely align with the main analysis conducted in Study 2-2, the outcomes concerning the medical student group only partially correspond to the main analysis. It should be noted that the participation rate of medical school students (n=131) was roughly half that of their counterparts from the dental school (n=240). This discrepancy in sample size might have influenced the statistical significance of the mediating effect, potentially accounting for the observed outcomes.

Figure 4. Structural results of PLS-SEM (Supplementary analysis for a dental student group)




*Note*. This figure only represents statistically significant paths and their standardized coefficients. Gender, age, and grade are included as covariates. *p<.05, **p<.01, ***p<.001

Figure 5. Structural results of PLS-SEM (Supplementary analysis for a medical student group)




*Note*. This figure only represents statistically significant paths and their standardized coefficients (If the p-value exceeded the significance level of .05 but a 95% confidence interval did not include zero, the standardized coefficient value was accompanied by the confidence interval). Gender, age, and grade are included as covariates. *p<.05, ***p<.001

## Discussion of Study 2

The aim of this research is to comprehend the impact of motives for attending dental (and medical) school on mental health. The findings from two distinct studies reveal a significant correlation between MAU and mental health. In the first study performed on dental students, PER was found to negatively predict depressive symptoms through an increase in SOC, whereas EXP and DEF positively predicted depressive symptoms through a decrease in SOC. Conversely, HUM and CAR demonstrated no significant association with any variable. Therefore, the results of the initial study provide partial support for the research hypothesis. In order to consistently validate and amplify the findings of the first study, the second study was conducted on dental and medical students, incorporating EA as a mediator and well-being as an outcome of mental health in the second mediation model. According to the results of the second study, PER was found to negatively predict depressive symptoms and positively predict well-being through an increase in SOC. In contrast, EXP and DEF positively predicted depressive symptoms and negatively predicted well-being through a decrease in SOC. Moreover, EXP and DEF were found to positively predict depressive symptoms and negatively predict well-being through an increase in EA. However, PER demonstrated no significant association with EA. Similar to the first study, CAR did not demonstrate any significant association with any variable, while HUM positively and directly predicted well-being only.

Regarding the influence of intrinsic motives on mental health outcomes, the present research found that SOC played a significant role in mediating the relationship between PER and those outcomes. Conversely, EA did not serve as a mediator in the relationship between any intrinsic motives and mental health outcomes, which is in contrast to prior research indicating a negative association between the pursuit of meaning and purpose in life and EA (Gámez et al., 2014; Kashdan & Kane, 2011; Yela et al., 2020). These findings

suggest that for such individuals, their outlook on life and the world, rather than avoidance of internal and external experiences, represents a significant determinant of their mental health status. Moreover, these findings indicate that individuals who possess a clear and resolute motive for personal growth demonstrate a stronger conviction in the ordered and comprehensible nature of the world, possess the necessary resources and abilities to manage life's challenges, and interpret life's adversities as meaningful rather than distressing (Antonovsky, 1987). Hence, SOC may serve as a guiding life orientation, enabling them to effectively manage problems by utilizing their resources effectively and pursuing goals that align with their needs and values, thereby reducing their mental illness and enhancing their overall well-being. These findings align with those of Vainio and Daukantaitė (2016), who demonstrated that perseverance in pursuit of long-term goals aligned with inner values (i.e., grit) positively predicts mental well-being via SOC.

In contrast to the association between intrinsic motives and mental health outcomes, the present study revealed that both mediators mediate the association between EXP and DEF and mental health outcomes. More precisely, both motives were observed to have a negative predictive effect on SOC, while also exhibiting a positive predictive effect on EA, resulting in heightened depressive symptoms and diminished mental well-being. These findings imply that their psychological vulnerability is associated with difficulties in comprehending the world, a lack of resources and abilities to cope with life's challenges, an inclination to perceive such challenges as simply torturous, as well as an inability to accept and respond appropriately to negative internal and external experiences. These impedes their ability to cope effectively with life's challenges and hinders their progress towards achieving a fulfilling life.

On one hand, it is worth noting that the relationship between two motives (i.e., HUM and CAR) and mental health outcomes did not align with the research hypothesis. Specifically, CAR did not significantly predict any of the outcomes, which diverges from

previous research that has demonstrated positive relationships between extrinsic goals and psychological problems and a lower level of well-being (Kashdan & Breen, 2007; Kasser & Ryan, 1993, 1996; Muñiz-Velázquez et al., 2017). It is possible that the complex properties of CAR may have contributed to this finding. In this study, CAR was categorized as an extrinsic motive for academic pursuit. Nevertheless, the correlation analysis conducted in both Study 2-1 and Study 2-2 revealed significant positive correlations between CAR and PER as well as HUM. These positive correlations are similar to the results of Lee et al.'s (2010) study, which confirmed the positive correlation between wealth pursuit and contributions to family and society. Furthermore, CAR exhibited characteristics akin to intrinsic motives in the correlation analysis of both Study 2-1 and Study 2-2. That is, CAR had a significant negative correlation with depressive symptoms and a significant positive correlation with SOC in both studies. In addition, the findings of Study 2-2 demonstrated that CAR showed a significant positive correlation with well-being and a significant negative correlation with EA.

The present findings indicate that students who ascribe significant value to their intellectual growth and contribution to society, as the underlying motives for their studying medicine and dentistry, also place considerable importance on future professional prospects, financial success, reputation, and social status. Given that healthcare professionals are commonly associated with lucrative careers, it is conceivable for healthcare-affiliated students with intrinsic motives for their major selection to consider such extrinsic motives together, which may also be seen as an adaptive consideration for their future. As a result, it is possible that CAR exhibits a mixed characteristic that reflects both intrinsic and extrinsic goals, leading to a relatively weaker impact on the dependent variables compared to other motives with more distinct characteristics.

Not only that, the findings for the relationship between HUM and the designated outcomes failed to substantiate the research

hypothesis. According to the correlation analysis, HUM exhibited a significant correlation with SOC in the two studies and with well-being and depressive symptoms in Study 2-2. Nevertheless, in the parallel mediation models of the two studies, HUM solely predicted well-being and did not predict SOC and depressive symptoms directly. In other words, the predictive power of HUM for SOC and depressive symptoms was diminished to a non-significant level when controlling for PER, implying that the effects of PER on those variables may outweigh those of HUM. These results demonstrate that even if both PER and HUM can be classified as intrinsic motives, each motive may have differential effects on mental health outcomes via distinct processes.

In the pursuit of medical and dental education, personal growth and intellectual advancement may be associated with finding meaning in the learning process, while the desire to assist others or foster community development may stem from a commitment to personal values and preferences. Thus, it is posited that PER may be more germane to intrinsic self-regulation (i.e., focusing on the activities themselves and deriving positive affect from them), while HUM may be more applicable to identified and integrated regulation (i.e., maintaining engagement in tedious but valuable activities) (Burton et al., 2006). Distinctions between these forms of regulation are linked to mental health outcomes. Burton et al. (2006) discovered that, among students who exhibit higher levels of intrinsic regulation, engagement in activities that they value is positively associated with their psychological well-being, irrespective of academic performance. By contrast, students who evince greater levels of identified regulation are more reliant on academic performance for their psychological well-being. That is, students with greater levels of intrinsic regulation derive psychological well-being from their enjoyment of the activities themselves, whereas those with higher levels of identified regulation experience this state as a consequence of the favorable outcomes generated by sustained efforts toward achieving long-term goals.

The findings of this study suggest that the perception of meaningfulness represents a significant predictor of favorable outcomes in mental health. Meaningfulness, defined as a profound level of intrinsic motivation, does not derive from the outcomes of specific activities, but rather from the intrinsic value of the activities themselves (Chalofsky & Krishna, 2009). Antonovsky (1987) posits that meaningfulness constitutes a motivational dimension among three fundamental components (i.e., comprehensibility, manageability, and meaningfulness) of SOC, emphasizing that individuals strive to comprehend and overcome challenges through the pursuit of meaningfulness in life. The process of making or seeking meaning enables individuals to discover positive meanings within experiences of hardship, thereby mitigating psychological distress and fostering psychological adjustment and well-being (Baumeister & Vohs, 2002; Edwards & Van Tongeren, 2020).

As scholarly pursuits play a prominent role in the lives of medical and dental students, the underlying rationale and objectives of academic activities can wield considerable influence over the overall sense of purpose in their lives. Consequently, PER, which holds a more proximal connection with meaningfulness in academic pursuit, is expected to exert a stronger impact on the overall sense of meaningfulness in their lives compared to HUM, thereby potentially yielding greater predictive capacity for SOC and depressive symptoms. These findings also suggest that striving for meaning within a specific activity itself may be more closely associated with experiencing a sense of purpose amid challenges and successfully surmounting them than pursuing values that are associated with the activity.

In addition, it is noteworthy that HUM significantly predicted well-being without the mediation of SOC, even after accounting for the effect of PER on the same outcome. This suggests that HUM may explain a unique variance in the mediation model. HUM involves prosocial motives, which reflect an individual's desire to benefit others and have a positive impact on the community. Prior research

has consistently demonstrated a positive association between prosocial motives and well-being. For instance, individuals with prosocial motives can experience a sense of purpose and meaning in their pursuits, which may enhance their well-being, and may also derive subjective well-being from self-actualization (Farmer & Van Dyne, 2017; Gebauer et al., 2008). Thus, motives to contribute to the development of others and society may directly impact well-being in a positive manner.

Furthermore, it is plausible that the relationship between HUM and well-being is partially explained by other mediators that were not accounted for in the mediation model. For example, positive emotions such as compassion, gratitude, and awe can stimulate prosocial motives and behavior, and have been shown to enhance life satisfaction, happiness, and mitigate psychological distress (Stellar et al., 2017; Wood et al., 2010). As such, additional psychological factors that foster prosocial motives may play a role in the positive effect of HUM on well-being. Nevertheless, the current data do not permit direct confirmation of these possibilities, and further research is required to address these issues.

While not the primary focus of this investigation, it is intriguing to observe the significant statistical influence of gender, age, and grade as control variables. Study 2-1 revealed a significant positive relationship between SOC and age. Past research has demonstrated that SOC undergoes persistent development until the age of 30, and once it reaches a level of significant potency, a stable disposition of SOC is established (Antonovsky, 1987; Feldt et al., 2000; Kivimäki et al., 2000). Given these developmental characteristics of SOC, the positive association may be understood, since the majority of students who participated in this study are young adults in their twenties.

On the other hand, the same study indicated that grade had a negative relation with SOC. The demanding nature of examinations, grades, and workload are significant stressors for dental students, and as their academic curriculum progresses, stress from these

factors tends to escalate (Elani et al., 2014). Therefore, this negative correlation is unsurprising because stressful events or circumstances can undermine SOC, independent of the manifestation of any psychopathological symptoms (Braun-Lewensohn & Sagy, 2010; Schnyder et al., 2002; Volanen et al., 2007). However, the finding may seem puzzling, given the general tendency for age to increase as grade progresses. In Korea, adults in their mid to late 20s and early 30s are increasingly endeavoring to re-enter medical or dental schools by quitting their jobs or changing their majors for a more stable future (Han, 2022). As a result, even within the same grade, there may be variation in students' age groups, which could account for the independent effects of age and grade on SOC.

Finally, Study 2-2 showed a gender effect on well-being, which is consistent with previous research demonstrating gender differences in well-being. For example, de la Fuente et al.'s (2020) investigation of young adults reported that women exhibited higher levels of flourishing than men, and highlighted the significant influence of self-focus and support from family members and partners on men's flourishing, while women's prioritization of studies had a significant effect on their flourishing. Additionally, Arrosa and Gandelman (2016) observed that women report higher levels of happiness than men on a worldwide scale, even under less favorable life circumstances, which they attribute to women's optimism. These findings imply that female students may have a more optimistic perspective on their lives and, when engaged in academic activities, a greater capacity for psychological satisfaction than their male counterparts. This may lead to higher levels of mental well-being despite the heightened mental demands inherent in medical and dental education.

Notwithstanding, it is imperative to underscore that the aforementioned suggestions are conjectural. To clarify, the significant impacts of age and grade were not replicated in Study 2-2, and there exists a potential for non-replication of the gender disparities in well-being within this study, considering the

inconsistent outcomes in research pertaining to gender differences in mental health (Matud et al., 2019). As such, additional investigation into these associations is necessary.

# Further exploratory investigation

The present study was conducted through an exploratory approach to examine the differences in MAU based on demographic characteristics.

## 3.1. Exploratory analysis of MAU based on gender and educational courses

To investigate gender and educational course differences in MAU, an Analysis of Covariance (ANCOVA) was conducted using the dataset from 2021 (Study 1 and Study 2-1) and 2022 (Study 2-2). The aim was to assess the impact of gender on MAU while considering age and educational course (i.e., pre-clinical course and clinical course) as covariates, as they were found to be correlated with MAU. Additionally, to explore the variations in MAU related to educational course, age and gender were included as covariates, given their correlation with MAU.

Results of ANCOVA (see Appendix 13) revealed that, with respect to gender differences, only the differences in PER within the dataset from 2021 exhibited statistical significance ($F(3, 222) = 4.400$, $p = .037$, $\eta_p^2 = .019$), indicating that female students ($M = 20.08$, $SD = 3.31$) exhibited higher level of PER compared to their male counterparts ($M = 19.05$, $SD = 3.77$). In relation to the educational courses, the difference in PER was found to be statistically significant for both 2021 ($F(3, 222) = 4.829$, $p = .029$, $\eta_p^2 = .019$) and 2022 ($F(3, 222) = 6.487$, $p = .011$, $\eta_p^2 = .027$), highlighting the impact of the course on PER levels. That is, students enrolled in the pre-clinical course exhibited markedly higher level of PER compared to their counterparts in the clinical course, as indicated by the dataset encompassing the years 2021 ($M = 20.62$, $SD = 3.48$) and 2022 ($M = 20.75$, $SD = 3.09$) for the pre-clinical group, and 2021 ($M = 19.01$, $SD = 3.50$) and 2022 ($M = 18.82$, $SD = 3.53$) for the clinical group. Moreover, students in pre-clinical course ($M = 12.66$, $SD = 4.03$) reported significantly lower level of

EXP than their counterparts in the clinical course ($M$ = 13.23, $SD$ = 3.76) within the dataset from 2022 ($F$(3, 222) = 4.498, p = .035, $\eta_p^2$ = .019).

### 3.2. Brief discussion of Further exploratory investigation

In both 2021 and 2022 dataset, students in clinical course reported lower level of personal-intellectual development motivation than their counterparts in pre-clinical course. Once transitioning to the clinical course, students are required to acquire new dental skills and knowledge related to the clinical context, as well as learn how to interact with patients. Additionally, the workload significantly increases compared to the pre-clinical course. The resulting stress experiences, such as anxiety, inadequacy, and decreased self-confidence, greatly impact intrinsic motivation and goal orientation towards academic pursuits (Malau-Aduli et al., 2020; Orsini et al., 2016). Therefore, in order to alleviate the pressures and stress associated with the transition to the clinical course, it can be beneficial to gradually expose students to clinical experiences (e.g., the provision of healthcare services in underserved areas) starting from the pre-clinical course (Lalumandier et al., 2004; Malau-Aduli et al., 2020). This approach not only cultivates values and attitudes of professionalism but also enables students to anticipate and prepare for the clinical course to some extent.

In contrast, the analysis of one of the two datasets revealed gender differences in PER and differences in EXP across educational courses. Specifically, it was discerned that women demonstrated a higher magnitude of personal-intellectual development motivation in the 2021 dataset, relative to men. These findings align with previous research indicating that women tend to have higher intrinsic goals (Kasser & Ryan, 1996), a stronger mastery orientation (D' Lima et al., 2014), and prioritize academic pursuits to a greater extent than men (de la Fuente et al., 2020). Furthermore, the analysis of the 2022 dataset revealed a significant disparity in the level of EXP between students enrolled in clinical courses and their counterparts

in pre-clinical courses. This finding implies that students in clinical courses may persist with their academic endeavors due to external expectations from family and friends, even in the absence of intrinsic motivation and purpose. However, given the absence of gender disparities in the 2022 dataset and the lack of course-based disparities in the 2021 dataset, the present findings remain inconclusive, failing to offer definitive insights into whether the observed disparities are transient phenomena or consistent outcomes. Consequently, it is crucial to consistently assess these disparities when selecting a major based on motives in future investigations and elucidate the factors contributing to such disparities.

# General discussion

The present study aimed to elucidate the associations between students' MAU and their learning approach and mental health, specifically focusing on dental (and medical) students. The previous body of literature in the field of dental and medical education has predominantly focused on categorizing and evaluating the prevalence of admission motives among students, while neglecting an in-depth examination of the influence of these motives on academic or psychological outcomes (e.g., Goel et al., 2018; Herz & ElAyouti, 2021). Although extensive literature on non-healthcare students has explored the impacts of students' future goals on learning approach and mental health outcomes (e.g., Kashdan & Breen, 2007; Monnot & Beehr, 2022; Vansteenkiste et al., 2004; Wilding & Andrews, 2006), most of these studies have concentrated on examining the impact of goals categorized as either intrinsic or extrinsic, rather than investigating the effects of individualized motives. Furthermore, empirical investigations directly examining the mechanisms through which motives for choosing a major influence learning behaviors and mental health outcomes are currently lacking.

In order to address the limitations of previous research, this study investigates the distinct impacts of students' specific motives and objectives for their academic pursuits on both a deep approach to learning and mental health outcomes. Furthermore, this research explores the underlying mechanisms through which these motives and objectives influence such learning and mental health outcomes. Considering that students may possess multiple motives pertaining to their studies, this methodology enables a more precise identification of the motive that has a greater impact on their studies and mental health, thereby facilitating a more informed approach to interventions.

According to Self-determination theory (Ryan & Deci, 2019), students can fulfill their true needs through intrinsic goals and

motivation, whereas students with extrinsic goals or no goals at all fail to recognize their genuine needs, leading to thwarted need satisfaction. Consequently, intrinsic goals and motivation are associated with a deep approach to learning and positive mental health outcomes (e.g., Niemiec et al., 2009; Vansteenkiste et al., 2004), whereas extrinsic goals or the absence of goals are associated with a surface approach to learning and negative mental health outcomes (e.g., Kashdan & Breen, 2007; Wilding and Andrews, 2006). The findings of the present study support the theoretical framework of Self-determination theory, demonstrating that each motive exerts a distinct influence on learning behavior and mental health outcomes, mediated by factors such as AE, SOC, and EA.

To be more specific, this study demonstrates that the motive of personal and intellectual growth is strongly related to DAL via the mediation of AE, and also with favorable mental health outcomes through heightened SOC. These findings may be attributed to the optimal concurrence between environmental demands for their study and individual desires. However, students in dental education face high levels of psychological stress due to academic demands, making it challenging to maintain interest in their studies. Thus, it is crucial for these students to discern a greater purpose beyond their individual academic progress in their field, allowing them to overcome the challenges they face and approach their life's journey with a sense of significance.

In light of this perspective, this study accentuates the importance of humanistic and prosocial motives. Previous research has found that even in boring and challenging situations, having prosocial and self-transcendent motives not only enables students to persevere with patience and persistence, but also exerts beneficial effects on their mental well-being (Burton et al., 2006; Farmer & Van Dyne, 2017; Gebauer et al., 2008; Yeager et al., 2014). Based on these findings, together with the results of the current study, it can be inferred that attitudes and motives that are emphasized as core competencies of professionalism in medical and dental education (Sattar et al., 2023)

are significantly associated with positive outcomes in students' academic learning and mental health. This highlights the significance of cultivating humanistic and prosocial motives in academic pursuits, thus suggesting that nurturing students' professionalism could have significant implications for their academic and mental well-being.

In contrast, the pursuit of career success and monetary gains exhibited a negative link with DAL. Furthermore, a motive stemming from external pressure or a lack of any clear objective displayed a substantial association with poor mental health. These findings underscore the necessity for suitable interventions for students displaying elevated levels of these extrinsic motives or the absence of any motive. The present study investigates a range of characteristics associated with the motives for attending dental and medical schools, drawing upon multiple theoretical perspectives. As a result, it can offer valuable insights into effective intervention strategies.

The current study found a positive correlation between a fixed mindset and extrinsic motives, as well as the lack of any underlying motives. A fixed mindset is known to induce individuals to evade circumstances that may expose their shortcomings, firmly believe that exerting effort in a task signifies a dearth of natural talent, and attribute substandard performance to an unalterable defect within themselves (Yeager & Dweck, 2020). Corresponding to these attributes, it is anticipated that students who display high levels of extrinsic motives or a lack of motive are inclined to evade demanding tasks and rely excessively on external measures of accomplishment to establish their sense of self-worth, which impedes academic engagement and deep learning. Therefore, the implementation of growth mindset interventions for these students holds considerable importance (e.g., Yeager et al., 2019).

There are several commonly reported strategies to promote a growth mindset. These methods involve implementing interventions that assess and track changes in learners' mindsets over time, educating learners about the differentiation between growth and fixed

mindsets, and facilitating the development of learning objectives that prioritize progress over performance objectives or letter grades (Wolcott et al., 2021). These interventions have been found to enhance the performance of individuals with a fixed mindset or low prior achievement (Bettinger et al., 2018). Moreover, such interventions have been observed to increase the propensity of high-achieving individuals to undertake challenging tasks (Yeager et al., 2016). Consequently, the cultivation of a growth mindset has the potential to confer several advantages, such as promoting intrinsic motivation, encouraging engagement in learning, and improving academic achievement, especially for students with extrinsic motives or a lack of purpose in the healthcare field.

Based on the empirical findings of this study, moreover, it is recommended that interventions aimed at ameliorating the mental health of students exhibiting elevated levels of extrinsic motives or a lack of motive should incorporate components that facilitate the cultivation of SOC while concurrently mitigating EA. Mindfulness and acceptance-based interventions could be suitable options for addressing the mental health of such students. The effectiveness of these interventions has been consistently supported by various empirical investigations among healthcare professionals and healthcare-affiliated students (e.g., Ando et al., 2011; Scheepers et al., 2020; Warnecke et al., 2011). These interventions involve cultivating a non-evaluative, moment-to-moment awareness of both internal and external experiences, with a focus on attending to one's present circumstances without the imposition of judgments or interpretations (Brown et al., 2007). The implementation of such interventions can foster self-reflection and insight regarding one's emotions, desires, and thoughts, thereby promoting self-awareness. This heightened level of self-awareness can facilitate the identification of personal needs, values, and preferences, and enable the establishment of intrinsic goals aimed at achieving a fulfilling life that is aligned with these factors (Scheepers et al., 2020; Schultz & Ryan, 2015). Through this process of goal-setting, individuals may

be afforded a sense of structure and predictability in their lives (i.e., comprehensibility of SOC), and find meaning even in challenging circumstances (i.e., meaningfulness of SOC), enabling them to tackle problems proactively (i.e., manageability of SOC) (Antonovsky, 1987; Martela & Steger, 2016). Furthermore, this intervention approach promotes acceptance of unwanted thoughts or emotions, enabling individuals to move forward in a direction that aligns with their values and preferences, and providing opportunities for personal growth in difficult situations (Kashdan & Breen, 2007).

Research indicates that individuals with extrinsic aspirations or a lack of clear goals are alienated from their authentic identity, making it difficult for them to comprehend their genuine desires and values and realize them. Conversely, individuals who have intrinsic goals are deeply connected to their authentic selves, allowing them to perceive their needs, values, and preferences and act in harmony with this awareness (Deci & Ryan, 2000; Hodgins & Knee, 2002; Klussman et al., 2022; Ntoumanis et al., 2009). By adopting intrinsic goals through self-connection, these interventions may have the potential to transform students who hold extrinsic aspirations or lack clear purposes into individuals who can enjoy a fulfilling life.

However, it is important to note that these interventions for students alone may be insufficient to elicit the desired positive effects on learning and mental health. It is imperative to establish a supportive healthcare education environment to complement these interventions. According to the mindset-plus-supportive-context hypothesis (Yeager et al., 2022), fostering interactions between instructors who possess a growth mindset and students can promote the cultivation and sustenance of a growth mindset. Additionally, the establishment of an environment that fulfills the needs of individuals, particularly autonomy, plays a pivotal role in improving EA and enhancing SOC. The facilitation of SOC development is made possible through the provision of pedagogical support for autonomy (Ma et al., 2020). The provision of autonomy support also results in a reduction of EA by enabling individuals to perceive unpleasant experiences as

challenges rather than stressors, and consequently accept such experiences (Wang et al., 2023).

How can we enhance the growth mindset and promote autonomy among students in dental education curricula? Firstly, incorporating early clinical experiences into pre-clinical courses can have a positive impact on students' understanding of their roles as dental practitioners and their motivation to help others. For instance, Lalumandier et al. (2004) involved first-year dental students in a restorative dentistry course targeting elementary and middle school students under the supervision of 2-3 faculty members. During this course, first-year dental students reviewed patients' medical histories, assessed oral hygiene status and pathologies, charted restored and carious teeth, and documented inserted sealants. This experience not only taught the students clinical procedures but also reinforced the motivation of students who wanted to help marginalized individuals and increased their awareness of the value and relevance of the educational process. Similarly, AkbariRad et al. (2023) implemented an early clinical exposure program for medical students in a pre-clinical course, teaching them the fundamental principles of physical examination, communication skills with patients, the role of empathy, and basic principles of clinical reasoning. This program had a positive effect on students' motivation toward their field of study. Thus, early clinical experiences may amplify the meaning and interest in students' disciplines, fostering autonomy in their learning processes, and serving as a driving force to endure the demanding educational journey.

Moreover, the changes in the evaluation system are also significant factors. Students admitted to dental schools are those who have demonstrated exceptional academic achievements throughout their prior educational trajectory. Consequently, evaluations can be both highly important and threatening to these students. Particularly within a relative grading system, even if students perceive meaning in their academic pursuits, there is often a tendency to prioritize achieving favorable evaluations over meaningful learning, as

favorable assessments serve as a crucial factor in the academic process. Additionally, it is inevitable for students to feel a sense of competition among their peers. Ultimately, the influence of the evaluation system, as an educational framework, may have a greater impact on individual academic trajectories beyond personal characteristics. Pass-fail grading can be considered as one alternative that addresses these issues. Pass-fail grading moves away from relative grading, promoting collaboration with peers rather than competition (White & Fantone, 2010). This approach not only enhances motivation for learning and academic improvement but also increases autonomy and control over one's own learning (Kogan & Hauer, 2020; White & Fantone, 2010). Particularly for students who place considerable importance on external evaluations and outcomes, such an evaluation method can help foster greater autonomy in their learning and self-development. Alongside this evaluation system, an instructor's feedbacks that emphasize accepting failure experiences and striving for growth (i.e., growth mindset) can play a pivotal role in enhancing dental students' growth mindset and autonomy.

The current study underscores the necessity of identifying students' personal motives for their admission in order to facilitate their successful learning and school life. Consequently, it is crucial to ascertain the reasons underlying students' attendance at dental school during the admission process. Including personal interviews or reviewing essays related to students' admission motives can be advantageous in selecting candidates who exhibit a greater inclination towards becoming dentists to aid the impoverished and marginalized populations (Toit et al., 2014). Particularly, the adoption of multiple mini-interviews, consisting of a series of brief interviews with various assessors, proves to be a valuable approach for assessing students' sense of purpose and motivations, as well as evaluating non-cognitive domains such as ethical considerations, communication skills, and collaborative abilities (Eva et al., 2004). Moreover, this method has been shown to predict the clinical competence of medical professionals in objective structured clinical

examinations (Eva et al., 2004).

Selected students, perceiving themselves as autonomous, competent, and belonging to a special group, tend to experience temporary reinforcement of motivation (Wouters et al., 2016). However, as this positive state is not long-lasting, it is important to monitor whether the initial motives for selecting their major at the time of admission persist or undergo modifications during the academic year, and to investigate the factors contributing to such alterations. Furthermore, a continual analysis of how these motives influence their overall academic trajectory is important.

Despite these manifold implications, this study has certain limitations that should be considered when reviewing the findings. First, the cross-sectional nature of the analyses prevents the assessment of causal relationships between the observed variables. Thus, future studies should longitudinally test the examined mediation hypothesis as well as replicate the findings in subsequent years of dental studies and in multiple contexts. Another limitation is that the conclusions were based on dental and medical students, which imposes obvious limits on the generalizability of the findings. In this regard, expanding the study subjects to represent diverse characteristics of student populations is necessary. In addition, identifying the common and unique MAU and learning behavior and mental health in dental and medical students and comparing them with those of nonhealthcare schools will be meaningful. Finally, SOC and EA did not fully mediate the relations between MAU and the mental health outcomes. This complementary mediation indicates the existence of unaccounted alternative mediators within the model (see Zhao et al., 2010), thereby implying the necessity for a more comprehensive investigation of the associations between MAU and mental health.

In conclusion, this investigation has made valuable contributions to the comprehension of the connections between MAU and both learning behavior and mental health outcomes. Specifically, it has been found that intrinsic motives, especially PER, exhibit a significant

association with a deep approach to learning and positive mental health outcomes. Therefore, these results underscore the necessity for early and apt interventions to be implemented for students experiencing maladjustment, with the aim of fostering intrinsic motives.

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# Appendix

## Appendix 1. Motives for attending university-revised version

다음 문항을 읽고 자신에게 가장 알맞다고 생각하는 곳에 체크해주시기 바랍니다.

| 번호 | 항 목 | 전혀 그렇지 않다 | 그렇지 않다 | 보통 이다 | 그렇다 | 매우 그렇다 |
|---|---|---|---|---|---|---|
| 1 | 내가 속한 전공은 내가 흥미롭고 만족스러운 직업을 가질 수 있도록 하는 하나의 방법이다. | 1 | 2 | 3 | 4 | 5 |
| 2 | 내가 속한 전공은 내가 개인적 성공을 이루기 위한 실용적인 수단이다. | 1 | 2 | 3 | 4 | 5 |
| 3 | 내가 속한 전공은 내가 더 높은 수준의 생활을 하는데 도움이 될 것이다. | 1 | 2 | 3 | 4 | 5 |
| 4 | 내가 속한 전공은 내가 더 많은 돈을 버는데 유용한 특별한 기술들을 배우는 하나의 방법이다. | 1 | 2 | 3 | 4 | 5 |
| 5 | 내가 속한 전공은 내가 높은 사회적 지위를 얻을 수 있도록 하는 하나의 방법이다. | 1 | 2 | 3 | 4 | 5 |
| 6 | 교육은 내가 인생의 복잡함을 이해하는데 도움이 되어야 한다. | 1 | 2 | 3 | 4 | 5 |
| 7 | 내가 속한 전공은 나에게 공부하고 배울 기회를 주기 때문에 나는 나의 학부에 만족한다. | 1 | 2 | 3 | 4 | 5 |
| 8 | 내가 속한 전공은 내가 나 자신을 스스로 발전시킬 수 있는 환경을 제공한다. | 1 | 2 | 3 | 4 | 5 |
| 9 | 내가 속한 전공은 나의 지적 능력을 향상시킬 수 있는 곳이다. | 1 | 2 | 3 | 4 | 5 |
| 10 | 내가 속한 전공은 내가 현대 사회의 복잡함을 이해할 수 있도록 해야 한다. | 1 | 2 | 3 | 4 | 5 |
| 11 | 전공 교육은 잘 못사는 사람들을 도울 수 있도록 해야 한다. | 1 | 2 | 3 | 4 | 5 |
| 12 | 나는 나의 교육을 다른 사람들의 복지를 위한 공헌에 유용하게 쓸 것이다. | 1 | 2 | 3 | 4 | 5 |
| 13 | 나는 인류의 상황을 향상시키는 데 공헌하기 위해 나의 학문을 사용할 것이다. | 1 | 2 | 3 | 4 | 5 |
| 14 | 나는 나의 학문을 통해 시스템에 대한 의미있는 변화를 만들 수 있을 것이라 믿는다. | 1 | 2 | 3 | 4 | 5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 15 | 나는 무엇보다 내 전공과 관련된 학위를 받아야 하기 때문에 내가 속한 학부에 다닌다. | 1 | 2 | 3 | 4 | 5 |
| 16 | 만약 내가 속한 전공의 학위를 따지 못한다면 나의 부모님은 매우 실망할 것이다. | 1 | 2 | 3 | 4 | 5 |
| 17 | 나는 친구들로부터 나의 전공과 관련된 학위를 받아야 한다는 압력을 상당히 받았다. | 1 | 2 | 3 | 4 | 5 |
| 18 | 나는 기본적으로 내가 속한 전공에 오는 것 외에 다른 선택이 없었다. | 1 | 2 | 3 | 4 | 5 |
| 19 | 나는 가족들로부터 내가 속한 전공의 학위를 받아야 한다는 압력을 상당히 받았다. | 1 | 2 | 3 | 4 | 5 |
| 20 | 나는 내가 속한 전공에서 진정으로 얻을 것이 없지만, 다른 대안보다는 낫다. | 1 | 2 | 3 | 4 | 5 |
| 21 | 나는 나의 수업으로부터 얻는 것이 없다. | 1 | 2 | 3 | 4 | 5 |
| 22 | 나는 다른 대안이 거의 없기 때문에 내가 속한 전공에 다닌다. | 1 | 2 | 3 | 4 | 5 |
| 23 | 나는 자주 내 스스로에게 왜 내가 속한 전공에 다니는지 묻곤 한다. | 1 | 2 | 3 | 4 | 5 |

## Appendix 2. Academic engagement

다음 문항을 읽고 자신에게 가장 알맞다고 생각하는 곳에 체크해주시기 바랍니다.

| 번호 | 항 목 | 전혀 그렇지 않다 | 그렇지 않다 | 보통 이다 | 그렇다 | 매우 그렇다 |
|---|---|---|---|---|---|---|
| 1 | 나는 내가 하고 있는 공부의 의미와 목적을 분명히 안다. | 1 | 2 | 3 | 4 | 5 |
| 2 | 나는 공부란 도전해 볼만한 것이라고 생각한다. | 1 | 2 | 3 | 4 | 5 |
| 3 | 나는 공부를 하면 뿌듯해진다. | 1 | 2 | 3 | 4 | 5 |
| 4 | 나는 공부를 통해 자아실현을 할 수 있다고 생각한다. | 1 | 2 | 3 | 4 | 5 |
| 5 | 나는 공부할 때 힘이 나고 활기가 생긴다. | 1 | 2 | 3 | 4 | 5 |
| 6 | 나는 공부할 때 에너지가 생긴다 | 1 | 2 | 3 | 4 | 5 |
| 7 | 나는 공부할 때 정신적으로 힘이 난다. | 1 | 2 | 3 | 4 | 5 |
| 8 | 나는 아침에 일어나면 수업 들으러 학교에 가고 싶다. | 1 | 2 | 3 | 4 | 5 |
| 9 | 나는 공부를 잘한다. | 1 | 2 | 3 | 4 | 5 |
| 10 | 나는 공부에 있어 누구에게도 뒤지지 않는다. | 1 | 2 | 3 | 4 | 5 |
| 11 | 나는 공부에 자신이 있다. | 1 | 2 | 3 | 4 | 5 |
| 12 | 나는 어려운 과제도 충분히 해결할 만한 능력이 있다. | 1 | 2 | 3 | 4 | 5 |
| 13 | 나는 공부할 때 내 주변의 다른 모든 것을 잊어버린다. | 1 | 2 | 3 | 4 | 5 |
| 14 | 나는 공부를 시작하면 푹 빠진다. | 1 | 2 | 3 | 4 | 5 |
| 15 | 공부를 하다 보면 나도 모르게 집중할 때가 있다. | 1 | 2 | 3 | 4 | 5 |
| 16 | 나는 공부할 때 시간이 잘 간다. | 1 | 2 | 3 | 4 | 5 |

## Appendix 3. Mindsets

다음 문항을 읽고 자신에게 가장 알맞다고 생각하는 곳에 체크해주시기 바랍니다.

| 번호 | 항 목 | 전혀 그렇지 않다 | 그렇지 않다 | 보통 이다 | 그렇다 | 매우 그렇다 |
|---|---|---|---|---|---|---|
| 1 | 나는 열심히 노력하면 능력을 얼마든지 바꿀 수 있다고 생각한다. | 1 | 2 | 3 | 4 | 5 |
| 2 | 나는 능력이 낮은 사람이라도 열심히 노력하면 능력을 바꿀 수 있다고 생각한다. | 1 | 2 | 3 | 4 | 5 |
| 3 | 나는 열심히 노력하면 능력이 훨씬 높아질 것이라고 생각한다. | 1 | 2 | 3 | 4 | 5 |
| 4 | 나는 새로운 것을 배우고 공부하면 능력이 많이 좋아질 것이라고 생각한다. | 1 | 2 | 3 | 4 | 5 |
| 5 | 나는 능력은 타고나는 것이라서 아무리 노력해도 바꿀 수 없다고 생각한다. | 1 | 2 | 3 | 4 | 5 |
| 6 | 나는 새로운 것을 배우고 공부하더라도 능력을 많이 바꿀 수 없다고 생각한다. | 1 | 2 | 3 | 4 | 5 |
| 7 | 나는 능력은 이미 결정되어 있어 노력해도 바꾸기 어렵다고 생각한다. | 1 | 2 | 3 | 4 | 5 |
| 8 | 나는 열심히 노력해도 능력은 쉽게 바꿀 수 없다고 생각한다. | 1 | 2 | 3 | 4 | 5 |

## Appendix 4. The Revised Two-Factor Study Process Questionnaire

다음 문항을 읽고 자신에게 가장 알맞다고 생각하는 곳에 체크해주시기 바랍니다.

| 번호 | 항 목 | 전혀 그렇지 않다 | 그렇지 않다 | 보통 이다 | 그렇다 | 매우 그렇다 |
|---|---|---|---|---|---|---|
| 1 | 나는 공부하면서 때때로 개인적인 깊은 만족감을 느낀다. | 1 | 2 | 3 | 4 | 5 |
| 2 | 나는 만족하기 전에 강의의 주제에 대해 스스로 결론을 내릴 수 있도록 충분한 공부를 하야한다고 생각한다. | 1 | 2 | 3 | 4 | 5 |
| 3 | 강의를 수강하면서 나의 목표는 가능한 적은 공부를 하면서 수업을 통과하는 것이다. | 1 | 2 | 3 | 4 | 5 |
| 4 | 나는 수업이나 강의자료에서 제공되는 내용에 한정해서 집중해서 공부한다. | 1 | 2 | 3 | 4 | 5 |
| 5 | 나는 내가 일단 관심을 갖게 된다면, 거의 모든 주제가 흥미로울 수 있다고 생각한다. | 1 | 2 | 3 | 4 | 5 |
| 6 | 나는 대부분의 새로운 주제를 흥미롭게 생각하며 더 많은 정보를 얻기 위해 수업 외의 추가적인 시간을 쓴다. | 1 | 2 | 3 | 4 | 5 |
| 7 | 나는 강의내용이 크게 흥미롭지 않기 때문에 공부를 꼭 필요한 최소한의 수준으로 유지한다. | 1 | 2 | 3 | 4 | 5 |
| 8 | 나는 공부할 때 어떠한 개념을 이해하고자 여러 번 노력해도 잘 안 되어서 단순 암기를 통해 배울 때도 있다. | 1 | 2 | 3 | 4 | 5 |
| 9 | 나는 학문적 주제를 공부하는 것이 좋은 소설이나 영화만큼이나 흥미로울 수 있다고 생각한다. | 1 | 2 | 3 | 4 | 5 |
| 10 | 나는 중요한 주제를 완전히 이해할 때까지 스스로 확인(테스트)한다. | 1 | 2 | 3 | 4 | 5 |
| 11 | 나는 주요 개념을 이해하는 것 보다는 암기를 통해서 시험을 준비한다. | 1 | 2 | 3 | 4 | 5 |
| 12 | 나는 일반적으로 강의에서 제시하는 범위를 벗어나는 범위는 불필요하기 때문에, 제시된 범위 안에서 공부한다. | 1 | 2 | 3 | 4 | 5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 13 | 나는 강의교재가 흥미롭기 때문에 열심히 공부한다. | 1 | 2 | 3 | 4 | 5 |
| 14 | 나는 여러 수업에서 논의된 흥미로운 주제에 대해 더 많은 것을 배우기 위해 자유시간에도 많은 시간을 보낸다. | 1 | 2 | 3 | 4 | 5 |
| 15 | 나는 강의에서 다루는 주제를 대충 안다면, 깊이 탐구하는 것은 도움이 되지 않다고 생각한다. 왜냐하면 그것은 더 혼란스럽게 하고 시간 낭비이기 때문이다. | 1 | 2 | 3 | 4 | 5 |
| 16 | 나는 교수님들이 학생들이 시험에 나오지 않을 것을 알고 있는 내용에 대해서 많은 시간 동안 공부할 것이라고 기대하지 않는 것이 좋다고 생각한다. | 1 | 2 | 3 | 4 | 5 |
| 17 | 나는 대부분의 수업을 듣기 전에 대답을 듣고 싶은 질문을 생각하고 온다. | 1 | 2 | 3 | 4 | 5 |
| 18 | 나는 강의와 함께 제공되는 대부분의 자료를 공부한다. | 1 | 2 | 3 | 4 | 5 |
| 19 | 시험에 포함되지 않은 수업자료를 공부하는 것은 큰 의미가 없다고 생각한다. | 1 | 2 | 3 | 4 | 5 |
| 20 | 시험을 보는 가장 좋은 방법은 예상 질문에 대한 답을 외우는 것이다. | 1 | 2 | 3 | 4 | 5 |

## Appendix 5. Sense of coherence

다음 문항을 읽고 자신에게 가장 알맞다고 생각하는 곳에 체크해주시기 바랍니다.

| 번호 | 항 목 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 당신은 주변에서 일어나는 일에 대해 관심을 갖지 않는다고 느끼십니까? | | | | | | | | |
| | 전혀 그런 적 없다 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 매우 자주 그렇다 |
| 2 | 과거에 당신이 잘 안다고 생각했던 사람의 행동을 보고 놀란 적이 있습니까? | | | | | | | | |
| | 전혀 그런 적 없다 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 항상 그랬다 |
| 3 | 당신이 의지하고 있던 사람들이 당신을 실망시킨 적이 있습니까? | | | | | | | | |
| | 전혀 그런 적 없다 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 항상 일어났다 |
| 4 | 지금까지 당신의 삶은 | | | | | | | | |
| | 명확한 목표나 목적이 없다 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 매우 명확한 목표나 목적이 있다 |
| 5 | 당신은 자신이 부당하게 취급 받고 있다고 느끼십니까? | | | | | | | | |
| | 매우 자주 그렇다 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 전혀 그렇지 않다 |
| 6 | 자신이 친숙하지 않은 상황에 있고, 무엇을 할지 모르겠다고 느끼십니까? | | | | | | | | |
| | 매우 자주 그렇다 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 전혀 그런 적 없다 |
| 7 | 당신이 매일 하고 있는 일은 | | | | | | | | |
| | 큰 만족감과 기쁨의 원천이다 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 전혀 그렇지 않다 |
| 8 | 혼돈스러운 느낌과 생각이 있습니까? | | | | | | | | |
| | 중요성을 과소평가했거나 과대평가 했다 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 균형 잡힌 시각으로 보았다 |
| 9 | 당신이 느끼고 싶지 않은 어떤 감정이 마음 안에서 일어난 적이 있습니까? | | | | | | | | |
| | 매우 자주 그렇다 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 전혀 그렇지 않다 |
| 10 | 아무리 강한 성격의 사람일지라도 때때로 어떤 상황에서는 실패자처럼 느낍니다. 당신은 과거에 얼마나 자주 이런 느낌을 가진 적이 있습니까? | | | | | | | | |
| | 매우 자주 그렇다 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 전혀 그렇지 않다 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 11 | 어떤 일이 일어났을 때, 일반적으로 당신은 그것을 | | | | | | | | |
| | 중요성을 과소평가했거나 과대평가 했다 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 균형 잡힌 시각으로 보았다 |
| 12 | 당신이 일상에서 하는 일이 의미가 없다는 느낌을 자주 갖습니까? | | | | | | | | |
| | 매우 자주 그렇다 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 전혀 그렇지 않다 |
| 13 | 당신을 스스로 통제할 수 없다는 느낌을 자주 갖습니까? | | | | | | | | |
| | 매우 자주 그렇다 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 전혀 그렇지 않다 |

## Appendix 6. Acceptance and the Action Questionnaire-II

다음 문항을 읽고 자신에게 가장 알맞다고 생각하는 곳에 체크해주시기 바랍니다.

| 번호 | 항 목 | 전혀 아님 | 거의 가능성 없음 | 별로 아님 | 가끔 그러함 | 자주 그러함 | 대부분 그러함 | 항상 그러함 |
|---|---|---|---|---|---|---|---|---|
| 1 | 고통스러운 경험과 기억으로 인해 나는 내가 가치 있게 여기는 삶을 살기가 어렵다. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2 | 나는 내 감정을 느끼는 것이 두렵다. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3 | 나는 내 걱정과 느낌을 통제하지 못하는 것에 대해 염려한다. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4 | 내 고통스러운 기억들은 내가 만족스러운 삶을 살지 못하게 한다. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5 | 감정은 내 일상생활에서 문제를 일으킨다. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 6 | 대부분의 사람들은 나보다 자신의 삶을 잘 꾸려나가고 있는 것 같다. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 7 | 걱정은 내가 성공하는데 걸림돌이 된다. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

## Appendix 7. Patient Health Questionnaire-9

다음 문항을 읽고 자신에게 가장 알맞다고 생각하는 곳에 체크해주시기 바랍니다.

| 번호 | 항 목 | 없음 | 2-6일 | 7-12일 | 거의 매일 |
|---|---|---|---|---|---|
| 1 | 기분이 가라앉거나, 우울하거나, 희망이 없다고 느꼈다. | 1 | 2 | 3 | 4 |
| 2 | 평소 하던 일에 대한 흥미가 없어지거나 즐거움을 느끼지 못했다. | 1 | 2 | 3 | 4 |
| 3 | 잠들기가 어렵거나 자주 깼다/혹은 너무 많이 잤다. | 1 | 2 | 3 | 4 |
| 4 | 평소보다 식욕이 줄었다/혹은 평소보다 많이 먹었다. | 1 | 2 | 3 | 4 |
| 5 | 다른 사람들이 눈치 챌 정도로 평소보다 말과 행동이 느려졌다/혹은 너무 안절부절 못해서 가만히 앉아 있을 수 없었다. | 1 | 2 | 3 | 4 |
| 6 | 피곤하고 기운이 없었다. | 1 | 2 | 3 | 4 |
| 7 | 내가 잘못 했거나, 실패했다는 생각이 들었다/ 혹은 자신과 가족을 실망시켰다고 생각했다. | 1 | 2 | 3 | 4 |
| 8 | 신문을 읽거나 TV를 보는 것과 같은 일상적인 일에도 집중 할 수가 없었다. | 1 | 2 | 3 | 4 |
| 9 | 차라리 죽는 것이 더 낫겠다고 생각했다/ 혹은 자해할 생각을 했다. | 1 | 2 | 3 | 4 |

## Appendix 8. PERMA Profile

다음 문항을 읽고 자신에게 가장 알맞다고 생각하는 곳에 체크해주시기 바랍니다.

0: 전혀 그렇지 않다 ~ 10: 늘/완전히 그렇다

| 번호 | 항 목 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 자신의 목표 달성을 위해 나아가고 있다고 느끼는 시간이 얼마나 됩니까? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 2 | 얼마나 자주 자신이 하고 있는 일에 몰두합니까? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 3 | 전반적으로 얼마나 자주 즐겁다고 느낍니까? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 4 | 전반적으로 얼마나 자주 불안하다고 느낍니까? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 5 | 얼마나 자주 스스로 설정한 중요한 목표들을 성취합니까? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 6 | 전반적으로 당신의 건강 상태는 어떻습니까? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 7 | 전반적으로 얼마나 목적있고 의미있는 삶을 살아가고있습니까? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 8 | 당신이 필요할 때, 타인으로부터 도움이나 지지를 얼마나 받습니까? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 9 | 전반적으로 당신의 삶 속에서 하는 일이 얼마나 가치 있고 값지다고 느낍니까? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 10 | 전반적으로 얼마나 재미있고 흥미롭다고 느낍니까? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 일상생활 속에서 당신은 얼마나 외롭다고 느낍니까? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 12 | 현재 자신의 신체적 건강에 얼마나 만족합니까? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 13 | 전반적으로 얼마나 자주 긍정적인 기분을 느낍니까? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 14 | 전반적으로 얼마나 자주 화가 나는 것을 느낍니까? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 15 | 얼마나 자주 자신의 책임에 충실합니까? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16 | 전반적으로 얼마나 자주 슬픔을 느낍니까? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 17 | 얼마나 자주 시간가는 줄 모르고 뭔가를 즐깁니까? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 18 | 같은 나이, 같은 성별과 비교할 때, 당신은 얼마나 건강합니까? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 19 | 얼마나 사랑받고 있다고 느낍니까? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 20 | 전반적으로 얼마나 삶 속에서 방향감각을 갖추고 있다고 느낍니까? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 21 | 당신의 인간관계에 얼마나 만족합니까? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 22 | 전반적으로 얼마나 자신의 삶에 만족합니까? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 23 | 모든 것들을 종합해서 당신은 얼마나 행복하다고 말할 수 있습니까? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

Appendix 9. Direct effect, $R^2$, and $f^2$: a dental student group

| Construct | $\beta$ | $t$−Value | $p$−Value | 95% CI | $f^2$ |
|---|---|---|---|---|---|
| EC: SOC ($R^2$=.332) | | | | | |
| PER | .318 | 4.182 | .000 | [.175, .470] | .083 |
| HUM | .051 | .780 | .436 | [−.085, .171] | .003 |
| CAR | −.043 | .745 | .456 | [−.170, .061] | .002 |
| EXP | −.225 | 3.794 | .000 | [−.332, −.102] | .048 |
| DEF | −.167 | 2.222 | .026 | [−.319, −.022] | .022 |
| C: Age | .057 | .761 | .447 | [−.098, .198] | .002 |
| C: Gender | −.022 | .198 | .843 | [−.237, .191] | .000 |
| C: Grade | −.098 | 1.185 | .236 | [−.259, .065] | .006 |
| EC: EA ($R^2$=.244) | | | | | |
| PER | −.092 | .993 | .321 | [−.280, .078] | .006 |
| HUM | .065 | .920 | .358 | [−.068, .205] | .004 |
| CAR | .003 | .042 | .966 | [−.126, .153] | .000 |
| EXP | .249 | 2.989 | .003 | [.076, .405] | .052 |
| DEF | .272 | 2.720 | .007 | [.077, .465] | .052 |
| C: Age | −.010 | .129 | .897 | [−.162, .155] | .000 |
| C: Gender | −.031 | .270 | .787 | [−.254, .189] | .000 |
| C: Grade | .051 | .560 | .575 | [−.122, .234] | .001 |

| | | | | | |
|---|---|---|---|---|---|
| EC: DEP ($R^2$=407) | | | | | |
| PER | .137 | 1.883 | .060 | [−.013, .277] | .016 |
| HUM | −.002 | .042 | .966 | [−.119, .109] | .000 |
| CAR | −.033 | .499 | .618 | [−.163, .092] | .002 |
| EXP | .097 | 1.567 | .117 | [−.023, .223] | .009 |
| DEF | .050 | .568 | .570 | [−.122, .214] | .002 |
| SOC | −.435 | 5.176 | .000 | [−.600, −.270] | .173 |
| EA | .189 | 2.416 | .016 | [.038, .340] | .037 |
| C: Age | −.138 | 2.069 | .039 | [−.271, −.012] | .013 |
| C: Gender | .048 | .465 | .642 | [−.154, .252] | .001 |
| C: Grade | .224 | 3.080 | .002 | [.088, .371] | .034 |
| EC: WB ($R^2$=.589) | | | | | |
| PER | .301 | 4.865 | .000 | [.181, .421] | .111 |
| HUM | .101 | 2.045 | .041 | [−.002, .194] | .017 |
| CAR | .017 | .356 | .722 | [−.081, .107] | .001 |
| EXP | .010 | .152 | .879 | [−.113, .148] | .000 |
| DEF | .048 | .512 | .609 | [−.141, .222] | .003 |
| SOC | .444 | 6.946 | .000 | [.316, .564] | .261 |
| EA | −.182 | 2.575 | .010 | [−.308, −.030] | .050 |
| C: Age | −.001 | .018 | .986 | [−.140, .127] | .000 |

| | | | | | |
|---|---|---|---|---|---|
| C: Gender | .107 | 1.200 | .230 | [−.070, .281] | .007 |
| C: Grade | .049 | .746 | .456 | [−.079, .178] | .002 |

$\beta$: Standardized regression weight, CI: Confidence interval, EC: Endogenous construct, C: Covariates, CAR: Careerist−materialist motivation, PER: Personal−intellectual development motivation, HUM: Humanitarian motivation, EXP: Expectation−driven motivation, DEF: Default motivation, SOC: Sense of Coherence, EA: Experiential avoidance, DEP: Depression, WB: Well−being

Appendix 10. Specific indirect effects: a dental student group

| Paths | $\beta$ | $t$−Value | $p$−Value | 95% CI |
|---|---|---|---|---|
| PER→EA→DEP | −.017 | .931 | .352 | [−.068 .009] |
| PER→EA→WB | .017 | .838 | .402 | [−.014 .068] |
| PER→SOC→DEP | −.138 | 3.302 | .001 | [−.237 −.068] |
| PER→SOC→WB | .141 | 3.436 | .001 | [.073 .234] |
| HUM→EA→DEP | .012 | .819 | .413 | [−.008 .054] |
| HUM→EA→WB | −.012 | .763 | .445 | [−.056 .010] |
| HUM→SOC→DEP | −.022 | .769 | .442 | [−.075 .041] |
| HUM→SOC→WB | .023 | .782 | .435 | [−.035 .078] |
| CAR→EA→DEP | .001 | .040 | .968 | [−.025 .035] |
| CAR→EA→WB | −.001 | .037 | .970 | [−.034 .027] |
| CAR→SOC→DEP | .019 | .716 | .474 | [−.026 .080] |
| CAR→SOC→WB | −.019 | .749 | .454 | [−.079 .025] |
| EXP→EA→DEP | .047 | 1.707 | .088 | [.007 .118] |
| EXP→EA→WB | −.046 | 1.887 | .059 | [−.105 −.009] |
| EXP→SOC→DEP | .098 | 2.954 | .003 | [.040 .167] |
| EXP→SOC→WB | −.100 | 3.206 | .001 | [−.166 −.045] |
| DEF→EA→DEP | .051 | 1.655 | .098 | [.008 .137] |
| DEF→EA→WB | −.050 | 1.812 | .070 | [−.119 −.010] |
| DEF→SOC→DEP | .072 | 1.952 | .051 | [.010 .159] |
| DEF→SOC→WB | −.074 | 2.268 | .023 | [−.146 −.016] |

$\beta$: Standardized regression weight, CI: Bias corrected bootstrap confidence intervals, CAR: Careerist-materialist motivation, PER: Personal-intellectual development motivation, HUM: Humanitarian motivation, EXP: Expectation-driven motivation, DEF: Default motivation, SOC: Sense of Coherence, EA: Experiential avoidance, DEP: Depression, WB: Well-being

Appendix 11. Direct effect, $R^2$, and $f^2$: a medical student group

| Construct | $\beta$ | $t$−Value | $p$−Value | 95% CI | $f^2$ |
|---|---|---|---|---|---|
| EC: SOC ($R^2$=.278) | | | | | |
| PER | .226 | 2.241 | .025 | [.019 .419] | .040 |
| HUM | .132 | 1.305 | .192 | [−.070 .325] | .019 |
| CAR | .000 | .004 | .997 | [−.191 .150] | .000 |
| EXP | −.142 | 1.377 | .168 | [−.329 .076] | .018 |
| DEF | −.210 | 1.796 | .073 | [−.445 .019] | .027 |
| C: Age | −.017 | .170 | .865 | [−.206 .179] | .000 |
| C: Gender | −.012 | .072 | .942 | [−.320 .338] | .000 |
| C: Grade | .043 | .438 | .661 | [−.153 .240] | .001 |
| EC: EA ($R^2$=.125) | | | | | |
| PER | −.092 | .714 | .475 | [−.339 .162] | .005 |
| HUM | .051 | .483 | .629 | [−.145 .266] | .002 |
| CAR | −.086 | 1.025 | .305 | [−.232 .107] | .007 |
| EXP | .182 | 1.436 | .151 | [−.087 .408] | .024 |
| DEF | .099 | .614 | .539 | [−.192 .440] | .005 |
| C: Age | .116 | 1.084 | .278 | [−.100 .319] | .009 |
| C: Gender | −.105 | .604 | .546 | [−.436 .244] | .003 |
| C: Grade | −.150 | 1.543 | .123 | [−.345 .039] | .014 |

| | | | | | |
|---|---|---|---|---|---|
| EC: DEP ($R^2$=475) | | | | | |
| PER | −.028 | .239 | .811 | [−.277 .188] | .001 |
| HUM | −.023 | .326 | .745 | [−.165 .115] | .001 |
| CAR | −.048 | .609 | .543 | [−.201 .109] | .004 |
| EXP | .187 | 2.140 | .032 | [.006 .342] | .042 |
| DEF | .059 | .368 | .713 | [−.251 .357] | .003 |
| SOC | −.328 | 2.399 | .016 | [−.562 −.054] | .093 |
| EA | .222 | 1.673 | .094 | [−.022 .478] | .052 |
| C: Age | .069 | .771 | .441 | [−.090 .262] | .005 |
| C: Gender | −.307 | 2.445 | .015 | [−.550 −.053] | .037 |
| C: Grade | −.050 | .522 | .602 | [−.254 .129] | .003 |
| EC: WB ($R^2$=.595) | | | | | |
| PER | .161 | 1.858 | .063 | [.010 .341] | .034 |
| HUM | .134 | 1.945 | .052 | [.004 .276] | .034 |
| CAR | .121 | 1.563 | .118 | [−.036 .267] | .030 |
| EXP | −.028 | .378 | .705 | [−.166 .127] | .001 |
| DEF | .061 | .493 | .622 | [−.173 .296] | .004 |
| SOC | .499 | 4.439 | .000 | [.282 .720] | .279 |
| EA | −.125 | 1.047 | .295 | [−.358 .093] | .021 |
| C: Age | .071 | .954 | .340 | [−.077 .214] | .007 |

| | | | | | | |
|---|---|---|---|---|---|---|
| C: Gender | .344 | 2.802 | .005 | [.096 | .577] | .061 |
| C: Grade | −.079 | 1.041 | .298 | [−.221 | .082] | .008 |

$\beta$: Standardized regression weight, CI: Confidence interval, EC: Endogenous construct, C: Covariates, CAR: Careerist−materialist motivation, PER: Personal−intellectual development motivation, HUM: Humanitarian motivation, EXP: Expectation−driven motivation, DEF: Default motivation, SOC: Sense of Coherence, EA: Experiential avoidance, DEP: Depression, WB: Well−being

Appendix 12. Specific indirect effects: a medical student group

| Paths | $\beta$ | $t$−Value | $p$−Value | 95% CI |
|---|---|---|---|---|
| PER→EA→DEP | −.020 | .453 | .650 | [−.145 .026] |
| PER→EA→WB | .011 | .371 | .711 | [−.015 .106] |
| PER→SOC→DEP | −.074 | 1.491 | .136 | [−.210 −.005] |
| PER→SOC→WB | .113 | 1.929 | .054 | [.019 .256] |
| HUM→EA→DEP | .011 | .377 | .706 | [−.034 .100] |
| HUM→EA→WB | −.006 | .322 | .748 | [−.074 .016] |
| HUM→SOC→DEP | −.043 | 1.132 | .258 | [−.152 .006] |
| HUM→SOC→WB | .066 | 1.240 | .215 | [−.020 .190] |
| CAR→EA→DEP | −.019 | .680 | .496 | [−.093 .019] |
| CAR→EA→WB | .011 | .524 | .601 | [−.012 .071] |
| CAR→SOC→DEP | .000 | .004 | .997 | [−.049 .069] |
| CAR→SOC→WB | .000 | .004 | .997 | [−.099 .072] |
| EXP→EA→DEP | .040 | .954 | .340 | [−.015 .148] |
| EXP→EA→WB | −.023 | .741 | .458 | [−.112 .016] |
| EXP→SOC→DEP | .047 | 1.153 | .249 | [−.005 .166] |
| EXP→SOC→WB | −.071 | 1.318 | .187 | [−.195 .019] |
| DEF→EA→DEP | .022 | .528 | .598 | [−.042 .118] |
| DEF→EA→WB | −.012 | .433 | .665 | [−.108 .019] |
| DEF→SOC→DEP | .069 | 1.575 | .115 | [.008 .200] |
| DEF→SOC→WB | −.105 | 1.798 | .072 | [−.253 −.009] |

$\beta$: Standardized regression weight, CI: Bias corrected bootstrap confidence intervals, CAR: Careerist-materialist motivation, PER: Personal-intellectual development motivation, HUM: Humanitarian motivation, EXP: Expectation-driven motivation, DEF: Default motivation, SOC: Sense of Coherence, EA: Experiential avoidance, DEP: Depression, WB: Well-being

Appendix 13. Differences in MAU based on gender and educational course[③]

| | Year | Male | Female | Main effect of gender | | | Pre-clinical | Clinical | Main effect of courses | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | M(SD) | M(SD) | $F(3, 222)$ | $p$ | $\eta_p^2$ | M(SD) | M(SD) | $F(3, 222)$ | $p$ | $\eta_p^2$ |
| PER | 21 | 19.05(3.77) | 20.08(3.31) | 4.400 | .037 | .019 | 20.62(3.48) | 19.01(3.50) | 4.829 | .029 | .019 |
| | 22 | 19.14(3.55) | 20.02(3.38) | 2.816 | .095 | .012 | 20.75(3.09) | 18.82(3.53) | 6.487 | .011 | .027 |
| HUM | 21 | 15.41(3.13) | 16.16(2.92) | 3.283 | .071 | .015 | 16.16(2.93) | 15.60(3.09) | .701 | .403 | .015 |
| | 22 | 15.12(3.16) | 15.74(3.01) | 1.851 | .175 | .008 | 16.10(2.96) | 14.99(3.12) | 2.863 | .092 | .012 |
| CAR | 21 | 20.17(3.40) | 20.61(3.59) | 1.003 | .318 | .004 | 20.23(3.50) | 20.49(3.50) | .092 | .763 | .004 |
| | 22 | 20.75(3.07) | 20.98(3.28) | .146 | .702 | .001 | 21.26(2.78) | 20.62(3.35) | .062 | .804 | .000 |
| EXP | 21 | 12.26(4.33) | 12.45(3.62) | .166 | .684 | .001 | 11.73(3.82) | 12.69(4.02) | 2.845 | .093 | .013 |
| | 22 | 12.84(3.72) | 13.23(4.04) | .555 | .457 | .002 | 12.66(4.03) | 13.23(3.76) | 4.498 | .035 | .019 |
| DEF | 21 | 8.11(3.38) | 7.55(3.37) | 1.352 | .246 | .006 | 7.25(3.39) | 8.13(3.35) | 1.799 | .181 | .008 |
| | 22 | 8.05(3.44) | 8.11(3.39) | .056 | .813 | .000 | 7.65(3.30) | 8.33(3.46) | 1.040 | .309 | .004 |

PER: Personal-intellectual development motivation, HUM: Humanitarian motivation, CAR: Careerist-materialist motivation, EXP: Expectation-driven motivation, DEF: Default motivation, Year: The year of data collection

[③] In the dataset of the year 2021, there were 110 males and 116 females, with 79 enrolled in the pre-clinical course and 147 in the clinical course. In the dataset of the year 2022, the number of males was 132, while the number of females was 108. Additionally, 89 individuals were enrolled in the pre-clinical course, and 151 were enrolled in the clinical course.

# 국문초록

**배경:** 치의학 교육의 높은 학업적 요구와 경쟁적인 분위기는 치의학 전공 학생들에게 상당한 스트레스 및 심리적 압박감을 유발할 수 있으며, 이는 학생들이 학업에 충분히 몰입하기 보다는 피상적인 학습 전략에 의존하게 만들 수 있다. 하지만 이러한 환경 내에서도 비교적 잘 적응하며 학업적으로도 뛰어난 성과를 내는 학생들이 있는 반면, 그러지 못하고 부적응적인 모습을 보이는 학생들도 존재한다. 본 연구는 이러한 학생들의 특성들을 이해하고 적절한 개입을 위한 기반을 마련하기 위하여, 학생들의 전공 선택 대한 동기가 학습 접근 및 정신건강에 미치는 영향을 규명하고자 하였다.

**방법:** 연구 1에는 226명의 치의학 전공 학생들이 참여하였으며, 전공 선택에 대한 동기, 심층적 학습 접근, 마인드 셋, 학업 열의에 대한 설문지를 작성하였다. 해당 연구에서는 공분산 기반 구조 방정식 모형을 활용하여 학생들의 동기와 심층적 학습 접근 방식 간의 관계에 대한 학업 열의의 매개 효과를 분석하였으며, 마인드 셋과 학생들의 동기와의 관계 또한 확인하였다. 연구 2-1에서는 연구 1과 동일한 226명의 치의학 전공학생들이 전공 선택에 대한 동기, 통합성, 우울을 측정하는 세 가지 설문지를 작성하였다. 이 연구에서는 부분최소제곱 구조방정식 모형을 사용하여 학생들의 동기와 우울 간의 관계에 대한 통합성의 매개 효과를 분석하였다. 마지막으로, 연구 2-1의 결과를 반복검증하고 확장하기 위해, 연구 2-2에서는 371명의 치대 및 의대생을 모집하여 연구 2-1에서 사용한 설문과 더불어 경험적 회피 및 웰빙에 대한 추가 설문을 실시하였다. 본 연구에서는 연구 2-1에서 사용된 것과 동일한 통계 분석을 사용하였으며, 이를 통해 학생들의 동기가 우울 및 웰빙을 예측함에 있어서 통합성 및 경험적 회피의 매개효과를 확인하였다.

**결과:** 연구 1에서, 성장 마인드셋은 학생들의 여러 동기들 중 출세 및 물질주의, 개인 및 지적 성장, 인도주의와 유의한 수준의 정적 관계가 있었다. 또한 고정 마인드셋은 출세 및 물질주의, 주변의 기대를 충족시키기 위한 동기, 동기의 부재와 관련이 있었다. 그리고 학업 열의는 개인 및 지적 성장에 대한 동기와 심층적 학습 접근의 관계 만을 완전 매개하였고, 출세 및 물질주의는 심층적 학습접근을 매개변인을 거치지 않고 부적으로 예측하였다. 연구 2-1에서는 개인 및 지적 성장 동기가 통합성의 증가를 통해 우울을 부적으로 예측하는 것으로 나타난

반면, 주변의 기대를 충족시키기 위한 동기와 동기의 부재는 통합성의 감소를 통해 우울을 정적으로 예측하는 것으로 나타났다. 마지막으로 연구 2-2의 결과에 따르면, 개인 및 지적 성장 동기는 통합성의 증가를 통해 우울 증상을 부적으로 예측하고 웰빙은 정적으로 예측하는 것으로 나타났다. 반면에, 주변의 기대를 충족시키기 위한 동기와 동기의 부재는 통합성의 감소와 경험적 회피의 증가를 통해 우울을 정적으로 예측하고 웰빙은 부적으로 예측하였다. 한편, 인도주의적 동기는 매개변인을 거치지 않고 오직 웰빙만을 정적으로 예측하였다.

**결론:** 본 연구는 학습 접근 및 심리적 안녕에 있어서, 개인 및 지적 성장 동기와 인도주의적 동기를 증진시키는 것이 중요하며, 출세 및 물질주의, 주변의 기대를 충족시키기 위한 동기, 동기의 부재 등을 보이는 치의학 전공 학생들에게 교육 및 심리적 개입이 필요함을 확인하였다. 뿐만 아니라, 본 연구는 이러한 개입에는 성장 마인드 셋과 통합성을 함양시키고 고정 마인드셋과 경험적 회피는 완화시키는 요소들이 포함되어야 함을 제시한다.

**주요어:** 전공선택동기, 심층적 학습접근, 마인드셋, 통합성, 경험적 회피, 정신건강

**학번:** 2019-38300