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Students' stimulant use for cognitive enhancement: A deliberate choice rather than an emotional response to a given situation.

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Abstract

Background: Prescription stimulants such as methylphenidate are usually prescribed to treat attention deficit (and hyperactivity) disorders (ADHD). Recently, these drugs have gained popularity among college students, because of the belief that they can help improve academic performance.

Objectives: This study assessed whether engaging in nonmedical use of prescription stimulants for cognitive enhancement is a rational or a more spontaneous decision-making process.

Method: A survey was conducted among 661 students (63.5% females, n = 420, M_{age} = 21.40). Data were analyzed using structural equation modeling.

Results: A total of 15.9% (n = 105) of the students had previously taken stimulants to improve their academic performance. The use of stimulants was significantly higher among males (22.4%) than females (12.1%).

Positive attitudes toward stimulant use for cognitive enhancement were strongest related to students' intention to take stimulants for increasing their academic performance, followed by the norm of parents. Additionally, the more the students identified themselves with the prototype of a student using stimulants for cognitive enhancement, the more likely they were to be willing to misuse stimulants.

Conclusions: The findings suggest that using stimulants for cognitive enhancement is a rational choice rather than an unplanned one.

Keywords:

College students; substance use; nonmedical stimulant use; academic performance enhancement

1. Introduction

Prescription stimulants such as methylphenidate are usually prescribed to treat attention deficit (and hyperactivity) disorders (ADHD) (Faraone et al., 2019). In recent decades, however, these drugs have also gained popularity among college students, in particular because of the belief that they can help improve academic performance (Arria et al., 2017; Faraone et al., 2020). This had led to an increase in the number of people using these drugs for nonmedical purposes, meaning that they are not used in accordance with their prescription (Helmer et al., 2016). A recent review study of the nonmedical use of prescription stimulants found a prevalence rate ranging from 2.1% to 58.7%, depending on the definition, study design, and population (i.e., college students or others) (2020). The nonmedical use of methylphenidate, however, poses risks to students' health, such as problems with their nerves, heart, and stomach, as well as possible addiction and psychosis (National Institute on Drug Abuse, 2018). Furthermore, nonmedical users of prescription stimulants have consistently been found to engage more often in polydrug use (Arria et al., 2018; Barrett et al., 2006; Garnier-Dykstra et al., 2012; Novak et al., 2016). It is apparent that the nonmedical use of stimulants in an academic context represents a significant public health risk (Faraone et al., 2020).

Most studies to date have focused on uncovering prevalence rates and variables correlated with stimulant use for cognitive enhancement rather than testing models adapted from psychological theories. To gain a better understanding of the possible factors influencing students' use of stimulants to enhance their academic performance, this study utilized the Prototype Willingness Model (PWM) framework (Gibbons et al., 1998; Gibbons et al., 2009). The central premise of this framework is that not all health behavior is completely intentional or planned as other behavioral models presume, such as the theory of reasoned action (TRA, Fishbein & Ajzen, 1975) or the theory of planned behavior (TPB, Ajzen, 1991), which state that behavior is a rational decision-making process. In addition to considering a reasoned path, the PWM also assumes a social reaction path which is more intuitive and spontaneous (see Figure 1).

insert Figure 1 here

In the reasoned path, attitudes and subjective norms toward a given behavior are antecedents of decisions or behaviors that involve deliberation through intention (Walrave et al., 2015). Attitudes refer to people's evaluations or appraisals of the target behavior. A subjective norm is defined as person's perception of the approval of this behavior by significant others, like one's partner or close friends. As students spend a large amount of their time in an academic environment among fellow students, the influence of peers is inevitable (Benson et al., 2015; Lueck et al., 2019). Meanwhile, some studies have suggested that parents sometimes pressure their children to meet unrealistic academic standards, which may unintentionally increase the likelihood of their children misusing prescription stimulants to improve performance (Donaldson et al., 2015; Nargiso et al., 2015). For this reason, this study included subjective norms of both peers and parents. Finally, the TRA predicts that the higher an individual's intention to perform a certain behavior, the higher the chances are of doing so. Therefore, as shown in Figure 1, we hypothesize:

H1. The more positive the attitude of college students toward stimulant use for academic performance enhancement, the greater their intention to use them will be.

H2. The more favorable the subjective norm of peers (H2a) and parents (H2b) to use stimulants for academic performance enhancement, the more college students intend to use them.

H3. The higher the students' *intention* to use stimulants, the more they are inclined to actually use them for academic performance enhancement.

The PWM also includes a social pathway that refers to decisions that are not necessarily well thought out. To actually perform a behavior also depends on a person's willingness to do so in a particular situation. The PWM states that willingness does not involve planning or consideration of a behavior and, thus, is independent from intention (Gibbons et al., 1998). A person who might not have the intention to engage in a certain risk behavior might nevertheless be open to doing so in certain circumstances (Van Gool et al., 2015). Based on this, we hypothesize:

H4. The higher students' *willingness* to use stimulants to enhance cognitive performance, the higher their *intention* (H4a) and their performance of the *actual* behavior (H4b).

The PWM further assumes that individuals' willingness to engage in risk behavior is associated with the mental image they have of persons performing this behavior (prototypes). In short, young people may have a clear image of peers engaging in a specific risk behavior; if they subsequently engage in this behavior, they are conscious that they can acquire this image themselves (Gibbons et al., 1998). College and university students in particular are highly influenced by others and, when it comes to drug use, they often have the misperception that the vast majority of their peers use several drugs (Lehne et al., 2018; Sanders et al., 2014). In the case of this study, the image students may have of a typical peer who uses stimulants to increase academic performance could, in turn, influence their willingness to use stimulants. Therefore, we hypothesize:

H5. The more college students identify themselves with the prototype of an individual using stimulants to enhance cognitive performance, the higher their willingness to use them.

H6. The more favorably college students perceive the prototype of an individual using stimulants for cognitive enhancement, the higher their willingness to do the same.

Some studies have already examined parts of the PWM to understand students' stimulant use for cognitive enhancement, but these studies are limited because they tested only parts of the PWM and did not take into account students' behavior (Eslami et al., 2014; Stock et al., 2013). The present study adds to the literature by testing a full PWM, thereby taking into account the social norm of peers as well as parents.

2. Method

2.1 Procedure and participants

The study was conducted among university students of a large Belgian university who were studying social sciences, law, economics, or medicine. A nonprobability sampling method was used to recruit the respondents. A self-administered survey was conducted during university courses in the presence of a researcher, who explained the purpose and procedures of the study. At the beginning of the survey, it was made clear to students that they were not obliged to participate and written consent was obtained. No personal details (such as name or email address) were collected. Only students who indicated they had no diagnosis of attention deficit (and hyperactivity) disorders were eligible to participate. The study protocol was approved by the Ethics Committee of our university.

A total of 661 students participated in the study. The average age of the students was 21.40 years (*SD* = 1.77, range 18–26), with 36.5% male (*n* = 241) and 63.5% female (*n* = 420). 31.1% (*n* = 205) were first-year bachelor's degree students, 12.1% (*n* = 80) were second-year bachelor's degree students, 51.5% (*n* = 340) were preparatory or third-year bachelor's degree students, and 5.3% (*n* = 35) were master's degree students. 15.9% (*n* = 105) of the students answered once or more than once to the question "Have you ever taken stimulants (e.g., Ritalin®, Concerta®, Provigil®) to improve your academic performance?" The students' self-reported use rate was significantly higher among males (22.4%; *n* = 54) than females (12.1%, *n* = 51), $\chi^2(1) = 12.07$, $p = .001$. No significant difference was found in self-reported use between those who lived with their parents (14.6%, *n* = 403) and those who did not (17.8%, *n* = 258), $\chi^2(1) = 1.20$, $p=.28$.

2.2 Measures

The survey consisted of a structured questionnaire with some socio-demographic questions and questions on the use of stimulants to improve cognitive performance. The questions to assess the constructs in the PWM were developed in line with the recommendations by Ajzen (2011) and similar studies that have applied the model, albeit in different contexts (e.g., Gerrard et al., 2008; Walrave et al., 2015). In a brief introduction, respondents were informed that the items concerned the prescription of methylphenidate to adult college students without a diagnosis of ADHD who wanted to improve their academic performance. Table 1 presents the descriptives of the study variables (mean, standard deviation, and Cronbach's alpha).

Attitude. Attitudes were measured by asking "The use of stimulants like Ritalin® among students in order to increase their academic performance is . . ." using five semantic differential items ranging on a seven-point scale: (1) "not understandable – understandable," (2) "not acceptable –

acceptable," (3) "dangerous – not dangerous," (4) "bad – good," and (5) "does not make sense – makes sense." The scale was reliable (α = .86).

Subjective norm. The subjective norm of friends or classmates and that of parents were measured with two items each: "My [friends or classmates/parents] would approve of my taking stimulants to improve my academic performance," and "My [friends or classmates/parents] would consider it normal that I take stimulants to improve my academic performance, even without having a diagnosis of ADHD or ADD." The four items were assessed using a five-point Likert scale ranging from 1 = *strongly disagree* to 5 = *strongly agree*. Both scales were reliable, with α = .82 for friends/classmates, and α = .89 for parents.

Intention. The intention to use stimulants to increase academic performance was measured using three items scored on a five-point Likert scale ranging from 1 = *strongly disagree* to 5 = *strongly agree*. The reliability of the scale was good (α = .95).

Prototype favorability. The students were presented with a brief introduction explaining the definition of a prototype: "I would like to know what you think about students who take stimulants to improve their academic performance. I don't suggest anyone in particular, just someone of the same age who might do this. Can you state which characteristics you find suitable?" They were then asked to rate the favorability of the image using five adjectives: "Smart," "Sympathetic," "Popular," "Confident," and "Cool," each followed by a seven-point Likert scale ranging from 1 = *not at all* to 7 = *totally*.

Prototype similarity. Prototype similarity was assessed with a single item: "How similar do you think you are to somebody who takes stimulants to improve his/her academic performance?" scored on a seven-point scale, ranging from 1 = *not at all* to 7 = *totally*.

Willingness. The willingness to use stimulants for cognitive enhancement was measured with a description of a hypothetical scenario: "Imagine you are studying for your exam, but you experience some difficulties. An acquaintance offers you stimulants to improve your study performance. What would you do?" This statement was followed by two options for proceeding in the scenario: "I would take the stimulants" and "After some hesitation, I would take the stimulants," which were scored on a five-point Likert scale ranging from 1 = *very unlikely* to 5 = *likely.*

Behavior. This construct was measured by one item: "Have you ever taken stimulants (e.g., Ritalin®, Concerta®, Provigil®) to improve your academic performance?" The response options ranged from 1 = *never* to 7 = *very often*.

2.3 Data analysis

To test the hypotheses, structural equation modeling was applied to the collected data using Mplus 6.11 to examine the relationships among the PWM constructs (Muthén & Muthén, 2010). First, a measurement model was built to test whether the observed variables reliably reflected the hypothesized latent variables. Second, we estimated a structural model. The SEM results were obtained with the maximum likelihood mean adjusted because preliminary tests suggested that self-reported stimulant behavior was a not normally distributed dependent variable.

The model fits of the measurement and path models were evaluated according to several fit indices. Given that the χ^2 is almost always significant and not an adequate test of the model fit (Kline, 2011), we also reported the comparative fit index (CFI), root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). The CFI ranges from 0 to 1.00, with .95 or higher indicating that the model provides a good fit (Hu & Bentler, 1999). RMSEA and SRMR values below .05 indicate a good model fit, and values from .06 to .08 indicate an adequate fit (Ponnet, 2014).

3. Results

Table 2 displays the correlations between the research constructs. All constructs were significantly related to each other at the $p < .001$ level.

insert Tables 1 and 2 here

3.1 Measurement model

The measurement model provided a good fit for the data: $\chi^2(163) = 399.49$, $p < .001$; CFI = .966, RMSEA = .049, CI [.043, .055], and SRMR = .036. All variables were treated as latent constructs, with the exception of the single-item measures (i.e., prototype similarity and behavior). All factor loadings were significant and above .54. We subsequently included age and gender as covariates in the analyses and examined the relationships between the age and gender of the students and the study variables.

The age of the students was not significantly associated with any of the study variables. The gender of the students was significantly related with the subjective norm of their friends ($\beta = -.19$, $p < .001$), suggesting that male students believe more often than female students that their friends would consider it acceptable to take stimulants to improve one's academic performance. Gender was also significantly related to willingness ($\beta = -.14$, $p < .001$) and behavior ($\beta = -.14$, $p < .001$), suggesting that male students have a higher willingness to use stimulants than female students and that they also use stimulants for cognitive enhancement more often.

3.2 Structural model

The results of the structural model are presented in Figure 2. The results of the fit statistics indicated an adequate model fit: $\chi^2(186) = 502.24$, $p < .001$; CFI = .956, RMSEA = .053, CI [.047, .058], and SRMR = .051.

insert Figure 2 here

Our analyses revealed that attitude, subjective norm, and willingness, together with the covariate gender, explained 47.5% of the variance in intention. The most important association with students' misuse was intention ($\beta = .61$, $p < .001$), thus confirming H3. Unexpectedly, willingness (H4b) was not significantly associated with behavior ($\beta = .02$, $p = .619$). However, the intention to use stimulants was related to willingness (H4a; $\beta = .31$, $p < .001$), attitude (H1; $\beta = .36$, $p < .001$), and the subjective norm of the parents (H2b; $\beta = .29$, $p < .001$). Contrary to our expectations, the subjective norm of friends (H2b) was not significantly associated with intention ($\beta = -.02$, $p = .738$). Furthermore, prototype similarity (H5; $\beta = .40$, $p < .001$) was the variable most strongly related to participants' willingness to use stimulants. Prototype favorability (H6; β = .11, p = .051) was not significantly associated with willingness.

Because of the significant associations between gender and the study variables, we also conducted a multi-group SEM analysis, with gender as a grouping variable. The model provided an adequate fit for the data: $\chi^2(372) = 713.70$, $p < .001$; CFI = .952, RMSEA = .055, CI [.049, .061], and SRMR = .074. As shown in Figure 2 (values in brackets), we found that favorability (H6) was significantly associated with willingness for male students (β = .26, p = .002) but not for female students (β = .00, p = .947). The other associations were similar for males and females.

4. Discussion

Given the significant health risks associated with the use of stimulants for academic performance, it is important to determine the factors that relate to their nonmedical use by students (Ponnet et al., 2015). To achieve this, the current study tested a PWM framework that consisted of two pathways associated with risk behavior: a heuristic social reaction path and a reasoned path.

Our results indicate that students' use of stimulants to enhance academic performance is significantly associated with their intention to use stimulants; that is, it is the result of rational decision-making. We did not find a significant association between their willingness to take stimulants and their actual behavior, which indicates that stimulant use is not a result of the more spontaneous pathway of the PWM. A possible explanation for this result is that university students become more effective at evaluating the consequences due to the increased media attention toward stimulant misuse for cognitive enhancement, and thus are able to rationally weigh the potential benefits and costs. Furthermore, students' attitudes toward stimulant use for cognitive enhancement and the subjective norm of the parents are strongly related to students' intention to use stimulants. The latter is a relevant finding that corroborates the findings of a study by Stoeber and Hotham (2016), who found a positive correlation between, on the one hand, parental pressure to be perfect (e.g., parents who want their child to be the best at everything) and, on the other hand, positive attitudes toward prescription stimulants and the perception that taking them is necessary. Moreover, a study by Van Damme et al.

(2018) reported that 17.2% of students who have misused prescription stimulants have acquired these from their parents, meaning that some parents would not only approve of the behavior but also play an active role in the acquisition of the medication. Future studies could further explore the potential impact of parents on stimulant misuse by focusing on the pressure some students may experience from parents to succeed in their studies, and by examining how their fear of not meeting their parents' expectations may be related to stimulant misuse.

The nonsignificance of the subjective norm of friends or classmates was an unexpected result. Our results suggest that friends' or classmates' norms are not associated with students' intention to use stimulants. One explanation might be that students are aware that only a minority of their friends or classmates take stimulants for cognitive enhancement and, thus, have an accurate perception of the prevalence of students engaging in stimulant misuse.

The present study also investigated the image students have of other students using stimulants, as the PWM focuses not only on attitudes and norms, but also on characteristics of prototypes. Our findings revealed that the more similar students consider themselves to somebody who takes stimulants to improve their academic performance (i.e. prototype similarity), the more willing they are to take stimulants. Interestingly, when students are confronted with a prototypical situation in which they are studying for an exam but are experiencing some difficulties, our findings indicated that the prototype favorability is significantly related to the willingness to take stimulants for males, but not for females. This, together with the finding that male students reported a previous use rate of stimulants twice that of female students, suggests that stimulant use for cognitive enhancement is gendered.

The findings from our explorative study can contribute to future studies aiming to test concrete prevention programs in order to decrease students' intention to use stimulants. First, it could be beneficial to test a prevention program primarily focusing on converting neutral or positive attitudes toward stimulant use for cognitive enhancement into negative attitudes. At the start of the program, freshman students could be educated about on the potential negative consequences of using stimulants for academic performance enhancement (e.g., sleep disturbances, risk of polydrug use, and mental illness). Second, our findings revealed that the norm of parents is significantly associated with students' intention to use stimulants. On the one hand, this is a worrisome finding, given the influential role parents play in the decision-making process of their student children toward using substances (Abar & Turrisi, 2008; Turrisi et al., 2001). However, this finding might also function as leverage: increasing knowledge among parents of the potential harmful consequences of stimulant misuse and guiding them in how to communicate about the topic with their children could be an effective strategy to reduce stimulant misuse among college students. Third, our results indicated that there are significant differences between male and female students with regard to stimulant use for improving academic performance. As such, it might be useful to test tailored educational programs for male and female students.

Despite this study's strengths, such as the use of the full PWM model, a large sample size, and the measurement of students' actual behavior as opposed to the mere intention to use stimulants, certain limitations should be kept in mind when interpreting the results. First, because of the study's cross-sectional nature, any inferences with respect to causality should be made with caution. A second limitation is that we made use of a convenience sample. Duplicating this study with different samples, including replications among probability samples, could increase its generalizability. Third, more research is needed on the pathways students use to obtain prescription stimulants. It has to be determined whether students acquire stimulants legally (e.g., through a prescription) or illegally (e.g., through the internet).

5. Declaration of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the article.

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Table 1

Descriptives of the Study Variables

	M	*SD*	Alpha
Attitude			.86
Att1. Not understandable to understandable	4.25	1.66	
Att2. Not acceptable to acceptable	3.92	1.66	
Att3. Dangerous to not dangerous	3.03	1.48	
Att4. Bad to good	2.97	1.30	
Att5. Does not make sense to makes sense	3.79	1.58	
Subjective norm friends			.82
Sn1. My friends/classmates would approve that I take stimulants to improve my academic performance	2.68	1.12	
Sn2. My friends/classmates would consider it normal that I take stimulants to improve my academic performance, even without having a diagnosis of ADHD or ADD.	2.36	1.05	
Subjective norm parents			.89
Sn3. My parents would approve that I take stimulants to improve my academic performance.	1.70	1.05	
Sn4. My parents would consider it normal that I take stimulants to improve my academic performance, even without having a diagnosis of ADHD or ADD.	1.58	.95	
Prototype favorability			.90
Fav1. Smart	3.29	1.36	
Fav2. Sympathetic	3.80	1.36	
Fav3. Popular	3.64	1.52	
Fav4. Confident	2.85	1.58	
Fav5. Cool	2.72	1.54	
Prototype similarity			
How similar do you think you are to somebody who takes stimulants to improve his/her academic performance?	2.36	1.46	
Willingness			.86
Wil1. I would take the stimulants.	1.49	.88	
Wil2. After some hesitation, I would take the stimulants.	1.48	.81	
Intention			.95
Int1. I intend to use stimulants to improve my academic performance.	1.69	1.01	
Int2. I want to use stimulants to improve my academic performance.	1.75	1.06	
Int3. It's my purpose to use stimulants to improve my academic performance.	1.64	1.03	
Behavior			
Have you ever taken stimulants (e.g., Ritalin®, Concerta®, Provigil®, etc.) to improve your academic performance?	1.44	1.21	

Table 2

Descriptives of the Study Variables

		1	2	3	4	5	6	7
1	Attitude							
2	Norm friends	.51**						
3	Norm parents	.45**	.54**					
4	Similarity	.47**	.33**	.31**				
5	Favorability	.46**	.31**	.27**	.61**			
6	Intention	.59**	.41**	.50**	.53**	.34**		
7	Willingness	.43**	.32**	.22**	.47**	.34**	.51**	
8	Behavior	.43**	.24**	.38**	.39**	.27**	.63**	.35**

Note. *$p < .01$; **$p < .001$.

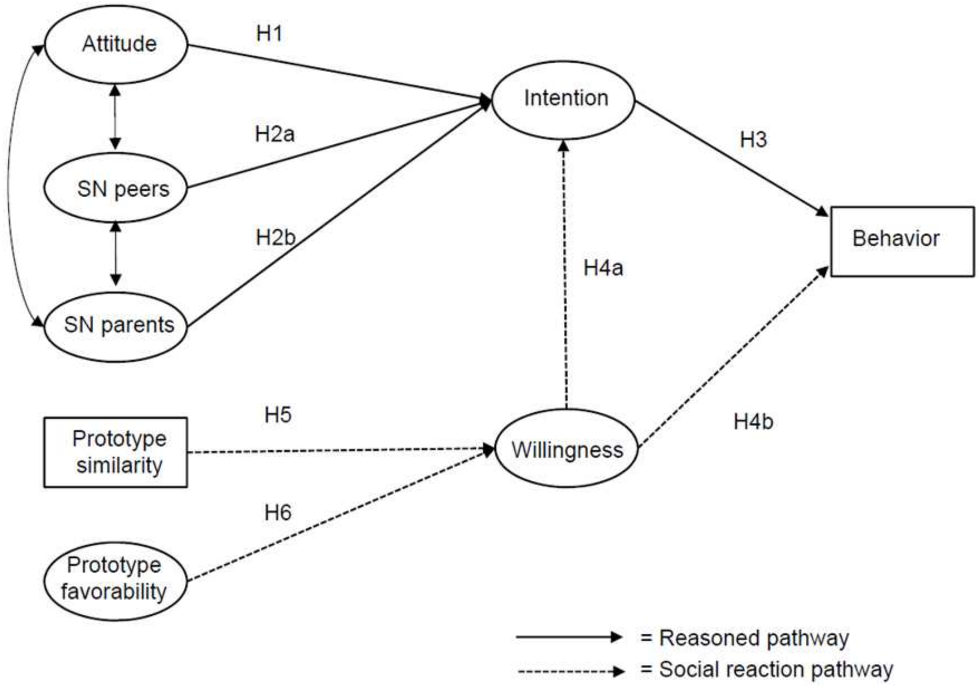

Figure 1. Conceptual model. SN = subjective norm.

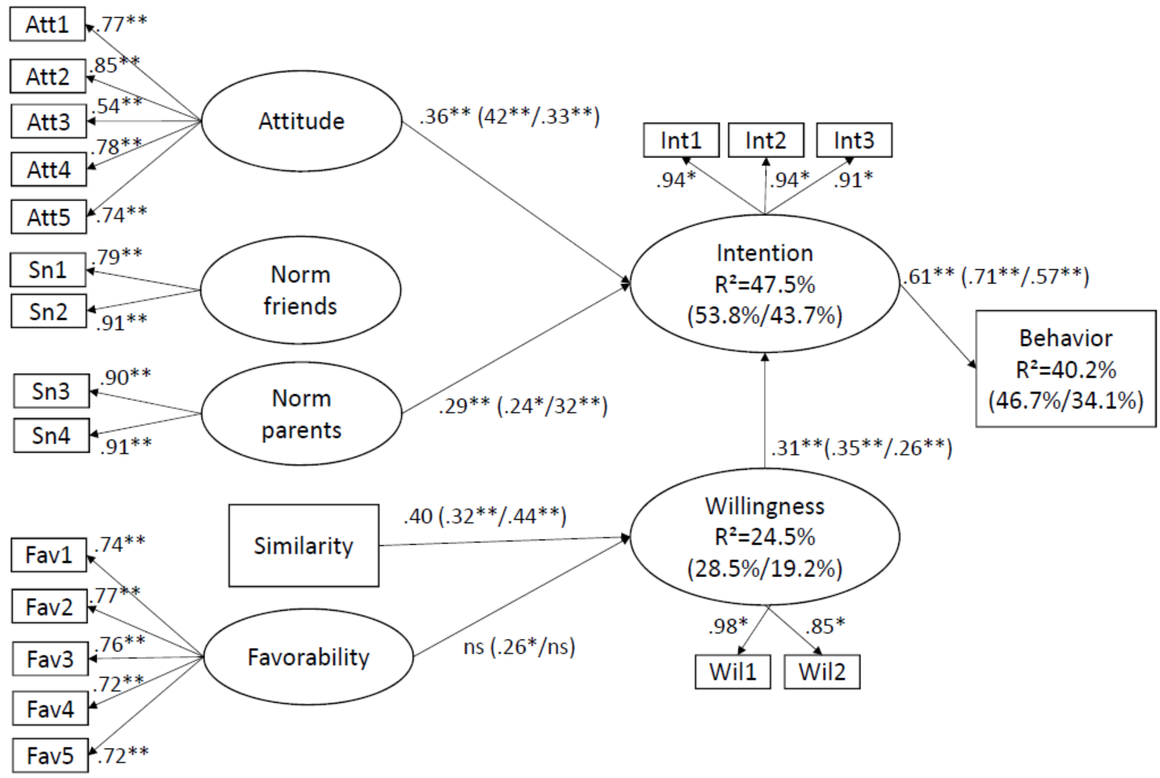

Figure 2. The PWM model applied to students' stimulant use for cognitive enhancement. All reported coefficients outside brackets are standardized values, adjusted for the influence of gender. All reported values between brackets refer to values related to males/females based on the multi-group SEM. Non-significant paths are not shown. **p* < .01; ***p* < .001.