What Determines Young Adults' Attitudes, Perceived Norms, and Perceived Behavioral Control Towards Healthy Sleep Behaviors?
A Reasoned Action Approach

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Abstract

A common limitation to the design of public health sleep interventions is the overall lack of using theory. Previous researchers have utilized the theory of planned behavior and the reasoned action approach (RAA) to predict healthy sleep behaviors, however much of this research was done using reflective (or generalized) measures, which alone is likely inadequate to equip health practitioners with tangible information they can use to translate theory into practice. Therefore, the purpose of this study was to use formative (or belief-based) measures of the RAA to evaluate the determinants of attitudes, perceived norms, and perceived behavioral control (PBC) of healthy sleep behaviors among young adults.

A survey was distributed via email using a university-wide listserv at a large southwestern university. Participants ($n = 310$) were on average 19.9 years old (+/-1.6), and reported sleeping five and a half hours (+/-0.7) per night. Associations between formative and reflective RAA measures were overall moderate to strong. *Thinking clearly* ($r = 0.55$; $p < 0.001$) was the strongest determinant of attitudes; *friends* ($r = 0.27$; $p < 0.001$) was the strongest referent of injunctive norms; *children* ($r = 0.14$; $p < 0.05$) was the strongest referent of descriptive norms; and *having a lot of homework/studying* ($r = -0.25$; $p < 0.001$) was the strongest determinant of PBC. Understanding the determinants of attitudes, perceived norms, and PBC will help health practitioners bridge the gap between theory and practice, and provide relevant information to aid in the development of effective public health sleep interventions.

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Introduction

Sleep deprivation has been associated with a number of mental health (i.e., depression and cognitive impairment) and social problems (i.e., increased family tension and receiving inadequate emotional support), as well as physical and metabolic problems (i.e., increased risk for heart disease, weight gain, diabetes, impaired immune function, and hypertension) (Ailshire & Burgard, 2012; Watson et al., 2015). Only a limited number of studies have been published on public health sleep interventions, and a major limitation to the design of these studies has been the overall lack of using theory. Notably, in a one systematic review researchers reported that among 13 studies evaluating school-based sleep interventions for adolescents, only four mentioned using theory. Furthermore, using theory was a recommendation for future researchers (Blunden & Rigney, 2015). In another review, researchers noted again a general lack of theory in the design of sleep interventions, and pointed to critical theoretical antecedents that should be operationalized for promoting healthy sleep behaviors in adolescents and young adults. Such antecedents included knowledge, motivation/intentions/readiness to change, attitudes, subjective

norms, and perceived behavioral control (Blunden, Chapman, & Rigney, 2012). Researchers further noted the theory of planned behavior (TPB) and the Transtheoretical Model (TTM) would be promising models for sleep interventions, since they encompass many of the aforementioned behavioral antecedents (Blunden et al., 2012).

To our knowledge, the TTM has not been applied to promoting healthy sleep behaviors, however five studies have evaluated sleep behaviors under the TPB context (Knowlden, Sharma, & Bernard, 2012; Kor & Mullan, 2011; Lao, Tao, & Wu, 2016; Robbins & Niederdeppe, 2015; Tagler, Stanko, & Forbey, 2017). Across these studies attitudes, perceived norms, and PBC predicted on average 38% of the variance in intentions (ranging from 12.8% to 55%), and intentions and PBC predicted on average 23% of the variance in sleep behaviors (7.3% to 41%). The TPB is one of the most utilized theories in public health, and social and behavioral science. The reasoned action approach (RAA) is the most recent adaptation of the TPB, and both the RAA and TPB posit that intentions are the primary determinant of performing a behavior, barring any environmental constraints or deficiencies in skills (Fishbein & Ajzen, 2010). Intentions are in turn formed by one's attitudes, perceived norms, and perceived behavioral control (PBC) (Figure 1).
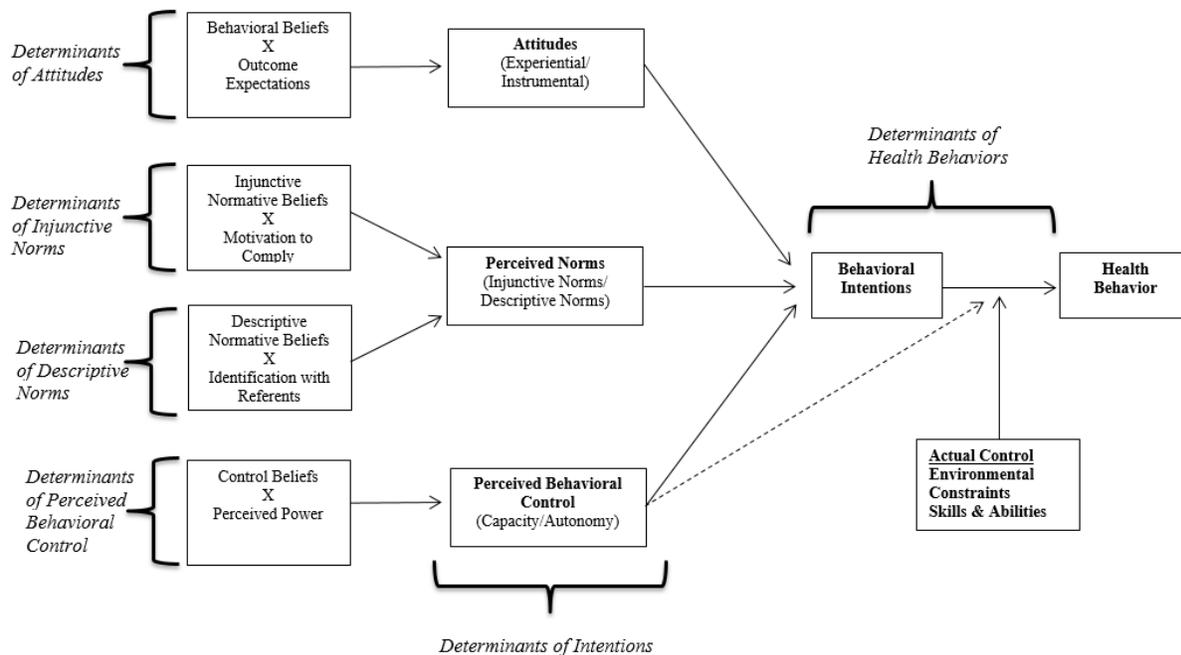

Figure 1. The reasoned action approach.

Fishbein and Ajzen (2010) have previously specified two methods by which attitudes, perceived norms, and PBC can be measured. First, reflective indicators (also known as direct measures) can be evaluated to reveal the latent constructs of attitudes, perceived norms, and PBC. For example, the item…

"For me to sleep at least seven hours per night…" <Important/Unimportant>

…is indication of one's *overall* attitudes towards performing the behavior. The other method relies on formative indicators (also known as indirect measures) which reflect the value-expectancy nature of the construct. For example, attitudes are theorized to be determined by considering different behavioral beliefs, which are beliefs about the advantages or disadvantages towards performing a behavior. This can be evaluated as:

(behavioral belief$_1$) "*If I sleep at least seven hours per night, I will feel rested*." <Strongly Agree/Strongly Disagree>

While this measures the belief strength one feels that a behavior will lead to a certain outcome, it may also be the case that behavioral beliefs will not have an equal status toward forming an individual's attitudes. Therefore, it is also recommended to consider one's outcome evaluation, or the value one places on each behavioral belief. For example:

(outcome evaluation$_1$) "*For me feeling rested is*..." <Good/Bad>

The same principle is also used for perceived norms and PBC. PBC can be measured with reflective indicators, such as:

"*Getting at least seven hours of sleep per night is completely up to me*" <Strongly Agree/Strongly Disagree>

PBC can also be measured by considering multiple control beliefs, or beliefs about factors that can enable or prevent someone from performing a behavior. In addition, the perceived power of each control belief, or how easy/difficult it would be to perform a behavior when faced with each control belief, should be measured.

(control belief$_1$) "*I will have a lot of homework/studying in the next 30 days.* <Strongly Agree/Strongly Disagree>

(perceived power$_1$) "*Having a lot of homework/studying will prevent me from sleeping at least seven hours per night.*" <Strongly Agree/Strongly Disagree>

The perceived norms construct represents the overall social pressure one feels to engage in a behavior, which stems from two sources: *injunctive norms*, or the perception one has that significant individuals in his/her life want him/her to behave in a certain way, and *descriptive norms*, or the perception one has that a behavior is normal for people like themselves, and thus should be performed (Fishbein & Ajzen, 2010). Both types of perceived norms can be evaluated with reflective indicators such as:

(direct/injunctive norm) "*Most people who are important to me want me to sleep at least seven hours per night.*" <Strongly Agree/Strongly Disagree>

(direct/descriptive norm) "*Most people like me sleep at least seven hours per night.*" <Strongly Agree/Strongly Disagree>

Both constructs can also be evaluated using formative indicators. Injunctive norms can be measured by considering multiple injunctive normative beliefs, or beliefs about important referents (individuals or groups) that want/don't want the individual to perform a behavior. The motivation to comply for each injunctive normative belief should also be measured.

(injunctive belief$_1$) "*My parents want me to sleep at least seven hours per night ...*" <Strongly Agree/Strongly Disagree>

(motivation to comply$_1$) "*For matters related to health, I want to do what my parents thinks I should do ...*" <Strongly Agree/Strongly Disagree>

Descriptive norms, on the other hand, can be measured by considering multiple descriptive normative beliefs, or beliefs about referents who are/are not doing the behavior. The amount one identifies with the referent for each descriptive normative belief should also be measured.

(descriptive belief$_1$) "*My friends sleep at least seven hours per night.*" <Strongly Agree/Strongly Disagree>

(identification with referent$_1$) "*For matters related to health, I am similar to my friends.*" <Strongly Agree/Strongly Disagree>

In Fishbein and Ajzen's (2010) last book on the RAA, they critically reviewed these approaches and concluded the distinction between the measures as 'two methods measuring the same construct' is misleading. They determined that reflective indicators evaluate 'generalized' predispositions or feelings toward a behavior, and formative indicators evaluate the determinants of attitudes, perceived norms, and PBC. Therefore, by operationalizing the TPB/RAA one can understand the determinants of behavior (via intentions and generalized PBC), the determinants of intentions (via generalized attitudes, perceived norms, and PBC), and the determinants of attitudes (via behavior beliefs and outcome evaluation), injunctive norms (via injunctive normative beliefs and motivation to comply), descriptive norms (via descriptive normative beliefs and identification with referents), and PBC (via control beliefs and perceived power) (Figure 1).

To date, a majority of research using the TPB/RAA have focused on evaluating the determinants of intentions and behaviors using generalized (or reflective/direct) measures of attitudes, perceived norms, and PBC. However, this limits researchers and practitioners, because the TPB/RAA posits that it is within the underlying beliefs of attitudes, perceived norms, and PBC that the nature of behaviors and behavior change can be understood (Yzer & Gilasevitch, 2019). As previously reviewed, five studies have evaluated the determinants of intentions and healthy sleep behaviors, however none have evaluated the belief-based determinants of attitudes, perceived norms, and PBC. Robbins and Niederdeppe (2015) evaluated both reflective and formative indicators of attitudes, perceived norms, and PBC; however in their results they reported both as determinants of intentions and behavior (sleeping for between eight to nine hours at night most night per week). Understanding the salient beliefs related to healthy sleep behaviors will further our understanding of what candidate beliefs would be best to utilize for future public

health interventions. Therefore, the purpose of this study was to evaluate the determinants of attitudes, perceived norms, and PBC using value-expectancy formative indicators.

Methods

The survey used for this study was developed by the authors using guidelines published by Fishbein and Ajzen (2010). In short, the behavior was first defined using the Target, Action, Context, and Time (TACT) principle as to "start getting 7-9 hours of sleep each night in the next 30 days", and the core RAA constructs were operationalized using this behavior. For a complete copy of the survey, please contact the corresponding author. Reflective items (four items per scale) measured generalized attitudes, perceived norms, and PBC. Formative items measuring the value-expectancy determinants of attitudes, perceived norms, and PBC constructs were evaluated by measuring belief strength and a corresponding value-laden item. To elicit the four types of beliefs, a brief survey with open-ended items was administered to a sample of students ($n = 50$): behavioral beliefs (e.g., Advantages/disadvantages of behavior?; What do you enjoy/hate about the behavior?), injunctive normative beliefs (e.g., What important people would be for/against you to do the behavior?), descriptive normative beliefs (e.g., What other college students are most/least likely to do the behavior?), and control beliefs (e.g., What factors make it easy/difficult for you to do the behavior?).

Both authors then thematically analyzed responses from each survey into codes, and the prominent codes were used to develop the survey items. For example questions for all scales, including both reflective and formative measures, please see Table 1. After the survey was developed, it was inspected for face and content validity by a panel of six experts in a two-round review (Sharma & Petosa, 2012). Afterwards, the instrument was pilot tested with 19 students who were asked to provide feedback about the clarity and readability of the survey, and whether they believed the survey contained any mistakes or errors. Students reported the survey flowed well, the questions were generally clear, and did not appear to contain any mistakes. Institutional Review Board approval was obtained before any recruitment started. The survey was distributed through the University mass email system. The total number of students contacted through this process included those that were enrolled at least part time, and did not opt out of the email distribution list ($N = 18,647$). Overall, 610 students responded to our request to participate (overall response rate = 3.3%). Participants first responded to an item from the Pittsburg Sleep Hygiene Index measuring sleep duration (During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spent in bed); Mastin, Bryson, & Corwyn, 2006). The answer to this question automatically sent students to the survey, only if they answered less than seven hours per night ($n = 310$ or 50.8% of the sample who responded). Participants were excluded from the survey if they slept seven or more hours, because we only wanted to evaluate participants not currently meeting sleep recommendations (i.e., sleeping less than seven hours per night). The goal of the survey was to understand what factors would potentially motivate students who were not meeting sleep recommendations to change their behavior, and start meeting sleep recommendations. As an incentive, participants chose to be entered into a raffle to win one of ten ten-dollar gift cards.

To evaluate the determinants of attitudes, injunctive norms, descriptive norms, and PBC, items measuring belief strength were multiplied to a corresponding measure of value, and the product of the pair was correlated with the corresponding construct of the RAA. For example, all

Table 1

Example Items for Each Reasoned Action Approach Scale

Scale	Example Items
Generalized Attitudes toward a Behavior	*--Instrumental Attitudes* Starting to sleep 7-9 hours every night in the next 30 days would be … <Beneficial/Harmful> *--Experiential Attitudes* Starting to sleep 7-9 hours every night in the next 30 days would be … <Satisfying/Unsatisfying>
Determinants of Attitudes towards a Behavior	*--Behavioral Belief* If I start sleeping 7-9 hours every night in the next 30 days, I will feel rested. <Likely/Unlikely> *--Outcome Evaluation* For me feeling rested is... <Good/Bad>
Generalized Perceived Norms	*-- Injunctive Norm* Most people who are important to me want me to start sleeping 7-9 hours every night in the next 30 days *--Descriptive Norm* Most people like me sleep 7-9 hours every night. <Strongly Agree/Strongly Disagree>
Determinants of Injunctive Norms	*--Injunctive Normative Belief* My parents think that I should start sleeping 7-9 hours every night in the next 30 days. <Strongly Agree/Strongly Disagree> *--Motivation to Comply* For matters related to health, I want to do what my parents think I should do. <Strongly Agree/Strongly Disagree>
Determinants of Descriptive Norms	*--Descriptive Normative Belief* My friends sleep 7-9 hours every night. <Strongly Agree/Strongly Disagree> *-- Identification with Referent* For matters related to health, I am similar to my friends. <Strongly Agree/Strongly Disagree>
Generalized Perceived Behavioral Control	*--Perceived Capacity (Self-efficacy)* I am confident that I can start sleeping 7-9 hours every night in the next 30 days. <Strongly Agree/Strongly Disagree> *--Perceived Autonomy* How much control will you have over whether or not you can start sleeping 7-9 hours every night, in the next 30 days? <Complete Control/No Control>
Determinants of PBC	*--Control Beliefs* I will have a consistent daily schedule in the next 30 days. <Strongly Agree/Strongly Disagree> *--Perceived Power* Having a consistent daily schedule will *ENABLE* me to start sleeping 7-9 hours every night in the next 30 days.

[behavioral belief x outcome evaluation] pairs were correlated with the attitudes scale. This is the recommended method suggested by Fishbein and Ajzen (2010) and further elaborated upon in their most recent text (Fishbein & Azjen, 2010). More advanced modeling practices (i.e., regression or structural equation modeling) are not recommended by Fishbein and Ajzen (2010) because [belief x value] pairs are typically highly correlated with one another. In addition, while regression weights may by high for some [belief x value] pairs, for others they may be low or non-significant, causing them to be regarded as unimportant which may be an incorrect interpretation (Fishbein & Azjen, 2010, p. 124). This method has also been used by others for understanding how beliefs determine other health behaviors (Robbins & Niederdeppe, 2015; Yzer et al., 2004). SPSS (Statistical Package for the Social Sciences) version 25 was used for data analyses in this study. In rare cases that participants missed an item, the mean replacement method was employed.

Results

Before data analysis, construct validity (via factor analysis) and reliability (via Cronbach's alpha) were evaluated for the generalized scales measuring attitudes, injunctive norms, descriptive norms, and PBC. For construct validity, all scales yielded an eigenvalue > 1.0 to confirm the presence of a single factor (attitudes = 2.84; injunctive norms = 1.63; descriptive norms = 1.50; PBC = 2.39), and all items significantly loaded on the corresponding scale, indicating strong construct validity. There also appeared to be good or acceptable reliability ($\alpha \geq$ .60) for all scales [attitudes (α=.86); injunctive norms (α=.76); descriptive norms (α=.65); PBC (α=.77)].

The average amount of sleep per night students ($n = 310$) reported was five and a half hours (+/-0.7). The average age was 19.9 years (+/-1.6), and there were more female ($n = 212$, 68.4%) than male students ($n = 87$, 28.1%). This was also a racially diverse sample of students (68% Caucasian, 3% African American, 7% Hispanic, 7% Asian, and 19% other).

Correlations between the value-expectancy pairs and corresponding determinant were overall moderate to strong, with some exceptions (Table 2). For attitudes, *thinking clearly* ($r = 0.55$; $p < 0.001$), *having better focus* ($r = 0.53$; $p < 0.001$) and *having more energy* ($r = 0.51$; $p < 0.001$) were the strongest factors.

For injunctive and descriptive norms, not all of the referents had a significant association, and the strength of association was much stronger for injunctive normative beliefs compared to descriptive normative beliefs. The strongest injunctive normative referent was *friends* ($r = 0.27$; $p < 0.001$) and the strongest descriptive normative referent was *children* ($r = 0.14$; $p < 0.05$).

For PBC, *having a consistent daily schedule* ($r = 0.30$; $p < 0.001$) was reported as being the strongest enabler, and *having a lot of homework/studying* ($r = -0.25$; $p < 0.001$) was reported as being the largest barrier.

Discussion

In the past, public health sleep interventions have been implemented without first evaluating the extent of the problem, and what messages and strategies are acceptable to the target population (Paterson, Reynolds, Duncan, Vandelanotte, & Ferguson, 2019). It is well

Table 2

Determinants of attitudes, perceived norms and perceived behavioral control towards healthy sleep behaviors

	Belief Strength (bb_i) (1 to 7)		Outcome Evaluation (oe_i) (-3 to 3)		Composite bb_i x oe_i (-21 to 21)		Correlation bb_i x oe_i with
Behavioral Belief	M	SD	M	SD	M	SD	Generalized Attitudes
Think Clearly	5.67	1.30	2.40	1.04	14.05	6.90	0.55***
Have More Energy	5.64	1.42	2.26	1.02	13.10	6.89	0.51***
Have Better Focus	5.69	1.28	2.31	1.09	13.58	7.00	0.53***
Feel Rested	5.73	1.41	2.05	1.23	12.30	7.87	0.45***
Have Better Health	5.88	1.28	2.09	1.38	12.89	8.69	0.37***
Not Miss Out on Important Activities	5.63	1.43	1.97	1.45	11.57	8.73	0.35***
Be Able to Study More	4.24	1.93	2.03	1.33	9.00	7.09	0.33***

	Belief Strength (inb_i) (1 to 7)		Motivation Comply (mtc_i) (-3 to 3)		Composite inb_i x mtc_i (-21 to 21)		Correlation inb_i x mtc_i with
Injunctive Normative Belief	M	SD	M	SD	M	SD	Generalized Injunctive Norms
Professors	4.99	2.58	0.30	1.72	2.79	8.72	0.35***
Extended Family Members	5.22	1.49	0.10	1.75	1.70	9.22	0.28***
Parents	6.19	1.16	1.33	1.52	8.64	9.92	0.22***
Friends	4.61	1.59	0.39	1.64	2.96	7.79	0.21***

	Belief Strength (dnb_i) (1 to 7)		Identification with Referents (iwr_i) (-3 to 3)		Composite dnb_i x iwr_i (-21 to 21)		Correlation dnb_i x wr_i with
Descriptive Normative Belief	M	SD	M	SD	M	SD	Generalized Descriptive Norms
Children (K-6th Grade)	6.07	1.50	-1.56	1.82	-9.88	8.82	0.35***
Parents	4.93	1.50	-0.33	1.82	-2.34	8.48	0.16**
Friends	2.80	1.44	1.24	1.97	2.75	4.74	0.08
Working Adults	4.07	1.44	0.32	1.97	0.74	6.62	0.07
Traditional College Students	1.99	2.22	1.38	2.28	2.45	3.87	-0.04

	Belief Strength (cb_i) (1 to 7)		Perceived Power (pp_i) (-3 to +3)		Composite cb_i x pp_i (-21 to 21)		Correlation cb_i x pp_i with
Control Belief	M	SD	M	SD	M	SD	Generalized PBC
Factors that enable							
Consistent Daily Schedule…	3.30	1.73	1.18	1.78	3.64	6.88	0.30***
Fewer Responsibilities…	1.96	1.33	1.64	1.78	2.42	4.96	0.20***
Factors that prevent							
Having a lot of Homework/Studying…	6.59	0.82	2.45	1.01	16.55	6.86	-0.25***
Having Social Events…	4.82	1.73	1.05	1.73	6.45	8.98	-0.22***
Have a Job/Employment…	4.62	2.67	1.36	1.93	8.16	10.32	-0.21***

Note. PBC (Perceived Behavioral Control); $p < .05*$; $p < .01**$; $p < .001***$

understood that having strong theoretical underpinnings is critical for public health interventions, and given the paucity of evidence, previous systematic reviews have called for more theory-based approaches. In this study we utilized the RAA as a promising model for future sleep health interventions. Previously, a meta-analysis of prospective studies using the RAA found on average constructs in the model predicted 30.9% of the variance in health behaviors, and 58.7% of the variance in intentions (McEachan et al., 2016). In another meta-analysis, TPB-based health behavior change interventions had on average a weighted effect size ($\delta^\wedge$) of 0.50 on behavior change (Steinmetz, Knappstein, Ajzen, Schmidt, & Kabst, 2016).

The translation of the TPB/RAA to public health practice can be problematic if practitioners do not understand how to operationalize the constructs into messages or methods for behavior change. Therefore, rather than focus on the determinants of sleep behaviors and intentions, in this study we sought to understand the specific belief-level determinants that shape the attitudes, perceived norms, and PBC of healthy sleep behaviors. We identified a number of diverse salient beliefs that have clear implications for developing health communication messages. For example, the strongest attitudinal beliefs reflected more internalizing goals about how one feels/functions, such as thinking clearly, having better focus, and having more energy, rather than external goals such as not missing out on important activities, or studying more. This is similar to a recent qualitative study using focus groups with college students, which revealed that when students wanted to change their sleep behaviors, it was primarily under the context of wanting to feel better when they are awake. This included feeling refreshed, less tired during the day, and more attentive (Paterson et al., 2019). With regard to PBC, the strongest control-related beliefs were related to time management. Specifically, having a consistent daily schedule (thus having good time-management skills), and demands placed on time such as homework. This again is similar to qualitative and quantitative studies that have evaluated sleep barriers among this group (Hoyt, et al., 2018; Paterson, et al., 2019).

Another strength of this study was the way we quantitatively evaluated belief-strength and the value-laden constructs (i.e., behavioral beliefs and outcome evaluations), and related them to generalized measures of the corresponding TPB/RAA construct. This information allows researchers and practitioners to make judgements about which beliefs would potentially be more effective by examining the strength of association. This is not typically reported in the literature. For example, a number of belief-elicitation studies have been published on a variety of behaviors, such as stress management (Yzer & Gilasevitch, 2019), walking among women with fibromyalgia (Pastor et al., 2015), African American caregivers' decision to give sugary drinks to their preschoolers (Tipton, 2014), and Hispanic mothers' beliefs about having their daughters take the HPV vaccine (Roncancio, Ward, Carmack, Muñoz, & Cribbs, 2017). While all of these studies have value, they only present the results of what beliefs were elicited about the behavior, and not which beliefs would be best to use to promote behavior change.

Limitations

This study is not without limitations. First, to evaluate the variables in this study self-reported data were used, which are prone to issues of measurement bias. The design of the study was also cross-sectional, and therefore it is premature to make any causal connections between reflective and formative measures. This study also used a convenience sample, which limits its generalizability. Our sample was also relatively diverse, with over 30% of participants reporting as non-white, therefore future studies should determine whether belief formation about sleep

differs among these sociodemographic groups. However, our sample was mostly similar to the characteristics of the student population at the university, as 72.4% of the study body is Caucasian, and the average age is 21.2 years. It should be noted that while our sample was mostly female (68.4%), the university has approximately equal representations for gender (50.7% of the student body is female) (University of Oklahoma, 2019).

Implications for Health Behavior Theory

This study contributes to the body of research using the TPB/RAA to understand sleep behaviors among college students by illustrating how health education specialists, and other public health workers, can evaluate determinants of attitudes, perceived norms, and PBC. While we do not want to undervalue the importance of previous research using the TPB/RAA that has reported determinants of healthy sleep behaviors and intentions, we hope to bring light to the fact that this information alone is likely inadequate to equip health educators with tangible information they can use to translate theory into practice. Public health practitioners are instrumental in planning, implementing, and evaluating public health programs and initiatives. Therefore, we hope this study inspires them to engage in their own formative research to better understand what factors predispose, enable, and reinforce healthy behaviors in their communities by first conducting an elicitation of beliefs (i.e., behavioral, normative, and control beliefs), and then understanding how those certain beliefs shape community members attitudes, perceived norms, and PBC.

Discussion Question

1. We suggest that when researchers and practitioners use the Theory of Planned Behavior or Reasoned Action Approach, they should include both formative and reflective items so they can understand not only the determinants of behaviors and intentions, but also attitudes, perceived norms, and PBC. This also will help link theory to practice. What will prevent or enable professionals from evaluating both formative and reflective items in the future?

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