

Examination of Associations between Physical Activity and Eating Identities among College-aged Adults Living in Hawai‘i

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Abstract

While physical activity and diet behaviors are correlated, mechanisms underlying associations have rarely been examined. This study examined associations between physical activity identity and eating identity among college-aged adults in Hawai‘i to provide guidance for future multiple behavior change interventions. This study was a cross-sectional analysis of data collected between September 2013 and January 2014. Participants were 40 college students attending 4-year and 2-year institutions within the University of Hawai‘i system. Total physical activity identity score and dimensions were measured using the Athlete Identity Questionnaire. Eating identity subtypes were measured using the Eating Identity Type Inventory. Associations between physical activity identity total score, 4 physical activity identity dimensions (appearance, importance, competence, and encouragement), and 4 eating identity subtypes (healthy, emotional, meat, and picky) were examined using multiple linear regressions. A significant positive association was found between total physical activity identity score and the healthy eating subtype and a negative association with the picky eating subtype. The physical activity dimension importance had a significant positive association with the healthy eating subtype, appearance a negative association with the emotional eating subtype, and competence a positive association with the meat eating subtype but a negative association with the picky eating subtype. The findings suggest important overlap in identities for physical activity and diet. Measurement of physical activity identity and eating identity as well as tailored intervention strategies should be incorporated into more behavior change research.

Keywords

obesity; identity theory; multiple behavior change; young adults; emerging adulthood

Abbreviations and Acronyms

AIQ = Athlete Identity Questionnaire
EI = eating identity
EITI = Eating Identity Type Inventory
M = mean
PAI = physical activity identity
SD = standard deviation

Introduction

Despite known health benefits, many college-aged adults fail to adopt and maintain healthy physical activity and diet behaviors contributing to a rise in obesity during young adulthood.¹⁻³ In Hawai‘i, 19% of college-aged adults (18-24 years)⁴ are obese and nearly 23% have at least 1 chronic disease.⁵ In addition, only half of college-aged adults in Hawai‘i meet physical activity recommendations⁴ and less than half consume fruits (45%) or vegetables (28%) once per day.⁴

While research has traditionally focused on changing physical activity and diet behaviors in isolation, multiple behavior change interventions have been increasing in number.^{6,7} This is partly due to research indicating health behaviors often cluster together^{8,9} as well as the potential for multiple behavior change interventions to increase health benefits and reduce healthcare costs.^{6,7,10} However, these interventions are an understudied area,^{6,7,10,11} especially interventions with young adults and racial/ethnic minority groups.⁶

Studies examining physical activity and diet behavior change have been mixed regarding the proportion of individuals currently engaged in or ready to engage in both physical activity and healthy diet behaviors.^{9,12} These studies suggest being further along in the change process of 1 behavior may enable change in other behaviors although cognitive focused interventions may be needed to move forward the less advanced behavior.^{9,12} Unfortunately, a lack of research on psychosocial constructs that motivate changes across behaviors currently limits the field.^{7,11} Therefore, understanding psychosocial constructs that connect physical activity and diet behaviors is important when developing theory-based targets for multiple behavior change interventions aimed at reducing obesity.^{13,14}

Identity theory is particularly relevant for multiple behavior change research as it suggests the self is multi-faceted and hierarchically organized based on an individual's view of themselves within a particular role.^{15,16} Identities are meanings individuals attach to roles played in society¹⁷ that build upon past experiences and serve as a standard for behavior.¹⁸ Individuals enact multiple roles daily and each role taps into an identity.¹⁹ Identities are managed by individuals assigning importance to identities and enacting identity-congruent behaviors.²⁰ However, occasions exist where multiple identity-congruent behaviors are enacted at once,^{21,22} suggesting overlap in identities (eg, physical activity and diet) as well as their congruent behaviors (eg, exercise and healthy eating patterns) and a potential mechanism by which multiple behavior change interventions may work.

Individuals with a high degree of physical activity-related identity (PAI) have increased participation in physical activity, and development of PAI at younger ages is associated with engagement in physical activity later in life.^{23,24} Historically, PAI has been labeled “athlete identity,” which was conceptualized as a single construct with multiple dimensions related to sport involvement.²⁵ The field has evolved to measure PAI

using more global concepts of physical activity.^{13,26} The Athlete Identity Questionnaire (AIQ) was developed using a definition inclusive of sport, exercise, and physical activity involvement.²⁷

The AIQ also assesses PAI as a multidimensional construct inclusive of 4 dimensions that connect PAI to psychosocial constructs that underlie the behavior change theories of Social Cognitive Theory, Transtheoretical Model, and Theory of Planned Behavior.²⁸⁻³⁰ Research on mediators highlight these theories and their psychosocial constructs as important to diet and physical activity behavior change.^{14,31-33} The PAI dimensions of appearance, importance, competence, and encouragement²⁷ align with the psychosocial constructs of outcome expectations, identity salience, self-efficacy, and social support, respectively.^{14,27,34-36}

How an individual eats is another way to assign identity.¹⁷ Within eating identity (EI) research, healthy EI has been the primary focus and linked with healthier dietary practices.^{37,38} However, many people do not identify as a healthy eater.^{17,39,40} EI research now acknowledges the existence of multiple EIs leading to the development of the Eating Identity Type Inventory (EITI), which includes scales measuring the presence of healthy, 'meat, emotional, and picky EI subtypes.³⁹

It may be particularly important to understand if there are psychosocial constructs that underlie both PAI and EI among young adults, a time period when the process of exploring, establishing, monitoring, and revising identities is particularly active.⁴¹ Despite this malleability, few multiple behavior change interventions target college-aged adults,⁶ and those that have, found it difficult to achieve significant positive results.⁷ A lack of knowledge about the psychosocial constructs that should be targeted has impeded success,^{10,42} and a better understanding of between-behavior relationships and cross-behavior influences is needed.^{11,22}

The purpose of this study was to examine associations between PAI and EI among college-aged adults living in Hawai'i to provide guidance for future multiple behavior change research. Associations between total PAI score, PAI dimensions (ie, appearance, importance, competence, and encouragement), and EI subtypes (ie, healthy, emotional, meat, and picky), were examined.

Methods

Participants

Participants were 40 students who attended 4-year and 2-year institutions in the University of Hawai'i system and were at least 18 years of age at the time of recruitment. Participants were recruited using a mix of posted flyers and on-campus recruitment tables between September 2013 and January 2014. Recruitment for this study was part of a larger qualitative study

seeking input on programming associated with the construction of a new on-campus recreation center. A \$15 gift card was given to each participant. Approval was received from the University of Hawai'i Institutional Review Board before recruitment or data collection began (CHS#21355).

Measures

Participants signed an informed consent form and returned it in person or via email. They then completed demographic questions, screeners of dietary intake developed and validated by the National Cancer Institute,⁴³⁻⁴⁶ and validated physical activity questions from Project EAT^{2,47,48} along with questions examining participant's PAI and EI. Surveys were collected via email or in person before focus groups were conducted to reduce the discussion biasing responses.

Physical Activity Identity (PAI)

The AIQ^{50,45} includes 21 items that differentiate 4 dimensions of PAI: appearance, importance, competence, and encouragement (see Table 1).²⁷ The questionnaire items have been validated in both adult and adolescent populations with coefficient reliabilities ranging from 0.68 to 0.89.^{23,27} Participants answered questions using a 5-point, Likert scale ranging from 1 (strongly agree) to 5 (strongly disagree). Traditionally, the items from each dimension are added together and all dimension scores summed to compute a total score, but means for each dimension are presented.^{23,27} These steps were followed and means were used in all analyses to enable comparisons with EI subtypes.³⁹

Eating Identity (EI)

A previous validation study in adults examined the structure of the 11-item EITI, which included 4 EI dimension subscales: healthy, emotional, meat, and picky (see Table 1) and found acceptable internal consistencies with Cronbach alpha's ranging from 0.61 to 0.82.³⁹ Participants responded using a 5-point, Likert scale ranging from 1 (strongly agree) to 5 (strongly disagree) for each subscale. Mean scores were calculated for each EI dimension with higher scores indicating a greater affinity for that EI dimension.³⁹

Data Analysis

Data were analyzed using SPSS software, version 23 (IBM Corp., Armonk, NY) and SAS® software, version 9.4 (SAS Institute Inc., Cary, NC). No data were missing and, based on a review of Q-Q plots, were normally distributed. Internal consistency for the PAI dimensions and EI subtypes were assessed using Cronbach's alpha (Table 1). Previous research suggests identities associated with more developed behaviors may predict development of other behavior-related identities.⁹ A previous analysis from this dataset found the majority of participants

(55%) were further along in physical activity-related behaviors, as measured by meeting recommendations.⁴⁹ Therefore, PAI-related variables were entered as independent variables and EI-related variables as dependent variables in all analyses.

A multiple linear regression was used to examine associations between participant total PAI score and EI subtype (healthy, emotional, meat, or picky). A second set of multiple linear regressions were conducted to examine associations between each PAI dimension (appearance, importance, competence, and encouragement) and EI subtype to provide insight on potential psychosocial construct associations across behaviors (ie, outcome expectations/appearance, identity salience/importance, self-efficacy/competence, social support/encouragement).

Results

Participants had a mean age of 25 (SD=7.85), were 65% female, and 58% originally from Hawai'i. Most participants identified as Asian American (33%) or of mixed ethnicity (30%) and either lived with their parents (45%) or lived in other off-campus housing (30%). Participants ate on average 2.92 (SD=2.63) cup equivalents of fruits and vegetables per day, had 31% (SD=5.99) of their calories coming from fat, and participated in 3.59 (SD=3.35) hours of moderate-to-vigorous

physical activity per week. Additional information about the participant population can be found in previous publications.^{36,49}

Good internal consistency was found for items on the AIQ ($\alpha=0.87-0.94$) and EITI ($\alpha=0.62-0.83$) as shown in Table 1. On average, participants received a PAI total score of 3.10 (SD=0.70). The average scores for each PAI dimension were 3.04 (SD=1.13) for appearance, 2.63 (SD=1.01) for importance, 3.49 (SD=1.03) for competence, and 3.39 (SD=0.94) for encouragement. For EI, the picky EI subtype had the lowest mean of 2.20 (SD=1.02) while the meat EI subtype had the highest mean of 3.69 (SD=1.07). The healthy EI subtype had a mean of 3.26 (SD=0.71) and the emotional EI subtype a mean of 2.94 (SD=0.95).

When the associations between total PAI score and EI subtypes were examined, statistically significant associations were seen with the healthy EI subtype ($F(1,38)=10.78, P=.002; R^2=0.22$) and the picky EI subtype ($F(1,38)=5.29, P=.03; R^2=0.12$). Total PAI score was positively associated with the healthy EI subtype and negatively associated with the picky EI subtype (Table 2).

When regression results for each PAI dimension and EI subtype were examined, different associations were seen between each dimension and subtype (Table 2). The PAI domain importance

Table 1. Internal Consistencies for Subscales Used in Assessing Eating and Physical Activity Identity among College Students in Hawai'i September 2013-January 2014 (n=40)	
EITI	AIQ
Healthy Eater $\alpha = .83$ 1. I am a healthy eater 2. I am someone who eats in a nutritious manner 3. I am someone who is careful about what I eat	Appearance $\alpha = .94$ 1. I think I look athletic, like a person who exercises 2. I look like I never work out 3. My body looks in shape 4. My body looks well-proportioned 5. I look like a person who is physically fit 6. It's obvious to others that I'm flabby and out of shape
Emotional Eater $\alpha = .77$ 1. I am an overeater 2. I am someone who eats more when stressed or anxious 3. I am someone who eats more when sad or depressed	Importance $\alpha = .87$ 1. I schedule time to exercise 2. I don't let other things get in the way of my exercise/sport activity 3. I use several specific strategies to help me maintain regular exercise 4. After illness or injury, I begin exercising again as soon as possible 5. I would be very irritated if something prevented me from participating in a session of exercise I had planned to do 6. I plan specific alternate times, places, and/or types of exercise to use if I miss an exercise session
Picky Eater $\alpha = .80$ 1. I am a picky eater 2. I am someone who likes to eat a lot of different things (reversed scale) 3. I am someone who likes to try new foods (reverse scale)	Competence $\alpha = .87$ 1. I could participate in several types of physical activity if I wanted to 2. I simply don't have much athletic ability 3. In most physical activities, I feel I can become skilled with sufficient effort and practice 4. I'm not very good at athletic activities 5. I'm confident of my athletic skills
Meat Eater $\alpha = .62$ 1. I am a meat eater 2. I am someone who likes meat with every meal	Encouragement $\alpha = .90$ 1. I receive encouragement from others for exercising 2. My family/closest friends are enthusiastic about any effort/progress I make concerning exercise/sport 3. My family/roommates/companions are very willing to accommodate my involvement in exercise/sport 4. I get a lot of reinforcement from others regarding my physical activity

Notes: Eating Identity Type Inventory = EITI; Athletic Identity Questionnaire = AIQ

Table 2. Associations between Physical Activity Identity (Total Score and Dimension Scores) and Eating Identity Subtypes among College Students in Hawai'i September 2013-January 2014 (n=40)

	Healthy Eater			Emotional Eater			Meat Eater			Picky Eater		
	b	β	R ²	b	β	R ²	b	β	R ²	b	β	R ²
Total PAI			.22*			.07			.01			.12*
	.48	.47*		-.37	-.27		.16	.11		-.51	-.35*	
PAI Dimensions												
			.36*			.22			.19			.18
Appearance	.07	.11		-.40	-.48*		-.20	-.21		-.05	-.05	
Importance	.32	.45*		.11	.12		-.04	-.40		-.04	-.04	
Competence	.12	.17		-.03	-.04		.51	.49*		-.37	-.37*	
Encouragement	-.13	-.17		.20	.20		.01	.01		-.16	-.14	

Notes: PAI = physical activity identity, *represents significant *P*-values of <.05

had a significantly positive association with the healthy EI subtype ($\beta=0.45$, $P=.006$) while appearance had a significant negative association with the emotional EI subtype ($\beta=-0.48$, $P=.01$). The PAI domain competence had a statistically significant positive association with the meat EI subtype ($\beta=0.51$, $P=.007$), but a negative association with the picky EI subtype ($\beta=-0.37$, $P=.04$). The PAI domain encouragement was not significantly associated with any of the EI subtypes.

Discussion

Incorporating identity theory into the design of multiple behavior change interventions for physical activity and diet may be effective in combating rising rates of obesity, especially among young adults.^{3,6,50} However, to-date few studies have examined psychosocial constructs that would allow PAI and EI to simultaneously be the focus of multiple behavior change strategies.³³ This study found a significant positive association between total PAI score and the healthy EI subtype. In addition, significant associations between the PAI dimensions of appearance, importance, and competence and EI subtypes, emotional, healthy, meat, and picky (respectively), indicate psychosocial construct overlap between PAI and EI. These associations provide potential cross-behavior associations that can be examined in larger samples and through the testing of intervention strategies.

The means for total PAI score and most PAI dimensions in this study were similar to those found when validating the AIQ with college-aged adults.²⁷ Participants in the current study did score appearance lower ($M=3.04$) than participants in the validation studies ($M=3.64$, $M=3.67$).²⁷ Lower scores on the appearance sub-scale may be due to participants in the current study being overall less satisfied with their bodies. A previous study of body image among college students in Hawaii found some sex-ethnic groups (eg, Filipino males and Japanese females) reported high levels of body dissatisfaction with less diverse ideal body types.⁵¹

The current study had similar scoring patterns to the validation study of the EITI.³⁹ The picky EI subtype had the lowest mean score in both studies; however, participants in the current study had the highest mean score for the meat EI subtype while participants in the validation study had the highest mean score for the healthy EI subtype.³⁹ Participants in the validation study were on average older than participants in the current study and participants from the 2 studies came from different geographical regions.³⁹ Therefore, variation in EI subtypes is expected as studies indicate adults increase their interest in healthy eating with age^{52,53} and variation exists in dietary patterns by geography and race/ethnicity.^{33,54,55}

A higher total PAI score and score on the PAI domain importance were associated with a higher mean score for the healthy EI subtype in the current study. Total PAI score and the domain importance have been associated with higher engagement in physical activity among adolescents and college students in previous studies.^{23,27} Previous research also has found physical activity and diet behaviors cluster⁹ with individuals who identify as healthy-eaters often engaging in regular physical activity and vice versa.^{37,56}

Total PAI score and the PAI domain competence were negatively associated with the picky EI subtype. Picky eating is often thought to be a transient behavior⁵⁷ only found in childhood; however, research indicates a picky EI exists in adulthood and has significant impacts on eating and overall health.^{58,59} In a study of college students, higher scores on a picky eating scale were associated with lower intake of fruits and vegetables as well as reduced variation in fruit and vegetable selections.⁵⁸ Past studies also found picky eaters often identify as “unhealthy eaters,”^{40,60} therefore, it is not unexpected for total PAI scores to be negatively associated with the picky EI subtype, given the positive association with the healthy EI subtype in this study.

Dietary interventions have found self-efficacy to be a determinant of whether someone develops healthier eating behaviors,

which aligns with this study's finding of a negative association between the PAI domain of competence and the picky EI subtype.^{31,56,61} Given this negative association, more research is needed to determine whether assessing EI subtypes within multiple behavior change interventions is beneficial for identifying subtypes such as picky. While all intervention participants may benefit from increases in self-efficacy,³¹⁻³³ those with a picky EI subtype may need particular focus on strategies that help build self-efficacy to improve both physical activity and diet behaviors.

When PAI domains were examined, lower scores on the PAI domain appearance were associated with higher emotional EI subtype scores. Previous studies have found associations between appearance and less healthy eating patterns, including emotional eating.^{62,63} Specifically, studies indicate emotional and other forms of disordered eating occur in response to seeking a thin or muscular ideal along with body dissatisfaction.⁶³⁻⁶⁵ Findings from this study along with previous literature⁶⁵ suggest more research is needed on successful intervention strategies that incorporate body acceptance and outcome expectations not related to appearance, especially for behavior change interventions aimed at emotional eaters.

The PAI dimension competence was positively associated with the meat EI subtype. To better understand this association, variables were examined stratified by sex. Males compared to females exhibited higher means for both the meat EI subtype ($M=4.2$ and 3.4 , respectively) and the competence dimension ($M=3.7$ and 3.3 , respectively). The relationship between increased meat eating and masculinity has been noted in the literature,⁶⁶ and a study with college students found males reported higher levels of self-efficacy related to physical activity than females.⁶⁷ A study of adults in Hawai'i found Native Hawaiian and White males had higher levels of physical activity-related self-efficacy compared to males and females of other race/ethnic groups; however, males across racial/ethnic groups may need targeted help to meet fruit and vegetable recommendations.³³ One study found a high meat EI was reduced and a healthy EI increased using intervention messaging, and this modification may be enhanced if future studies incorporate psychosocial constructs from Theory of Planned Behavior as well as Social Cognitive Theory.⁶⁸ Given these findings, intervention strategies that enable college-aged adults to transfer competence in physical activity to eating a healthy diet should be tested and gender differences across racial/ethnic groups examined.

Each PAI domain was significantly associated with at least 1 EI subtype except for encouragement. While encouragement may be needed in defining oneself as someone who is active,²⁷ it may not be as transferrable to other behaviors. A previous study using the AIQ found only parental encouragement was associated with children's engagement in physical activity.

However, parent encouragement was not associated with children's participation in team sports or with adolescent physical activity engagement.²³ In addition, a review of physical activity, diet, and screen time interventions for adolescents found parental support was a mediator for diet change, but not other behaviors.³¹ Additional research is needed to better understand how social support-related constructs, source of support, and type of behavior intersect to influence physical activity and diet behavior change.

Limitations to this study include its small sample size, which likely restricted the ability to find additional significant associations. In addition, the data are cross-sectional, negating the ability to make causal statements. Further, the study population was comprised of a convenience sample recruited in 2013-2014, which limits generalizability of the findings. However, 2-year college students and a multi-ethnic population were recruited, tapping into college populations that are not commonly recruited.^{69,70} While the AIQ is successful at capturing physical activity involvement across multiple dimensions, it is not the most commonly used exercise identity measure. However, the more commonly used Exercise Identity Scale has been criticized as not fully representing "role-identity"⁷¹ nor is it divided into psychosocial subscales. Additionally, since the AIQ scale was related to physical activity and not dietary psychosocial constructs, interpretations may differ if diet specific psychosocial constructs (eg, self-efficacy for eating healthy) are measured and incorporated into analyses.

Conclusion

Despite these limitations, the present study was conducted with a population rarely included in multiple behavior change interventions.⁶ In addition, most research on PAI and EI has been siloed with little guidance on incorporating identity measurement into behavior change research. Given this study's findings, physical activity and diet research should incorporate measures of PAI and EI as associations exist that could help researchers better influence both behaviors. This study adds to previous research indicating physical activity and diet behaviors are correlated and may be transferrable (ie, if 1 behavior is changed, the other is influenced)⁹ as well as research indicating identities may be central to why some but not all individuals with intentions to change behaviors do change.^{61,68,72} Study findings suggest the PAI dimensions of appearance and competence as well as tailored strategies for some EI subtypes (eg, picky, emotional, and meat) should be examined further to progress research aimed at changing both physical activity and diet behaviors.

Conflict of Interest

None of the authors identify any conflicts of interest.

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