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Processes of Change for Increasing Fruit and Vegetable Consumption among Economically Disadvantaged African American Adolescents

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Abstract

This study sought to identify Transtheoretical Model processes of change associated with consumption of ≥ 5 daily servings of FVs in a sample of economically disadvantaged African American adolescents ($N = 549$; mean (SD) age = 12.44 (.99) years; 61% female; 15% African American Hispanic). Participants completed measures of stages and processes of change, and were ranked according to intake level based on their reported stage. Spearman correlations and independent samples t tests were used in cross-sectional analyses of the relationship between processes of change and FV consumption. Consciousness raising, environmental reevaluation, helping relationships and stimulus control processes were significantly associated with FV consumption ($p \geq .12$; $p < .01$), and were practiced more often by youths who consumed ≥ 5 daily servings of FVs relative to those who did not ($p < .05$). Findings highlight the potential of these processes for increasing FV consumption in this population.

Keywords

Fruit; vegetables; African Americans; adolescents; Transtheoretical Model

1. Introduction

Fruit and vegetable (FV) consumption is associated with reduced risks for cardiovascular diseases, diabetes, obesity and certain cancers (Bazzano, 2006). With few adolescents consuming recommended amounts of FVs (Guenther, Dodd, Reedy, & Krebs-Smith, 2006), there is a recognized need to increase consumption, in particular among demographic groups

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Contributors

Jennifer Di Noia designed and executed the study. Jennifer Di Noia and Debbe Thompson analyzed and interpreted the data and wrote the first draft of the manuscript. Both authors contributed to and have approved the final manuscript.

Conflict of Interest

All authors declare that they have no conflicts of interest.

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that are less likely to meet national dietary guidelines such as African Americans and low socioeconomic status groups (Robinson, 2008). To guide interventions, an understanding of behavior change strategies associated with adequate FV consumption is needed. Research in this area is limited (Sandeno, Wolf, Drake, & Reicks, 2000), and studies of theoretically prescribed strategies are lacking.

Transtheoretical Model (TTM) processes of change are a common set of strategies and techniques for modifying a health behavior (Prochaska & DiClemente, 1983; Prochaska, DiClemente & Norcross, 1992; Prochaska & Velicer, 1997), and are considered important guides for the development of health interventions when matched to individuals' stage of readiness to change (Padula et al., 2003). In smoking cessation, experiential or cognitive, affective and evaluative processes are used more often at earlier stages when people are considering or planning to modify their behavior, whereas behavioral or overt processes are used more often at later stages among those who have changed their behavior and are working to sustain the change (Prochaska & DiClemente, 1983; Prochaska et al., 1992; Prochaska & Velicer, 1997). For dietary change, experiential and behavioral processes increase in tandem across stages (Greene et al., 2004; Chung, Hoerr, Levine, & Coleman, 2006; Henry, Reimer, Smith, & Reicks, 2006; Hildebrand & Betts, 2009; Rosen, 2000). Stronger associations with stage of readiness are found for self-reevaluation (reappraisal of values related to the behavior), consciousness raising (seeking information), self-liberation (committing to change) and stimulus control (changing environmental cues) processes, suggesting that these processes may be particularly important for facilitating dietary change (Rosen, 2000). Because most studies to date have been conducted with adults, less is known about processes that are used at earlier life stages. The purpose of this study was to identify processes associated with consumption of ≥ 5 daily servings of FVs in a sample of economically disadvantaged African American adolescents.

2. Method

2.1. Participants

This cross-sectional study examined baseline data provided by African American adolescents enrolled in a dietary intervention study described elsewhere (Di Noia, Contento, & Prochaska, 2008). Youths were recruited through 27 youth services agencies serving low-income communities in the Greater New York City area, and were offered the opportunity to participate when they presented for services. Selection criteria were African American ethnic-racial heritage and aged 11 to 14 years. Following institutional review board approval, all youths provided informed written assent and informed written consent was obtained from a parent or guardian. Data were collected between November 2005 and April 2006.

2.2. Measures

Informed and assenting youths were administered an outcome battery under the direction of trained research staff. The battery assessed youths' demographic characteristics and included measures of TTM stages and processes of change. Stage of readiness to consume ≥ 5 daily servings of FVs was assessed with the 4-item staging measure and algorithm developed by research scientists at the Cancer Prevention Research Center (1995). Youths were ranked according to intake level based on their reported stage. Those in pre-action stages (an indication that intake was < 5 daily servings) were labeled low consumers, and those in action and maintenance stages (an indication that intake was ≥ 5 daily servings) were labeled high consumers. Other TTM constructs were related to stage of change as determined by the measure in ways predicted by the model, providing evidence of its validity (Di Noia & Schinke, 2006).

A 19-item instrument assessed processes of change used by economically disadvantaged African American adolescents to consume FVs (Di Noia & Schinke, 2006). Responses were on a 5-point scale ranging from never (1) to often (5). Measurement development included examination of the relevance and exhaustiveness of an initial pool of questionnaire items ($N = 48$), pilot testing to ensure the clarity and interpretability of the items ($N = 9$) and psychometric evaluation ($N = 262$). Principal components analysis yielded a 2-factor solution representing four experiential (7 items) and four behavioral (12 items) processes. Processes of change definitions (Mauriello et al., 2006) and measurement items are shown in Table 1. The measure was reliable and valid, with acceptable internal consistency for both scales ($\alpha = .77$ experiential, $.89$ behavioral) and evidence that use of the processes significantly increased from pre-action to action and maintenance stages (Di Noia & Schinke, 2006).

2.3. Analysis

Analyses were conducted using SPSS, version 17.0. Spearman correlations were calculated to provide an index of relation between processes of change and FV consumption. Differences by intake level in mean frequencies of the processes were also examined with independent samples t tests. The study was sufficiently powered to detect modest correlations ($\rho \geq .12$) and mean differences ($\geq .30$), $1-\beta = .80$; $\alpha = .05$, 2-tailed.

3. Results

Participants were 549 African American adolescents with a mean (SD) age of 12.44 (.99) years. The sample was 61% female and 15% African American Hispanic. A modest 12% of youths ($n = 64$) reported consumption of ≥ 5 daily servings of FVs, with most (88%, $n = 485$) reporting consumption of < 5 daily servings. All but three survey items were significantly associated with FV consumption, and were practiced more often by high versus low consumers (Table 2). Stronger correlations were found for ten items measuring two experiential processes, consciousness raising (1 item) and environmental reevaluation (2 items), and two behavioral processes, helping relationships (2 items) and stimulus control (5 items), $\rho \geq .12$; $p < .01$.

4. Discussion

Findings of this study of economically disadvantaged African American adolescents confirmed that few consumed ≥ 5 daily servings of FVs (Guenther et al., 2006), underscoring the need for dietary intervention programs to improve health outcomes and nutritional status in this population. Although fewer processes of change were associated with FV consumption than observed for non-dietary behavior (Prochaska & DiClemente, 1983; Prochaska et al., 1992; Prochaska & Velicer, 1997), as found in previous dietary applications of the TTM, both experiential and behavioral processes were used more often by high versus low consumers (Greene et al., 2004; Chung et al., 2006; Henry et al., 2006; Hildebrand & Betts, 2009). Moreover, stronger associations were found for consciousness raising and stimulus control (Rosen, 2000), processes that appear to be primary factors in promoting FV consumption.

A dissimilarity with findings in samples of adults was the stronger correlations found for helping relationships and environmental reevaluation processes. The dissimilarity may be an artifact of the young age of the present sample. Possibly, reliance on social support is greater during adolescence than adulthood, owing to differences in the importance of healthy eating and in the ability to consider the long-term consequences of current dietary choices (Kroll, Neumark-Sztainer, & Story, 2001; Steinberg et al., 2009). Considering the impact of one's behavior on others may also have greater salience during adolescence given developmental

changes in moral reasoning that are occurring. Youths at the ages included in the study are transitioning beyond egocentric reasoning to a more mature consideration of interpersonal expectations, the effects of one's decisions on others and the importance of relationships (Woods & Jagers, 2003). Thus, they may have been more likely to think about the influence of their eating behavior on others.

Alternatively, the stronger correlations found may be unique to African American adolescents. The Afrocentric worldview emphasizes collectivism, with the basic unit of society the group or family; group survival is a priority, as reflected by cooperation, concern and responsibility for others (Kreuter, Lukwago, Bucholtz, Clark, & Sanders-Thompson, 2002). Greater reliance on helping relationships and environmental reevaluation processes intuitively fit within this worldview. Moreover, there is evidence of greater social support for healthy eating among African American as compared to white adolescents (Stanton, Green, & Fries, 2007), suggesting that normative support for these practices requires further study.

Limitations of this study include the non-representative sample and use of self-report measures. Further, potential moderators of the association between processes of change and FV consumption (e.g., FV availability and accessibility) were not measured. Additionally, the relatively homogenous sample of low consumers may have limited the ability to detect stronger associations than might be found in a population with more diverse intake patterns.

Despite these limitations, the present study is among the first of its kind to identify processes of change that enable FV consumption among economically disadvantaged African American adolescents. To assist youths in increasing their FV consumption, nutrition researchers and practitioners are encouraged to raise awareness of current intakes relative to recommendations and to provide information on the benefits of a diet rich in FVs. Increasing youths' mindfulness of the potential to serve as a positive role model for others by increasing their intake and sharing ideas for modifying environmental cues to encourage consumption and for engaging social network members in the provision of support for dietary change are also recommended.

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References

- Bazzano LA. The high cost of not consuming fruits and vegetables. *Journal of the American Dietetic Association*. 2006; 106:1365–1368.
- Cancer Prevention Research Center. Stages of change (5 A Day). 1995. Retrieved June 5, 2005, from <http://www1.od.nih.gov/behaviorchange/measures/PDF/5daystg.pdf>
- Chung SJ, Hoerr S, Levine R, Coleman G. Processes underlying young women's decisions to eat fruits and vegetables. *Journal of Human Nutrition and Dietetics*. 2006; 19:297–298.
- Croll JK, Neumark-Sztainer D, Story M. Healthy eating: What does it mean to adolescents? *Journal of Nutrition Education*. 2001; 33:193–198. [PubMed: 11953240]
- Di Noia J, Contento IR, Prochaska JO. Computer-mediated intervention tailored on transtheoretical model stages and processes of change increases fruit and vegetable consumption among urban African-American adolescents. *American Journal of Health Promotion*. 2008; 22:336–341. [PubMed: 18517094]

- Di Noia J, Schinke SP. Application of the transtheoretical model to fruit and vegetable consumption among economically disadvantaged African-American adolescents: Preliminary findings. *American Journal of Health Promotion*. 2006; 20:342–348. [PubMed: 16706005]
- Greene GW, Fey-Yensan N, Padula C, Rossi S, Rossi JS, Clark PG. Differences in psychosocial variables by stage of change for fruits and vegetables in older adults. *Journal of the American Dietetic Association*. 2004; 104:1236–1243. [PubMed: 15281040]
- Guenther PM, Dodd KW, Reedy J, Krebs-Smith SM. Most Americans eat much less than recommended amounts of fruits and vegetables. *Journal of the American Dietetic Association*. 2006; 106:1371–1379. [PubMed: 16963342]
- Henry H, Reimer K, Smith C, Reicks M. Associations of decisional balance, processes of change, and self-efficacy with stages of change for increased fruit and vegetable intake among low-income African-American mothers. *Journal of the American Dietetic Association*. 2006; 106:841–849. [PubMed: 16720125]
- Hildebrand DA, Betts NM. Assessment of stage of change, decisional balance, self-efficacy, and use of processes of change of low-income parents for increasing servings of fruits and vegetables to preschool-aged children. *Journal of Nutrition Education and Behavior*. 2009; 41:110–119. [PubMed: 19304256]
- Kreuter MW, Lukwago SN, Bucholtz DS, Clark EM, Sanders-Thompson V. Achieving cultural appropriateness in health promotion programs: Targeted and tailored approaches. *Health Education & Behavior*. 2002; 30:133–146. [PubMed: 12693519]
- Mauriello LM, Driskell MM, Sherman KJ, Johnson SS, Prochaska JM, Prochaska JO. Acceptability of a school-based intervention for the prevention of obesity. *Journal of School Nursing*. 2006; 22:269–277. [PubMed: 17172199]
- Padula CA, Rossi S, Nigg C, Less F, Fey-Yensan N, Greene G, et al. Using focus groups for instrument development: Application of the transtheoretical model to fruit and vegetable behaviors of older adults. *Journal of Nutrition for the Elderly*. 2003; 22:13–33.
- Prochaska JO, DiClemente CC. Stages and processes of self-change of smoking: Toward an integrative model of change. *Journal of Consulting and Clinical Psychology*. 1983; 51:390–395. [PubMed: 6863699]
- Prochaska JO, DiClemente CC, Norcross JC. In search of how people change: Applications to addictive behaviors. *American Psychologist*. 1992; 47:1102–1114. [PubMed: 1329589]
- Prochaska JO, Velicer WF. The transtheoretical model of health behavior change. *American Journal of Health Promotion*. 1997; 12:38–48. [PubMed: 10170434]
- Robinson T. Applying the socio-ecological model to improving fruit and vegetable intake among low-income African Americans. *Journal of Community Health*. 2008; 33:395–406. [PubMed: 18594953]
- Rosen CS. Is the sequencing of change processes by stage consistent across health problems? A meta-analysis. *Health Psychology*. 2000; 19:593–604. [PubMed: 11129363]
- Sandeno C, Wolf G, Drake T, Reicks M. Behavioral strategies to increase fruit and vegetable intake among fourth- through sixth-grade students. *Journal of the American Dietetic Association*. 2000; 100:828–830. [PubMed: 10916523]
- Stanton CA, Green SL, Fries EA. Diet-specific social support among rural adolescents. *Journal of Nutrition Education and Behavior*. 2007; 39:214–218. [PubMed: 17606247]
- Steinberg L, Graham S, O'Brien L, Woolard J, Cauffman E, Banich M. Age differences in future orientation and delay discounting. *Child Development*. 2009; 80:28–44. [PubMed: 19236391]
- Woods LN, Jagers RJ. Are cultural values predictors of moral reasoning in African American adolescents? *Journal of Black Psychology*. 2003; 29:102–118.

Highlights

- Processes of change (POC) is the least researched Transtheoretical Model construct.
- Relationships between POC and fruit and vegetable intake ≥ 5 daily servings were examined among economically disadvantaged African American adolescents.
- Significant associations with consciousness raising, environmental reevaluation, helping relationships and stimulus control POC were found.
- Promoting these processes may aid in increasing intake in this population.

Table 1
Processes of change definitions and measurement items for fruit and vegetable consumption

Processes ^a	Definition	Measurement items ^b
Experiential		
CR	Seeking and considering information on the healthy behavior	Remember what people tell me about the benefits of eating FVs
ER	Realizing the impact of engaging in the healthy behavior on one's social and physical environment	Would set a good example for others if I ate FVs Might influence others to be healthier by eating FVs more often
SR	Emotional and cognitive reappraisal of values related to the healthy behavior	Eating enough FVs could make me healthier and happier Think of eating FVs as something to do for myself rather than as a chore Only I can decide whether to eat enough FVs
SL	Noticing how social norms are changing to support environments and individuals engaging in the healthy behavior	Find the world changing in ways to make it easier to eat healthfully
Behavioral		
RM	Increasing intrinsic and extrinsic rewards for engaging in the healthy behavior	Reward myself when I eat FVs
HR	Seeking and using social support to encourage or to help with engaging in the healthy behavior	Have a friend who encourages me to eat FVs Surround myself with people who are trying to eat more FVs
CC	Substituting the unhealthy behavior with healthier alternative behaviors and cognitions	Purchase FVs instead of junk food Make myself eat FVs even if I do not like their smell/taste Have fruit as a dessert instead of sweets or ice cream
SC	Removing cues to the unhealthy behavior and adding cues to engage in the healthy behavior	Keep reminders at school to eat FVs When friends are over, serve only FVs Keep reminders at home to eat FVs Remove things (like junk food) that prevent me from eating enough FVs Keep FVs in sight as reminders to eat more of them Avoid spending time in places where it is difficult to eat FVs

^a CR, consciousness raising; ER, environmental reevaluation; SR, self-reevaluation; SL, social liberation; RM, reinforcement management; HR, helping relationships; CC, counterconditioning; SC, stimulus control.

^b Items revised to fit table. FVs, fruits and vegetables.

Table 2
Relationship between frequency of processes of change and intake level (N = 549)^a

Processes ^c	Spearman correlation (ρ)	Mean difference ^b			
		M	SD	M	SD
Experiential					
ER	.20***	3.12	(1.31) ^a	3.94	(1.18) ^b
CR	.14**	3.36	(1.30) ^a	3.90	(1.14) ^b
ER	.12**	3.13	(1.37) ^a	3.65	(1.14) ^b
SR	.11**	3.37	(1.33) ^a	3.81	(1.30) ^b
SR	.10*	2.95	(1.32) ^a	3.34	(1.29) ^b
SR	.09*	2.99	(1.36) ^a	3.37	(1.15) ^b
SL	.04	3.22	(1.41) ^a	3.39	(1.34) ^a
Behavioral					
SC	.16***	2.20	(1.38) ^a	2.90	(1.52) ^b
SC	.15**	2.20	(1.30) ^a	2.80	(1.34) ^b
HR	.14**	2.46	(1.40) ^a	3.06	(1.41) ^b
SC	.14**	2.39	(1.40) ^a	3.03	(1.50) ^b
SC	.13**	2.44	(1.41) ^a	2.97	(1.34) ^b
HR	.13**	2.41	(1.39) ^a	2.95	(1.34) ^b
SC	.12**	2.40	(1.29) ^a	2.87	(1.26) ^b
CC	.11*	2.54	(1.24) ^a	2.94	(1.27) ^b
CC	.10*	2.65	(1.24) ^a	3.02	(1.21) ^b
RM	.10*	2.57	(1.41) ^a	3.00	(1.36) ^b
CC	.08	2.56	(1.41) ^a	2.95	(1.57) ^b
SC	.06	2.60	(1.40) ^a	2.84	(1.26) ^a

* $p < .05$;

**
 $p < .01$;

 $p < .001$.

^aNumbers may be reduced by varying small amounts because of incidental missing data.

^bDifferent superscripts denote significantly different mean values ($p < .05$) as determined by independent samples *t* tests.

^cCR, consciousness raising; ER, environmental reevaluation; SR, self-reevaluation; SL, social liberation; RM, reinforcement management; HR, helping relationships; CC, counterconditioning; SC, stimulus control; FVs, fruits and vegetables. Frequency measured on a 5-point scale (1 = never, 5 = often).