Published in final edited form as:

J Pediatr Nurs. 2014 ; 29(6): 493–502. doi:10.1016/j.pedn.2014.03.020.

Assessment of mobile device and SMS use for diet and exercise information among rural Mexican-American adolescents

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Rural youth have significantly higher prevalence of overweight and obesity than urban youth (Joens-Matre et al., 2008; Liu, Bennett, Harun, & Probst, 2008; Lutfiyya, Lipsky, Wisdom-Behounek, & Inpanbutr-Martinkus, 2007; Nelson, Gordon-Larsen, Song, & Popkin, 2006). Ethnic minority adolescents are particularly at risk as the prevalence of overweight and obesity among ethnic minority adolescents is increasing. The prevalence of obesity in Mexican American adolescent males has almost doubled in the last 20 years, from 14.1% in the period between 1988 and 1994 to 26.8% between 2007 and 2008 (Ogden & Carroll, 2010). Obesity prevalence in Mexican American adolescent females increased as well from 13.4% between 1988 and 1994 to 17.4% between 2007 and 2008 (Ogden & Carroll, 2010). Evidence from a retrospective analysis of data from a rural health clinic with a largely Mexican American population identified almost half (n=105, 49.5%) of rural Mexican American adolescents (RMAA) seeking care at the clinic as overweight, obese or severely obese (Champion & Collins, 2012). Attention is needed for RMAA and their communities to address these rising rates in weight.

The use of mobile devices for Internet access and short messaging service (SMS) or texting, to communicate with adolescents in regard to diet and exercise practices may help address the issue of overweight and obesity in ethnic minority rural adolescent populations. Increased accessibility and use of mobile devices among adolescents and improved health outcomes with its use in behavior modification interventions suggest a potential for its use with ethnic minority rural adolescents. Seventy five percent of 12 to 17 year old adolescents currently own cell phones and adolescents from ethnic minority populations tend to use cell phones to access the Internet more than non-Hispanic White adolescent populations (Lenhart, Ling, Campbell, & Purcell, 2010). Researchers who conducted two systematic reviews reported significant changes in behavior outcomes in disease management and

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disease prevention intervention studies that used mobile devices as one component of intervention delivery (Cole-Lewis & Kershaw, 2010; Krishna, Boren, & Balas, 2009). However, empirical studies of mobile health interventions lack ethnically diverse sample populations (LaPlante & Peng, 2011) and theoretically-based and empirically tested obesity prevention interventions for ethnic minority adolescent populations are generally lacking (Branscum & Sharma, 2010; National Heart Lung Blood Institute, 2008). Healthcare providers in rural areas may be able to use adolescents' frequent use of mobile devices as a means of communicating diet and exercise guidance to rural adolescent populations and further study is needed to explore this potential.

A retrospective analysis of data that was collected routinely in delivery of clinical services at a rural health clinic in a medically underserved area in Southwest Texas serving rural Mexican American adolescents (RMAA) was conducted (Champion & Collins, 2012). The county in which the clinic is located has a population of approximately 26,000 people (USDHHS, 2009) and is considered a micropolitan statistical area (Texas Department of State Health Services, 2012). Seventy percent of residents in this area are of Hispanic background (Texas Department of State Health Services, 2012). The rural clinic serves a five county area on the Texas-Mexico border. First documentation of overweight/obese status occurred most frequently (76.3%) when youth were between 11 and 16 years of age. Documentation of intervention for overweight and obese adolescents by healthcare providers at the clinic was low. The majority of cases (51.4% to 75.6%) did not include documentation of intervention, and of those with documentation, diet and exercise interventions were documented most frequently (57.1%).

The aim of this pilot study was to describe how rural Mexican American adolescents use the Internet or short message service (SMS) via mobile devices to gain knowledge about diet and exercise. Evaluating the use of mobile devices for diet and exercise knowledge will provide evidence for its potential use in a comprehensive, multi-factorial, multi-component intervention to address overweight and obesity in this community of rural Mexican American adolescents.

Background

The Weight of RMAA is a Priority Health Concern

The prevalence of overweight and obesity in ethnic minority adolescents is rising. Mexican American adolescent males had the highest prevalence of obesity among all male adolescents whereas Mexican American adolescent females had the second highest prevalence of obesity among all adolescent females in the United States (Ogden & Carroll, 2010). Obesity in childhood puts youth at risk for cardiovascular, renal, hepatic, pulmonary, psychological, neurological, orthopedic, and metabolic illness that may continue into adulthood (Kumanyika et al., 2008).

Health Disparities in the Region

The social demographics for the city in which members of the target population live are critical indicators of health disparity. Approximately 28% of individuals in this region are living below poverty level as compared to 17% in the US (Texas Department of State Health

Services, 2012). The median income per household income for this area (\$34,456) is lower than that for Texas (\$50,920) and the US (\$52,762) (U.S. Department of Health and Human Services (USDHHS), 2009).

Approximately 23% of the population is uninsured, 32% of the population receives Medicaid, and 24% of adults 25 years of age and older do not have a high school diploma in the city in which members of the target population live (USDHHS, 2009). Slightly more than a third (31.1%) of individuals 19 years of age and younger living in the city of the target population live below poverty as compared to 22.8–31.4% of individuals 0 to 19 years of age living in peer counties throughout the United States (USDHHS, 2009). The pregnancy rate for 13 to 17 year olds in this county is 27.7 per 1000 women, and is higher than the state of Texas average which is 21.4 per 1000 women (Texas Department of State Health Services, 2012). Disproportionately high rates of poverty, lower educational preparation, and teen pregnancy intensify this community's vulnerability.

Use of Mobile Technology with Adolescent Populations to Address Health Issues

Health behavior intervention content has been delivered using mobile technology to address health risk behaviors in adult and adolescent populations. Strengths of mobile health intervention studies include frequency of reminders and tailored messaging, low cost of intervention and randomization (Militello, Kelly, & Melnyk, 2012). Limitations of empirical studies of mobile health interventions included small sample sizes (Krishna et al., 2009; LaPlante & Peng, 2011; Militello et al., 2012), lack of ethnic diversity (i.e. mostly non-Hispanic White samples) in sample populations (LaPlante & Peng, 2011), self report bias, and lack of long term follow-up (Militello et al., 2012).

A review of health promotion interventions showed significant changes in exercise in more than half of mobile health studies reviewed (LaPlante & Peng, 2011) and was the only outcome where significant differences were found (Militello et al., 2012). Significant changes were found in behavior outcomes in a majority of studies in disease management and disease prevention (Cole-Lewis & Kershaw, 2010; Krishna et al., 2009). Access to mobile technology may provide an opportunity to address diet and exercise behaviors via a mainstream communication practice in adolescent social networks.

Method

Institutional review board approval was obtained. This study was completed in a rural community in southwest Texas.

Theoretical assumptions

Corbin and Strauss (2008) suggest that researchers may use theoretical frameworks to justify a particular methodological approach. Authors used assumptions from the Bioecological Model (Bronfenbrenner, 2005) to justify a descriptive approach to explore how RMAA use mobile devices to address diet and exercise. Bronfenbrenner's assumptions in the Bioecological model are that human development takes place through interaction between individuals, other persons and objects in its environment. Bronfenbrenner named these interactions over time as proximal processes, and includes the process of knowledge

acquisition. Authors explored if and how RMAA interact with others through the use of mobile devices to address diet and exercise knowledge or practice.

Sample and Participant Selection

A convenience sample of adolescents was recruited during routine visits to a rural health clinic. In fall of 2011, snowball sampling was used to recruit additional participants. Inclusion criteria for participants included: English speaking, self-report as Mexican American, or at least partial Mexican American, 12 to 18 years of age, and parental or guardian consent for adolescent participation. Potential research participants were excluded from enrollment if they self reported not belonging to a Mexican American ethnic group, if they were younger than 12 years of age or older than 18 years of age, or if a parent or guardian did not provide written consent for participation for adolescents 12 to 17 years of age.

The rural Mexican-American community in which the study was conducted is bilingual, English-Spanish speaking. The Mexican-American adolescents enrolled in the study all attended public school and were proficient in English. Therefore, the interviews were conducted in English. Parental consent and participant assent was obtained for participants 12 to 17 years of age. Each participant was paid \$20 for participation in the focus group. Three focus groups were conducted (one by the primary author and two by the co-author) which were digitally recorded and transcribed. To protect confidentiality in a rural community, only basic demographic information including age, phone number, address, and annual income (if known) were collected.

The second author has extensive experience in conducting focus groups and for this reason conducted two focus groups. The second author provided guidance to the first author in conducting a focus group. Focus groups were conducted at the clinic or another designated site in a private room to ensure confidentiality and were digitally recorded.

Questions Asked of Participants

The following questions were asked of participants. These questions were developed based on the theoretical approach chosen for this study, a review of related literature and on clinical expertise with the target population.

1. Tell me what you know about diet and exercise
2. Tell me about obesity in your area
3. Do you use mobile devices to find health information?
4. Do you use mobile devices to find information about diet and exercise?
5. Do you use mobile devices to make health changes?
6. Do you use mobile devices to help friends?

Authors explored participants' level of knowledge about and resources available to them regarding diet and exercise by asking fixed-response questions at first to assess resources for

health including mobile devices. Authors followed up on these probes using additional open-ended questions based on participants' responses.

Data were analyzed using content analysis as described by Elo and Kyngas (2008). In preparation, researchers determined the unit of analysis as the entire interview of the focus group. The lead author read through the data multiple times to make sense of it and completed open coding in which broad categories were created. Broad categories were examined for more specific content, seeking similarities and dissimilarities in content. Content was grouped by similarities into sub-categories in the process of abstraction. Sub-categories were used to explain the meaning of categories. The authors had ongoing discussions of categories and sub-categories to maintain rigor in the study design.

Results

Study Sample

Group one included males, (n=4), 14 to 17 years of age (mean=15.8), and all participants were in athletics. Group two included males, (n=5), 15 to 18 years of age, (mean=16.6). All participants were in athletics. Group three included females, (n=3), 14 to 15 years of age (mean=14.3). Two female participants were in athletics, one was not in athletics. The total sample included three focus groups. Each focus group lasted approximately one hour.

Authors identified four categories. These categories were knowledge of diet information, resources for diet and exercise information, who becomes overweight and why, and avoiding being overweight. Subcategories in the category of resources for diet and exercise information that further explained this area include peers; adults; mobile devices and SMS. Subcategories in the category of avoiding being overweight include comparisons; exercise now, diet later; and Women: You're overweight, go do something!

Knowledge of Diet Information

Participants described food as good and bad. Good was used to name preferred foods. When asked what a good diet was, one male participant in group two said, "Lasagna would be good", with another male participant adding, "I love lasagna. And spaghetti, yeah, that's some good stuff," with subsequent laughter in the group. Young men in group one offered the category of bad food, supporting the rationale for its name based on the physiologic impact on the body. One male participant stated, "[French fries] are bad because they're like fried it's all saturated with grease", while another young man suggested, "It weighs you down. Oh, it clogs your arteries." These statements were confirmed by a third male participant, "There you go".

One young man summarized the difference between good and bad food as, "Bad's the good one; good's the bad one. In taste, in taste, in taste." Female participants situated the ideas of good and bad in the context of commonly agreed upon knowledge. One young woman stated, "Hmm, I think that everybody pretty much knows, like you know, vegetables are better than chips, you know. Hotdogs are better than..." Another young woman finished the first young woman's thought by adding, "Anything. [Laughs] I mean anything else is better than having hotdogs and buns."

When asked by the moderator what a healthy diet included, one female participant stated, “Get on a good diet, three meals a day, healthy meals, balanced meals.” Another female participant added, “Salads, apples”. [Laughter by the group] A third female agreed, “Apples! Like a horse or something, apples. Apples is the way to go.” [Laughter by the group]

Resources for Diet and Exercise Information

Participants described how they interacted with others to acquire information and support regarding diet and exercise as well as how others motivated them to exercise. Subcategories that explain this category include peers; adults; mobile devices and SMS.

Peers—The young men in both groups described how they used peers to help them acquire information and for support regarding diet and exercise. Both groups of young men indicated that they exercised together during the summer. One young man from group one stated,

We um, we have this program here that’s strength and conditioning in the summer, and we go to that. And then I guess one day we just said let’s go back and workout. We went and lifted. And then we said we’ll come back tomorrow, and we did it, and it just became a habit.

Another young man in group two had a similar report.

Yeah, we-- like in the summer, we usually like, like call each other. Like we’ve done this a couple of times. We went and worked out at [an exercise facility]. And like I remember one time we woke up at like 5:30 in the morning and we met at the park, and we all ran around the city.

Young men in group two shared the power of peer support. Asked if they would exercise by themselves: One male said, “Probably not”, with confirmation from another, “Yeah, I probably wouldn’t do it by myself either.”

One young man in group two used peers at a local gym with certain body shapes as resources for information about how to have that body shape.

And there are like people that are like, like built, like that are, like have a good body, like I go and ask them, “Hey, you know, how do you do...?” and then they tell me. They’re all cool there. They tell me what like you should eat. I was like, “I want to get my arms like yours,” and then, “Oh, all right, you should do this.”

Adults—Adults were resources for participants. Male youth specifically mentioned their coaches’ influence on diet and exercise patterns as well as motivation to exercise. Coaches told them to drink pickle juice instead of water, not to eat fast food, and gave them bananas and oranges. Coaches provided support for males. One male in group two said, “And you know, you got motivated. The thing about you having a coach is like, every day, right, you’ve got somebody there”, with another male confirming, “Yeah, that helps a lot.” Coaches generally told young men what exercises to do and young men were receptive to this instruction. One young man in focus group one indicated, “Uh, well like when I workout and stuff, like football, they just tell you all what to do, and you all do it”,

confirmed by another, “Yeah, they just tell us what exercise to do and we do it.” One young man in group one shared that he took a sports medicine class and received information about calories, fats, and what healthy foods are. He said he listened to the teacher because, “well I do [listen] because I want to be a trainer. For just to know, like so you have a background if people ask you.”

Adolescents also reported parent and healthcare provider influence. One male in group one with agreement from another male in group one stated, “My Mom said you don’t digest after six”. A female participant stated, “I started eating right, because my mom’s on a diet, and I started eating right. I didn’t eat chips, stuff like that.” Two young men in group one indicated that physicians decide whether or not one’s weight was “okay or not”.

Mobile devices and SMS—Young women indicated that they were exposed to diet and exercise information while accessing the Internet on their mobile devices through advertisements online, in social media sites like Facebook, and on Internet radio sites. They indicated they would be receptive to SMS and Internet programs. One young woman, responding to the potential to receive text messages about weight suggested, “It’d like open a doorway to think... Hmm, am I okay? Am I all right?” Another female believed that adolescents would use Internet programs to track dietary intake.

Males mentioned using the Internet to seek information regarding muscle building and to support personal change. One male in group one stated, “Like if you want to focus on like a certain part of your body, then yeah I guess, you can look, I would for a certain exercise to key that muscle, I guess, I would. But I haven’t done it, I mean. But I mean if I did, yeah, probably.” The moderator asked the group if they had used the Internet for exercise information. A second male confirmed, “Mm-hmm [yes], Yeah, for like what he said.” Male participants also used SMS to arrange exercise. A male in group one shared, “We would text each other and say, “Let’s go workout right now.”

One young man in group one was undecided about diet information sent via SMS. Asked their response upon receiving a text suggesting what to eat, one male in group one stated, “Oh, I’d delete it”. Everyone in the group laughed at this. He continued, “Because I don’t need someone telling me what to eat. I don’t know, I just eat something. I just look at it and I’m like, all right, that looks good.” Later in the discussion the same young man stated, “Well now, I think I would probably try it, maybe, thinking now, like someone texting me to eat something, like, if it was something that reminded me every day, not like someone physically, but like a computer or something.”

All males in group one denied seeking information about diet or the possibility of using online programs to track diet intake. One male shared, “I don’t really pay attention.” Another stated that if he received a text from a friend about foods to eat, “I probably wouldn’t [pay attention], not just because I don’t want to listen to them, but I don’t really plan what to eat and what not to eat.” Asked if they would be willing to send one another texts about diet, one responded, “I’d forget to text them.”

Young men in group two, in contrast, indicated that they would and have used mobile devices to look for diet and exercise information. Several members indicated, “We have workouts,” with one male in group two stating, “I just go to YouTube and just, workout apps, they have like timing for ab workouts and all this stuff. We’ve, we’ve used them before.” Another male added, “And diet apps.” All members of the group agreed in unison that they used mobile devices to look for diet information.

Who Becomes Overweight and Why

Participants explained connections between diet and exercise and the impact on the body, specifically how and why an individual becomes overweight and the potential link with diabetes. The moderator for group two asked young men what would happen to an individual’s weight after the individual graduates from high school. Two different young men responded, “You get fat.” When asked why individuals get fat after they graduate, young men, speaking over one another, stated, “Because they’re not in sports.” One young man continued to explain, “Because when you’re in the sport, like you can eat, you can eat a lot and you work it out in the sport. But when you’re out of the sport you keep the eating habits with you. You’re not working out, but you still eat the same.” Another explained, “Because once you stop a sport, you get lazy.”

Young men in group two suggested a relationship between non-participation in athletics in high school and being overweight. When asked what happens to young men who don’t participate in athletics in high school, all young men in the group spoke over one another stating, “They get overweight, they’re lazy.” Different participants suggested, “They’re fat,” “They’re weak, not as healthy,” “They’re overweight because they’re not in sports, probably,” and “It’s just building up.”

One young woman explained, [that people become overweight] “When they sit at home and do nothing. Couch potatoes.” “Exactly, yes”, agreed another young woman. The first young female added, “I mean I don’t know. I don’t really, like I’m not really an athletic person. But if I’m at home, not like eating on the couch all day.”

Males and females discussed the impact of diabetes on family members and the connections to diet and exercise. Asked the relationship between weight and diabetes, one female responded, “I think it was, being like, overweight.” Young men in group two were asked if they had any family members who had diabetes. Four of the five young men reported someone in their family had diabetes.

Avoiding Being Overweight

Participants discussed the process by which they avoided being overweight. Three subcategories that explain these processes include comparisons; exercise now, diet later; and Women: You’re overweight, go do something!

Comparisons—One young woman discussed how she attempted to lose weight through diet and exercise and how this motivation arose through comparison.

Like because I didn't want to lose that much. You know? Like I didn't want to go overboard. Like I don't want to lose like ten pounds. Maybe like out of ten, like six or five, that's it. I just like started running. I started eating right, because my mom's on a diet, and I started eating right, I didn't eat chips, stuff like that. Just the kind of food that I was eating. The amount too, kind of, because I eat a lot.

She also compared herself to another young woman in the group.

I'm like her. I used to be like her [pointed to another participant], like real skinny like that. And then I started getting like older, whatever, and my mom kept telling me I was growing or whatever. But I've gotten bigger. I mean I used to be like 120-something...like 120, like her, but now I'm like 130, almost going to 40. So I'm like oooh.

Young men mentioned the motivation to avoid getting 'fat' and 'getting better'. Asked what their motivation was to stay in shape, young men in group two talked over one another stating, "I don't want to end up like fat," and "You don't want to be a fat guy," and "You don't want to end up like that." One young man in this group indicated, "Like you want more. Like when you see something new and improved, you want to get better than that" with another agreeing, "Yeah, you want to get better than that. You want to get bigger." A young man in group one indicated he was motivated to exercise, "to get better at a sport, mainly for me, I guess."

One young man whose father had diabetes was asked if his father having diabetes made him think about diabetes. He replied, "Sometimes. But I just try and exercise and I feel better." Another young man, after asked how family members diabetes affected him, stated,

I mean like it's there, but, I mean you think about it. But I mean when I look at, I don't know, I look at them, and then I see that I'm not like as big as they are, so I kind of see it that I don't have it. Like, I won't, I'm not like at the risk of getting it. But still, like, but still it's kind of just like I still need like to work out so I don't have the risk of getting it still, you know.

Exercise now, diet later—Young men in group one added a temporal element to the need to consider seeking information about and making choices about diet and exercise. They were asked if they would consider being in a program on exercise and diet after they graduated from high school. One young man responded, "I wouldn't. I don't think there'd be time, like working and stuff. Have to worry about other stuff." Another participant explained that diet and exercise practices change as a person ages and takes on different responsibilities.

You have a family probably by then [after high school] so you won't have time. You have your job, so, I think then it's just going to have to be like eating healthier then. If you're not going to be exercising, then you're going to have to make better choices. That's when it comes into play, is like, making the choices. Because in high school you were doing stuff, so it didn't really matter. Basically when you get older. But in high school, I mean if you're active, then it doesn't really like take a big thing to see what you're eating and everything.

Young men in group one consistently indicated that they didn't watch or give much thought to what they ate, didn't keep track of what they ate, and ate what was available to them. One young man reported, "Yeah. I don't... If it's a bunch of calories or something, I don't, like, 'Oh, I can't eat this.' You know? I just eat whatever is there, then." Young men in this group added to this by saying that they didn't pay attention to information about diet in newspapers and on TV or in general. "I don't really pay attention," said one young man, with another agreeing, "I fast-forward through them."

Women: You're overweight, go do something!—Young women and a young man in group one addressed application of diet and exercise information in the context of women's focus on and acceptance of social norms of thinness. Young women felt that despite the abundance of messages regarding weight in the media, these messages were ignored. One young woman offered, "Because it's not really what anybody wants to hear" with another adding, "That you're overweight! [Laughter in the group] You're overweight, go do something!"

All the women in the group agreed when asked if they sensed more pressure for women to be thin than for men to be thin. Asked why this is so, one young woman stated, "Because you just want to look like all the models and stuff." Another young woman indicated that women generally believed they were not thin. She stated, "Like everybody thinks they're fat, because that's the way they've been living for years."

One male in group one also suggested that women feel pressure to be thin.

Like girls, like they, like they're like, they're like skinny enough, they're fine, they're perfect. Like not perfect, but they're fine. And they're always saying that they need to lose more weight. I think they're just more pressured about it by society, like how looking at how girls are towards it. Like models, they have to have that size 2 like and all that and whatever, stuff.

Another young woman, when asked if people can do anything about weight, suggested, "Like if you, if you have enough guts to say like, 'I'm overweight, and I want to try to do this,' well then you'll try something. But most people just don't like to think that they're overweight".

Discussion

The aim of this pilot study was to describe how rural Mexican American adolescents use the Internet or short message service (SMS) via mobile devices to gain knowledge about diet and exercise. Participants in this study applied information about diet and exercise to their lives based on an interaction with community and through the use of use mobile devices. Avoiding overweight is the outcome of diet knowledge, use of resources, and explanations of who becomes overweight and why. The use of mobile devices is one tool in a process of gathering data, comparing against others and self, and listening to others. Participants dialogue suggests that to understand the use of mobile devices to seek and apply diet and exercise information, one must explore how mobile devices are used and separately, how

diet and exercise information is sought and applied. These concepts, mobile device, diet, and exercise information may be mutually exclusive depending on the context.

The goal sample size was three focus groups with three to five participants in each for a total of 15 participants. This sample size was based on maximizing the number of participants possible given funding available to complete the study. Participants were recruited during normal clinic hours; however, focus group meetings were scheduled after hours in order to accommodate school schedules and activities. Authors propose that timing of focus group sessions and participant interest influenced the ability to recruit fewer participants (n=12) than the goal of 15 participants.

Participant reports exemplified concrete cognitive patterns with regard to exercise and diet behaviors and subsequent potential for becoming overweight. Participants described diet in concrete terms as 'good' or 'bad' and one group of young men indicated they didn't pay attention to diet. They proposed connections between eating, exercise and weight status. Participants indicated being overweight is the result of failing to exercise yet maintaining diet habits. A lack of exercise, specifically non-participation in athletics, was provided as an explanation of why individuals were overweight. The category of who becomes overweight provides an explanation of condition and reaction by adolescents to overweight and obesity.

Authors discovered the resources for health upon which youth rely. Both young men and women relied on teachers, family, coaches and peers for information and influence regarding diet and exercise. Coaches, parents, and peers were mentioned as both sources of information and motivation for adolescents to engage in diet and exercise practices. Participants used mobile devices within this matrix of information and resources in their community. Mobile devices are used in conjunction with, rather than instead of, existing resources. Turning to peers, adults, and mobile devices appear to be outcomes to the conditions and reactions of participants with regard to overweight.

They listened to parents' advice, followed parents' practices, and reported reacting in response to family members' illnesses. Youth compared themselves to their friends and to their family and made assessments of their bodies based on a baseline understanding of overweight, diet, exercise, and avoidance of illness. Youth used mobile devices to text one another and occasionally to seek information about specific exercises on the Internet. Male participants' use of SMS to engage other youth in exercise is also consistent with current evidence. Adolescents use cell phones for "micro-coordination" of events and to increase social interaction (Lenhart et al., 2010).

Cultural norms, while not specifically discussed by participants, may be an additional factor that influenced knowledge of diet and exercise. Participants explained that peers, coaches and parents influenced their understanding about diet and exercise practices. Parental and extended family beliefs about diet, exercise and cultural food norms as well as language barriers that influence interpretation of diet and exercise practices may influence adolescent eating and exercise patterns (Peña, Dixon, & Taveras, 2012). Cultural norms may influence individuals' and parents' knowledge of prevention and health norms, including eating and exercise behaviors. Mothers of ethnic minority youth may define 'healthy' differently, with

members of some cultures associating thinness with illness rather than health (Peña et al., 2012). Additionally, parents who believe lack of illness to be a marker of health may consider their asymptomatic, overweight children to be healthy and in no need of intervention (Peña et al., 2012). The influence of parents and cultural norms on participants' understanding of health may have influenced their assessments of diet, exercise, weight and beliefs in health and norms about health.

Participants explained how individuals became overweight in relationship to exercise, specifically how lack of exercise, or being "lazy" resulted in overweight. This is consistent with other findings. Youth suggested that obesity was the result of eating unhealthy foods and failing to get exercise (DuongTran & Garcia, 2009). Male participants reported a personal motivation to exercise to look like certain peers and 'avoid being the fat guy'. Young men's focus on personal motivation appears consistent with other evidence in which males reported exercising for goal attainment (Iannotti et al., 2009).

Females described the media's attempt to motivate women to 'do something' and avoid being overweight through suggestions of norms that all women need to be thin. Young women's reports of feeling media pressure for thinness mirrors that of other female youth who believed they were more overweight, had greater anxiety that others believe they are overweight, and perceived more pressure from the media to lose weight than their male youth peers (Gillison, Standage, & Skevington, 2006).

Young men in one group explained a preference for a certain diet in conjunction with participation in athletics. Participation in athletics allowed young men to 'eat a lot' and also resulted in them not having any problems. Young men's perception of susceptibility may have been lower given the level of health that they believed participating in athletics afforded them. Additional comparison to characteristics of family members with diabetes, 'not like them in size' or 'not older' may also represent low perception of susceptibility and low readiness to address diet practices.

One male in this study prioritized a focus on eating behaviors 'later' in adulthood when exercise habits would decrease. This may suggest a low level of readiness to learn about diet and exercise in the absence of illness. Cultural norms may also provide insight to this young man's suggestion. Mexican youth, (mean age=19.5) suggested that Mexican Americans engage in reactive, rather than proactive healthcare, accessing preventive healthcare resources only for compulsory purposes (i.e. employment requirements) (DuongTran & Garcia, 2009). Other suggestions by participants that they were "doing fine" and weren't as large as or didn't have diabetes like family members may be consistent with this norm of reactive healthcare.

The limited report of use of mobile devices or Internet to gain knowledge about health behaviors may be explained by evidence from studies completed with adolescents with chronic illness. Although the target populations between the current study and other studies differ, even adolescents who may have higher levels of readiness due to illness do not appear to use the Internet to gain knowledge about health issues. Teens with chronic illness reported accessing sites for social support (Chisolm, Johnson, & McAlearney, 2011; van der

Velden & El Emam, 2013); however, they valued normalcy on Facebook and preferred to share health information in person with close friends, yet used hospital networks of youth with other chronic illnesses as social support (van der Velden & El Emam, 2013). Teens with chronic illness reported not accessing Internet health sites due to lack of time, interest, access (Chisolm et al., 2011) and need (Chisolm et al., 2011; van der Velden & El Emam, 2013). Only 10% indicated they intended to use Internet health sites to get information about control and prevention of their disease (Chisolm et al., 2011). Youth, even those with illness, may not use mobile devices and the Internet to discuss health-related topics, perceiving these resources largely as tools for social purposes.

Limitations of the present study

The sample population does not reflect adolescents at potentially higher risk (i.e. those with fewer resources and access to care at the clinic due to insurance, cost, or issues with transportation). Convenience and snowball sampling may have biased results as well, specifically in that study results may not be relevant to adolescents living in rural communities who are not members of athletic teams and who do not own cell phones. Further, all participants except for one participated in athletics, which may have influenced their reflections regarding diet and exercise, as well as their willingness to evaluate or have their dietary and exercise behaviors evaluated. Additionally, current weight status was not a factor considered in this study. Social desirability may have influenced participant responses. The small sample size limits the application of findings to other populations. Although small sample size and the subsequent lack of saturation of themes are limitations of this study, this pilot study was intended to explore if and how rural adolescents use mobile devices with regard to diet and exercise given the prevalence of overweight and obesity in the target population. Further work with individuals not in athletics and those at higher risk, along with exploration of the influence of weight status (i.e. normal weight versus overweight), and inclusion of more females will need to be done to validate findings.

Conclusions and future research

Given the influence of community members on individual health as evidenced by the Bioecological Model (Bronfenbrenner, 2005), future research for this population must include evidence from parents, extended family, and community partners. Study results support including members of the community as it may result in better health outcomes. For example, previous intervention research with Hispanic populations that included parents and community partners resulted in significant reductions in body weight and related outcomes as compared to those that did not include members of youths' social networks (Branscum & Sharma 2010; Hoelscher et al., 2010).

Theoretical support for identification and focus on appropriate conceptual targets from cognitive behavior intervention trials suggest a focus on social support, readiness, education, age, employment, perception of personal susceptibility, perception of outcome severity, commitment to change, barriers to change, self-efficacy, social support for risk reduction, and attitudes and expectations regarding their bodies (Champion & Collins, 2010). The presence or absence of intimate relationships, poverty, and healthcare barriers consistently has a significant impact on health, as do the influence of cultural and gender norms.

Providing information that is consistent with their priorities, communication patterns, norms, resources and social support systems suggests a community-based participatory research approach would be beneficial to further the findings from this study.

Clinical Implications

Nurses need to assess the potential use of mobile devices to transmit diet and exercise information within the context of adolescents' existing levels of knowledge, understanding and social support. This assessment must also include an evaluation of levels of readiness, perception of susceptibility and outcome severity to gauge receptivity to information. Use of existing communication methods among adolescents, (i.e. use of mobile devices, to send and receive diet and exercise information) builds upon these initial assessments.

Cultural norms, specifically an adherence to reactive response to illness, may be one unstated norm to which adolescents adhere. Without access to the context of an existing community of resources, nurses may miss the significance of relationships that influence youth diet and exercise knowledge and practice. Mobile devices cannot replace these communities; rather, these devices may enhance and promote dialogue of existing knowledge and practice. Healthcare providers may not positively influence adolescents' diet and exercise practices via mobile devices or be successful in guiding them to the Internet if providers are not aware of individual adolescents' unique personal preferences. Further, youth, and potentially their families, may not engage in partnership with healthcare providers until illness is present. Mobile devices and SMS may be tools through which to connect youth and members of their communities rather than as general tools independent of context.

Authors made an assumption that youth would express frequent use of mobile phones and texting to address diet and exercise practices as well as be receptive to receiving information from healthcare providers. These assumptions were not supported by the limited data offered by this study. Instead, youth reported resources through which healthcare providers might deliver diet and exercise information. Mobile devices must be used within the context of the community of resources the youth described.

Acknowledgments

Funding: National Institute on Drug Abuse R01DA19180

J Dimmitt Champion, Principal Investigator

ClinicalTrials.gov Identifier: NCT01387646

We would like to also acknowledge funding from the TTUHSC School of Nursing Faculty Research & Clinical Services Committee. We would like to acknowledge the anonymous reviewers for their guidance.

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