

Barriers and Facilitators to Intake of Dairy Products in Adolescent Males and Females With Different Levels of Habitual Intake

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Megan Racey, MSc¹, Jeanette Bransfield, BSc¹, Kathryn Capello, BSc¹,
David Field, MSc¹, Verena Kulak, MSc¹, David Machmueller, MSc¹,
Michèle Preyde, PhD¹, and Genevieve Newton, PhD¹

Abstract

Background: Dairy products and alternatives can contribute to overall good health including positive body composition and decreased adiposity; however, these foods are grossly underconsumed by youth, and worldwide, almost 25% of children are overweight or obese. **Objective:** The study investigated the barriers and facilitators toward dairy consumption by Grade 7 youth. **Methods:** Thirty 50-minute, audio-recorded focus groups were conducted with 134 students in eight Grade 7 classes across 5 elementary schools. Focus groups were led by trained facilitators in the elementary schools and participants were separated based on dairy consumption and gender. Recorded data were transcribed and thematically analyzed using qualitative analysis software to identify themes related to barriers and facilitators to dairy product intake by each gender. **Results:** Factors considered important by males and females across different levels of habitual intake include personal knowledge about dairy products and misconceptions regarding dairy foods and their associated health benefits; food characteristics, including taste; personal behaviors such as habits or routines including dairy products; social environments including parental and peer influence; physical environments factors such as availability and skipping meals; and the convenience of dairy products. Interestingly, only males noted sports as a positive influence for dairy product intake. Also, there were differences in the way males and females perceived dining out as affecting their dairy intake. **Conclusion:** Results suggest several potential factors that nutrition education interventions aiming to increase dairy consumption could target.

Keywords

dairy, children, school age, early lifespan nutrition, focus group, misconceptions

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Introduction

Dairy products are implicated as part of a healthy diet, and across various stages of life, they have been linked to numerous health benefits such as improving bone and tooth health¹; reducing the risk of developing obesity,² high blood pressure,³ cardiovascular disease, and type 2 diabetes⁴; and providing hydration and muscle repair after exercise.^{5–8} Canadian national survey data suggest that dairy products are grossly underconsumed in children and adolescents, as 61% of boys and 83% of girls aged 10 to 16 years do not meet the minimum recommended three servings of dairy foods per day.⁹ The same trends are seen in the United States, as only 15% of

Americans aged 2 and older meet the recommended servings of dairy products, and they consume only 1.9 servings of dairy products per day.¹⁰ This falls well short of the Dietary Guidelines for Americans' recommended three servings of dairy products a day for adolescents.¹⁰ Dairy consumption continues to decline with increasing age.¹⁰ As dairy can be a food to help combat weight gain

¹University of Guelph, Guelph, Ontario, Canada

Corresponding Author:

Genevieve Newton, Department of Human Health & Nutritional Science, University of Guelph, 50 Stone Rd E, Guelph, Ontario, Canada N1G 2W1.
Email: newton@uoguelph.ca



and obesity,¹¹⁻¹⁶ this is a concern for younger populations such as children and adolescents who are developing eating habits that will carry into adulthood and whose body composition during childhood are associated with adult adiposity and body mass.¹⁷

With respect to dairy consumption, previous research has identified several barriers and facilitators to intake.¹⁸⁻²⁵ Studies have identified demographic factors that are associated with low dairy intake including ethnicity, low socioeconomic status, increased body weight, and older age.^{22,23,25} Both qualitative and quantitative studies among children and adolescents have reported other factors that influence dairy intake.¹⁸⁻²⁵ Weight-related behaviors or concerns change dairy consumption differently in males and females, as boys want to impress girls and be strong, while girls are more concerned about dairy being a fattening food. Family environment and parental influence can affect dairy consumption both positively or negatively as parents or family dynamics may encourage or discourage dairy product consumption. Making dairy products part of a routine for children and incorporating dairy into meal patterns can encourage dairy consumption. Finally, taste preferences, lactose intolerance, and soft drink intake have been identified as factors influencing dairy intake, all of which vary based on gender.¹⁸⁻²⁵

Due to the various facilitators and barriers that may affect dairy intake, results have not been consistent between studies in children and adolescents. Within these factors, gender differences are frequently apparent as boys and girls like to receive information in different ways.²¹ Moreover, there has been limited exploration of the differences between individuals across different levels of dairy product consumption, such as those who meet and those who fail to meet intake requirements. It is expected that those meeting dairy requirements and those not meeting dairy requirements would have different facilitators and barriers affecting their intake. It is therefore predicted that children will have specific factors affecting their dairy intake that will differ depending on both gender and consumption levels.

As such, the present study sought to investigate the barriers and facilitators to dairy product consumption in Grade 7 children as stratified by gender and level of habitual dairy product intake, with the goal of identifying factors that are both common and unique to each group. Grade 7 was chosen due to their age range falling within the specified children/preadolescents and their ability to communicate and participate in verbal focus group research. These findings may be relevant as they could be used to guide the development of interventions tailored specifically to different populations, genders, or intake levels of dairy.

Methods

Study Sample

To be eligible, students had to be enrolled in a Grade 7 class in Guelph, Ontario. Of the 199 eligible students aged 10 to 12 years, 67% consented to participate ($n = 134$; 61 males, 73 females). Students were enrolled in eight Grade 7 classes in five elementary schools in Guelph, Ontario. The median household income of participating schools was within the middle three quintiles of the provincial range. Racial/ethnic breakdown of the participants was not determined. Lack of participation was mainly due to failure to return signed consent forms or absenteeism on either study day.

Procedures

Students were invited to participate in the study through invitation letters distributed by the classroom teacher. Both parent and children were required to give informed consent. All students participated in the activities, regardless of consent; however, data were only analyzed for consenting participants. Nonrecorded focus groups were conducted with nonconsenting students in order to allow for inclusion of all students in the activity and limit any feelings of exclusion. This study was approved by the Research Ethics Board at the University of Guelph and by the Upper Grand District School Board.

Prior to conducting the focus groups, a researcher visited the classrooms and facilitated completion of the Youth Adolescent Questionnaire (YAQ), a valid and reliable food frequency questionnaire developed at Harvard University.²⁶ In order to determine the approximate daily intake of dairy products, the dairy section of the YAQ as well as other dairy foods and dairy alternatives found throughout the YAQ were used to calculate the average daily intake of dairy foods in servings/day.¹⁹ Students were then divided into groups based on gender and dairy consumption, resulting in the following five groups: females do not meet dairy requirements ($n = 6$), females meet dairy requirements ($n = 7$), males do not meet dairy requirements ($n = 6$), males meet dairy requirements ($n = 8$), and a mixed gender group for the nonconsenting students and students who were absent for the first visit and therefore had no YAQ data. A minimum of two students in each group was needed to keep gender separate in consenting groups. If this condition was not met, the gender division was collapsed ($n = 3$); however, researchers were able to separate the male and female students in the transcript analysis.

Approximately one week following intake analysis and division of students into groups based on intake and gender, focus groups were conducted in the classroom

setting. In total, thirty 50-minute-long focus groups were conducted between October 2014 and January 2015. Facilitators were trained in September and October 2014. Focus group questions were developed based on the theory of planned behavior and social cognitive theory, and previous research,¹⁸⁻²⁵ and final questions were agreed upon by consensus with experts in the field (see Supplementary Material, available at <http://gph.sagepub.com/supplemental>). The questions targeted subjects' behavioral capabilities and attitudes, barriers and impediments, social norms and perceived control, environment and observational learning, and self-efficacy and perceived control. Probing was used in the case of close-ended questions. Students were not told how the groups were split in order to minimize bias. Facilitators were assigned to same sex groups and same dairy intake group category at each school (eg, female facilitator led a females do not meet requirements group in every school) in order to ensure consistency in facilitation from class to class. Each focus group lasted approximately 50 minutes, and consenting groups were audio-recorded.

Data Analysis

Recorded data were transcribed by an external company and scripts were analyzed using the ATLAS.ti (ATLAS.ti Scientific Software Development, Berlin, Germany) qualitative analysis software. Transcripts were checked against the original audio-recordings for accuracy. Factors influencing dairy intake in males and females were determined based on the analysis procedures described by Braun and Clarke.²⁷ Like the focus group questions, factors that influenced dairy product consumption were coded, based on theory, as being associated with an individual's attitudes/knowledge, perceived control/self-efficacy, environment/reinforcement, and social norms/observations. These refined categories related to an individual's source of information, personal knowledge, food characteristics, personal behaviors, and economic, physical, and social environment. The factors influencing dairy product intake were further evaluated to determine whether there were differences related to level of dairy intake in each gender. For this analysis, only factors that were coded for in the transcripts more than five times were considered in an attempt to focus primarily on factors discussed with greater frequency. The number of times a factor was coded was compared between the two intake groups in each gender and a ratio was determined. Factors were considered predominant for a single group if the ratio was greater than two, while factors were considered as being important for both groups if the ratio was between

0.8 and 1.2. Coding was done by three researchers, first individually, and then as a group.

Results

Participant Dairy Intake

Participants' average age was 11.97 years (± 0.03 SEM). The average daily intake of dairy in the females meet requirements group was 4.64 servings of dairy and alternatives/day ($n = 33$), while in the females do not meet requirements group the average intake was 1.78 servings of dairy and alternatives/day ($n = 40$). The average daily intake of dairy in the males meet requirements group was 4.76 servings of dairy and alternatives/day ($n = 30$), while in the males do not meet requirements group the average intake was 2.10 servings of dairy and alternatives/day ($n = 31$).

Factors Affecting Dairy Intake

Overall, we found that barriers and facilitators affecting dairy intake in both males and females were associated with the themes of attitudes and knowledge, perceived control and self-efficacy, environment and reinforcement, and social norms and observational learning, with considerable overlap between these categories. All barriers and facilitators were categorized into these themes, which consisted of more than 75 subcategories, in an attempt to not miss any information stated by participants.

The factors influencing dairy intake in females and males as categorized into attitudes/knowledge, perceived control/self-efficacy, environment/reinforcement, and social norms/observations are illustrated in Figures 1 and 2, respectively. These figures illustrate *all* of the factors that were identified in the thematic transcript analysis. Following analysis of the frequency of responses, *predominant* factors influencing dairy product consumption in groups with different levels of intake for each gender were identified, and are illustrated in Figure 3 for females and Figure 4 for males. The lateral portions of these diagrams represent factors that were unique to groups with different levels of dairy intake, with shared factors represented in the middle circle.

A majority of the factors influencing dairy intake were similar between both females and males, although some gender differences were noted. Sports was a predominant facilitator for dairy product consumption in males only. Also, eating out was a facilitator for all males as they more specifically referenced asking for milk or getting to choose dairy products at restaurants. Females were less likely to discuss availability of dairy products outside of the home and more frequently mentioned not having access to dairy products. Variety of

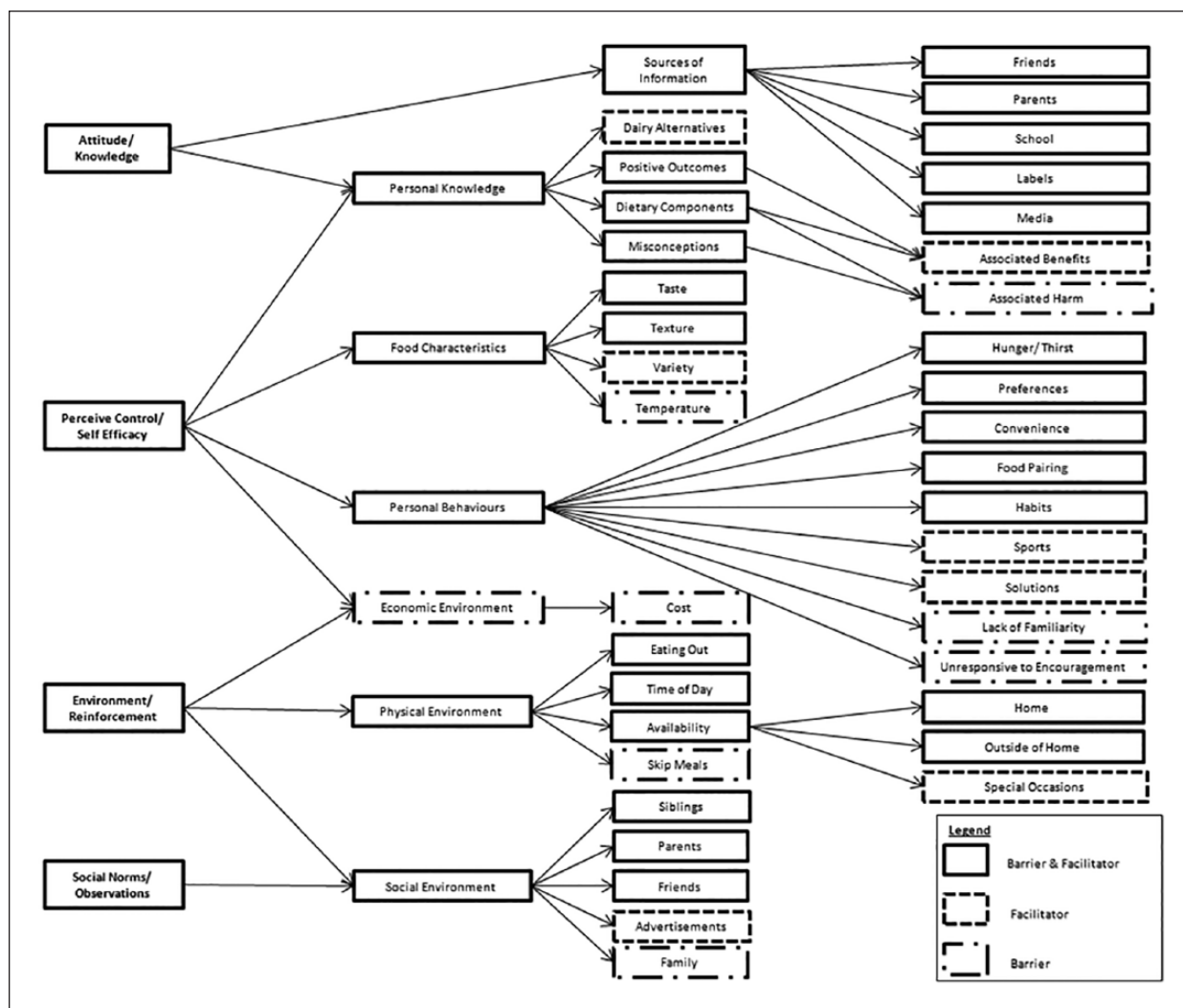


Figure 1. Flow chart illustrating the barriers and facilitators identified from thematic analysis of the females' focus group transcriptions.

dairy products available was identified as a facilitator in females, while it was both a facilitator and barrier in males. Males stated not liking or not willing to try different varieties of dairy products, such as different types of cheese; however, both genders stated liking choice and variety of dairy products such as types of milk, yogurt, or ice cream or the versatility of dairy products. Specifically, one female participant said they “like how you can just eat it with anything and like every time you try it, like a dairy product, even though it’s like the same ingredients, it always tastes different.” Females talked mostly about the lack of convenience of dairy products, while male students noted that dairy products could be convenient or not convenient. For instance, with regard to transporting or bringing dairy products to school, males felt it was “too much work.” But if dairy products

were provided by the school, such as the Elementary School Milk Program, some male students said dairy products would be more convenient in this case.

Both males and females across consumption groups noted similar facilitators affecting dairy product intake. Knowledge of the benefits of dairy products and positive health outcomes were strong facilitators in both males and females meet requirements groups, although all consumption groups showed knowledge of the individual components of dairy products and their influence on health. The students’ daily routine and habits that instilled dairy product consumption, such as cereal and milk at every breakfast, also helped facilitate dairy product consumption. Not surprisingly, taste was a major factor that influenced dairy product consumption in both genders. Also, barriers to dairy product intake that were similar

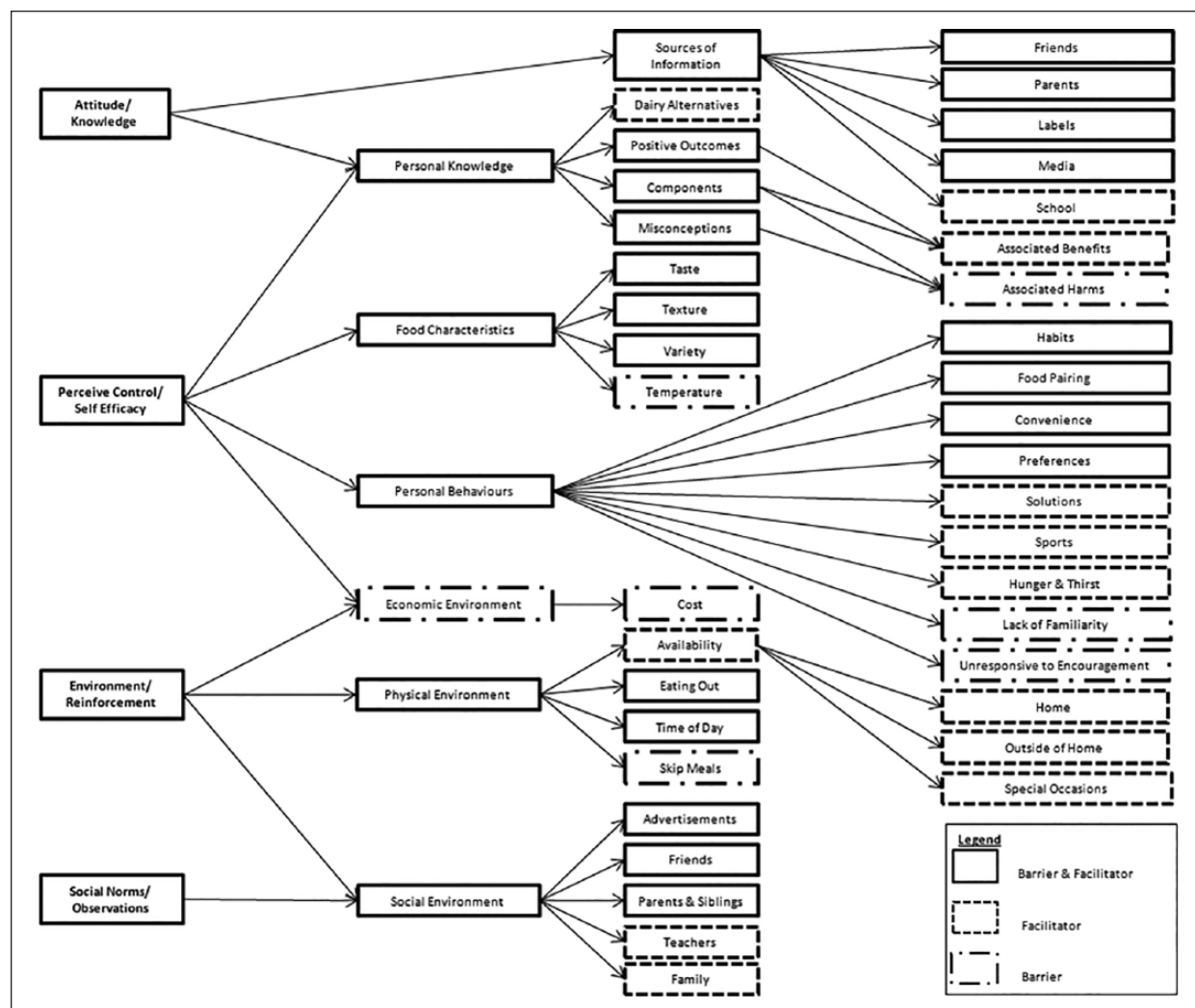


Figure 2. Flow chart illustrating the barriers and facilitators identified from thematic analysis of the males' focus group transcripts.

between genders and consumption groups included skipping meals that would have normally contained a dairy product or alternative and misconceptions regarding the perceived negative health effects of dairy products. Related to level of habitual intake, home availability between consumption groups appeared to be reduced in those not meeting dairy requirements. However, in our analysis we were unable to make a clear distinction between availability of dairy products (eg, available or not available) and the location in which dairy products are available (eg, at home, at school, or special occasions). Finally, both peers and parents were important social environment factors that could act as a facilitator or barrier in both genders, depending on the situation.

To further clarify the above factors, Tables 1 and 2 present participant quotations that illustrate each

predominant factor influencing dairy product consumption in females and males, respectively.

Discussion

This study assessed the barriers and facilitators to dairy product consumption in Grade 7 children as stratified by gender and level of habitual dairy product intake, with the goal of identifying factors that were both common and unique to each group. A majority of the factors influencing dairy intake were similar between both females and males, although some gender differences were noted. Similarly, we observed overlap in the barriers and facilitators that influenced both genders across different levels of habitual intake. This information may be used in the development of interventions tailored specifically to different populations.

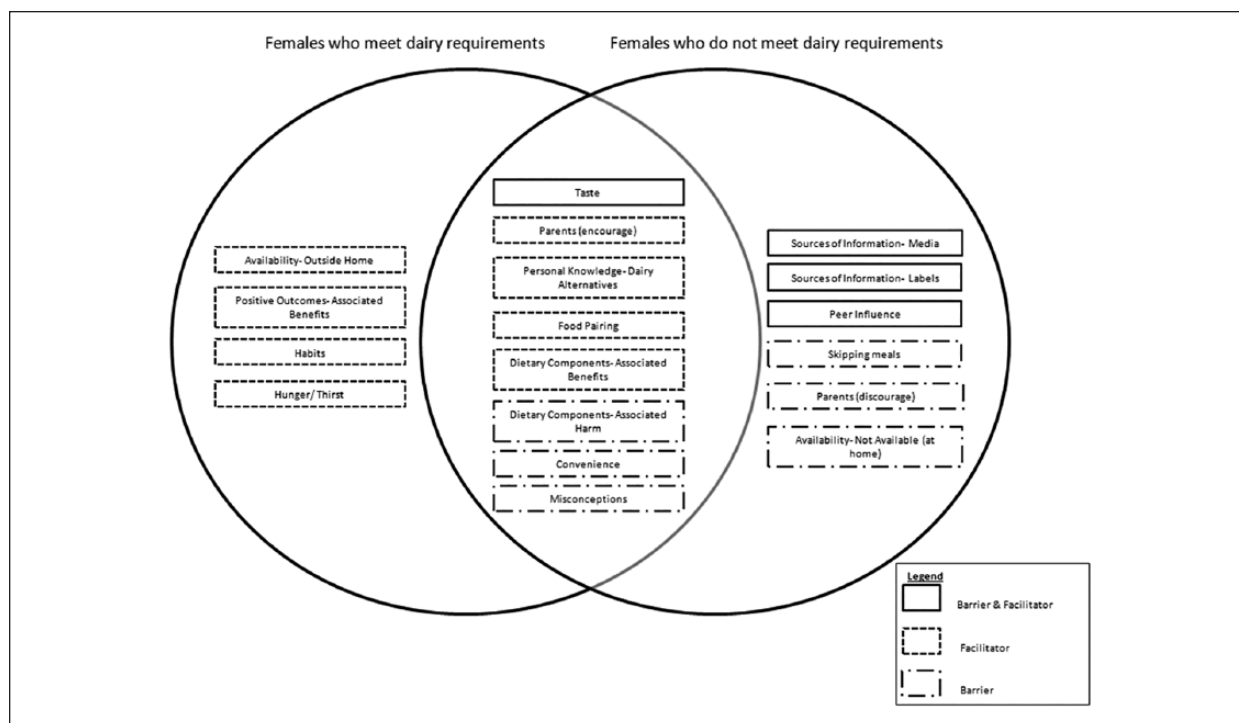


Figure 3. Comparison of similarities and differences in females between consumption groups of the predominant facilitators and barriers to dairy consumption in Grade 7 youth. Differences are shown on the right and left regions of each circle while the similarities are indicated by the overlap.

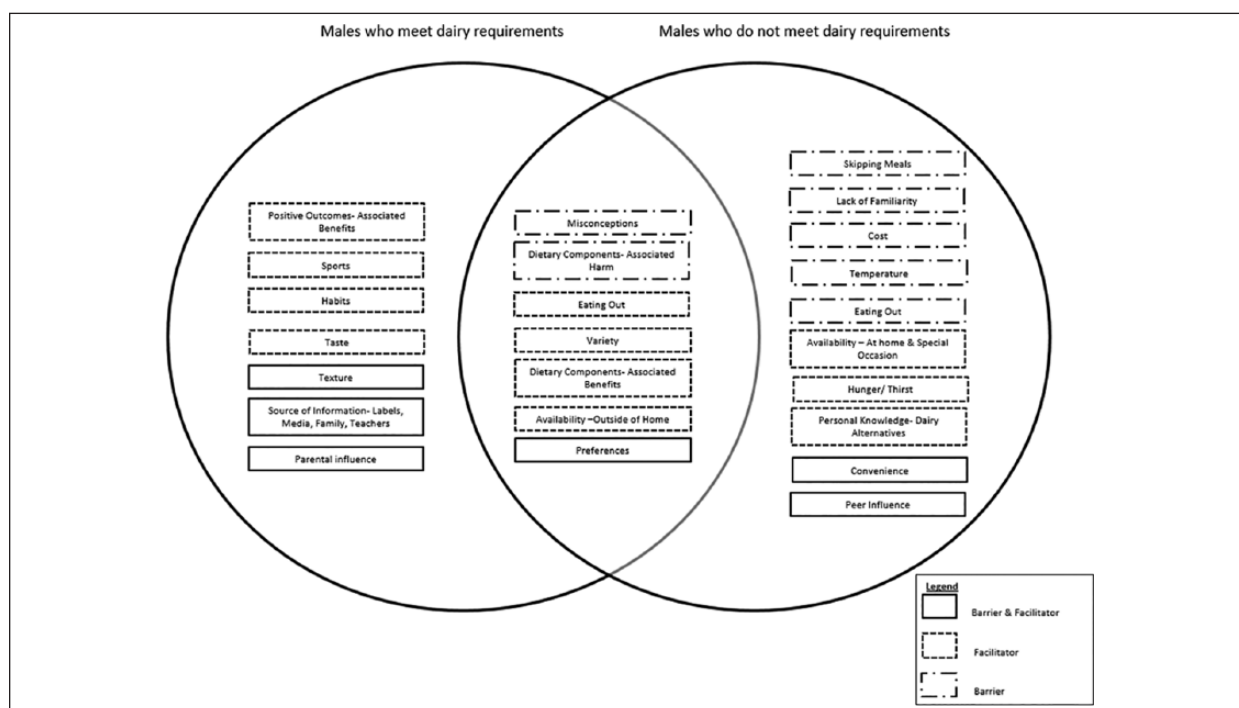


Figure 4. Comparison of similarities and differences in males between consumption groups of the predominant facilitators and barriers to dairy consumption in Grade 7 youth. Differences are shown on the right and left regions of each circle while the similarities are indicated by the overlap.

Table 1. Selection of Quotations Accompanying Each Predominant Factor Influencing Dairy Product Consumption in Females.

Factor	Quotation
<i>Females who meet dairy requirements</i>	
Availability—Outside home	Researcher: “And, um, where do you consume dairy products?” Participant: “It’s like I mostly drink it at home and eat at home, but I do a large amount at like school.”
Positive outcomes—Associated benefits	“I like drinking milk because I know it’s going to . . . [help my] bones.”
Habits	“Well, I drink milk every morning and night [and] before school starts and before [I go] to sleep.”
Hunger/thirst	“[I drink milk because] I’m awake and hungry.”
<i>Females who do not meet dairy requirements</i>	
Sources of information—Media	Researcher: “But speaking of all of the good things and bad things in dairy products, where did [you] we all hear that?” Participant: “Dr. Oz.”
Sources of information—Labels	Researcher: “So thinking about some of the unhealthy things . . . that might not be good for you in dairy products, so where did [you] hear that?” Participant: “Because we read the label.”
Peer influence	Facilitator: “When I’m with one of my friends, I have this big giant glass of milk sometimes, but I drink way more milk than I usually do.” <i>Barrier:</i> Researcher: “Do you ever think about having dairy products when you’re with friends? Like, do you choose cheese and crackers, if that’s your favorite? Or are chips and something like that easier, or popcorn or something?” Participant: “No, normally we eat fries.”
Skipping meals	Participant: “Sometimes if I get up later then I have to have something quickly for breakfast.” Researcher: “Yeah. So what would be quicker than the cereal and milk, what would you choose?” Participant: “My mom makes some toast.”
Parental influence	“My dad, he wants me to drink and eat more [dairy products] but my mom doesn’t because she doesn’t like it.”
Availability—Not available (at home)	Researcher: “If you open up your fridge would you find dairy products in your household?” Participant: “No”
<i>All female groups</i>	
Dietary components—Associated benefits	“It makes your bones strong.”
Dietary components—Associated harm	“Umm, as much as I like dairy products they also have a lot of sugar for the flavor.”
Taste	Facilitator: “For me it’s—it’s like because I like eating it and it’s yummy and it tastes really good.” <i>Barrier:</i> “I just really don’t like the taste of milk.”
Parental influence	“Yeah, every time I go home from school my dad would tell me like did you drink milk?”
Personal knowledge—Dairy alternatives	Researcher: “So when I say dairy products, what [comes to mind]?” Participant 1: “Um, soy milk.” Researcher: “Soy milk, yeah. Any other alternatives [you] know of?” Participant 2: “Almond milk.” Participant 3: “Goat milk.”
Food pairing	“I only like milk in my cereal because I don’t like the taste of it like by itself.”
Convenience	Researcher: “Do you think you would take dairy products and a snack on the go or is there other things that are easier and more convenient?” Participant: “I think other things are more convenient because I’m [not] having dairy products in wrappers so you tend not to take them and you take more crackers and that kind of thing ‘cause they’re more portable.”
Misconceptions	“Like if you eat too much of it, then you’re gonna get fatter.”

Table 2. Selection of Quotations Accompanying Each Predominant Factor Influencing Dairy Product Consumption in Males.

Factor	Quotation
<i>Males who meet dairy requirements</i>	
Positive outcomes—Associated benefits	“Um, it’s good for your bones and then it helps out with your muscles.”
Sports	Researcher: “What’s one of the main reasons you drink dairy products?” Participant: “Probably performance for sports.”
Habits	“It’s probably because, like, I have [milk], like, mostly every day and I’m, like, used to it.”
Taste	“My parents encourage me and I like the taste of [milk].”
Texture	Researcher: “Is there . . . any reason why you like [dairy] foods? You mentioned cheese, why do you like cheese so much?” Male 1: “I’m not sure. The texture.” Male 2: “The texture.” Male 3: “I like the taste and the texture, yeah.”
Source of information—Labels	Researcher: “What do you look for the on the label of a dairy product?” Participant: “Nutritional facts.” Researcher: “Nutritional facts. Like what type of facts?” Participant: “The fat, like the sugar, sodium.”
Source of information—Media	“I watched a short documentary about the history of cheese and other dairy products on TV once.”
Source of information—Family	“I heard it—like my parents kind of tell me . . .”
Parental influence	<i>Facilitator</i> : “They say why aren’t you drinking any milk, like any—if I forget they always remind me ‘Did you drink your milk yet?’” <i>Barrier</i> : “Except my dad kind of like—he doesn’t want me drinking a whole bunch [of milk] ‘cause like it’s not good you if you have a whole bunch of it. And also it’s wasting.”
<i>Males who do not meet dairy requirements</i>	
Skipping meals	“Breakfast on the weekdays I always end up skipping.”
Lack of familiarity	“Like most cheese that I’ve like never had like if I tasted them I probably wouldn’t like it.”
Cost	“It’s—it’s like—it’s a bit too much. It’s like 50 cents per milk per day per week.”
Temperature	“So like I can’t drink cold things so I—so I warm [chocolate milk] up for like I don’t know, 10-13 seconds and I stir it.”
Eating out	Researcher: “So if you are ever out at restaurants, do you order milk?” Participant: “I usually order pop.”
Availability—At home	Researcher: “Okay. And how about yourself, when you open your fridge at home what do you normally see?” Participant 1: “Ah, yeah. Like lots of bags of milk. I drink a lot of milk. Uh, maybe some cheese strings, like big bricks of cheese, uh, mozzarella sticks, and cream cheese and some yogurt.” Participant 2: “Two percent milk, yogurt, cheese, butter.”
Hunger/thirst	“And I like milk cause it quenches thirst, like it beats it up.”
Personal knowledge—Dairy alternatives	“I like almond milk, I’ll drink but it’s not my favorite. So, yeah, like rice milk is okay, like I’ve kind of like gotten used to it-ish, like when I have to drink it, when we don’t have milk, so, regular milk in my house.”
Convenience	<i>Facilitator</i> : “Um, cheese on my sandwiches or like, cause we have milk day [at school] so like we get milk.” <i>Barrier</i> : “I never bring dairy products [to school].”
Peer influence	<i>Facilitator</i> : “I went to this house, he offered me chocolate milk, I said yes.” <i>Barrier</i> : “Yeah, I usually—if I go over to a friend’s house like to drink I’d usually have water, I wouldn’t have like milk or anything.”

(continued)

Table 2. (continued)

Factor	Quotation
<i>All male groups</i>	
Misconceptions	Male 1: "Uh, if you have, like, too much vitamins in [dairy products]." Male 2: "Like, eating too much yogurt can be bad for you because it can make you sick, I guess." Male 3: "I think . . . well, I do know if you drink too much milk, um, you can get, like . . . it can really make you sick because it. . . I think . . . like, it's kind of . . . poison you because . . . I don't know. If you take too much dairy, um, it could really affect your health, not just because of the fat but because of other stuff. I'm not exactly sure what it is."
Dietary components—Associated harm	Participant: "Well, I like natural milk, just like that. Um, I think in, in some, like, dairy brands they add too much sugar in there." Researcher: "Okay. And, how, how could the sugar be bad for you if you were to, to-? Like, why would too much sugar be a bad thing for you." Participant: "Because my parents tell me if you take- like, have too much sugar, um, you could end up getting, like, diabetes and it will affect you for the rest of your life."
Eating out	"When we're at a restaurant we would order milk."
Variety	"Cause I like to—'cause you—you can use milk for cereal and drink it and . . . It's used for baking quite a lot, so . . ."
Dietary components—Associated benefits	"[Dairy products] hold a lot of protein and stuff. Or not protein. Like minerals and stuff that are healthy. Help fight off diseases."
Availability—Outside of home	"At school you get the chocolate milk."
Preferences	<i>Facilitator—Favorites:</i> "I like chocolate milk. Chocolate milk is my favorite." <i>Barrier—Least Favorites:</i> Researcher: "Why don't you like yogurt?" Participant: "It's pretty sweet cause it has a lot of sugar."

Many similarities exist between the predominant facilitators affecting dairy product intake in both males and females and across consumption groups, including knowledge, routine habits, peers, and taste, which is consistent with previous research in children and adolescents.¹⁸⁻²⁵ Higher nutritional knowledge has been associated with consumption of an overall healthier diet,²⁸ and a lack of knowledge about the association between dairy/calcium and health has also been found to be a barrier to calcium intake.²⁹ Habits, or routines, have also been found to affect dairy intake in children in previous research,^{25,30} which is important as it has shown that when food and beverage choices are taught in childhood and further developed in adolescence, they persist into adulthood.⁵ In addition to knowledge and habits, taste was also a strong facilitator for dairy product consumption in all females and for males meeting requirements. Having a taste preference for dairy products has been noted as one of the greatest influences to dairy product consumption,²² and studies have frequently noted food preferences or taste as a factor influencing food choices.^{22,25,30,31}

Males and females also showed similarities in the predominant barriers to dairy product intake. Skipping meals, especially breakfast, was an important barrier in both

genders not meeting dairy requirements. Eating breakfast, particularly cereal at breakfast, has been shown to facilitate milk consumption.³² Often, when meals were skipped that would typically have contained a dairy product, students reported grabbing a convenient snack or more transportable meal, such as toast, instead; however, these snacks or meals often did not contain the dairy products or alternatives that would have been consumed regularly. Furthermore, when asked whether the students would make up for this lost dairy serving from breakfast at another point during the day, many reported they would not. Another common barrier influencing dairy intake in both males and females was misconceptions. These misconceptions were typically regarding negative health outcomes that students associated with dairy product consumption. Research has shown that children and adolescents negatively associate the fat in dairy products with obesity, body fat, and body composition,^{25,29,33,34} and this was also seen in the current study. In contrast to this false belief, recent systematic reviews have shown no association between dairy and increased body weight or body fat.^{11,35} Research has actually shown that dairy products and alternatives have a positive influence on adiposity, body mass index, waist circumference, and lean body

mass in children and adolescents who reach dairy recommendations¹¹⁻¹⁶ mainly due to the nutritional components within dairy products as well as the replacement of sugar-sweetened beverages and other high-calorie foods with dairy products. The findings regarding misconceptions in children are critical as they suggest that interventions that target these gaps in knowledge, specifically with regard to the potential harm and benefits associated with dairy product consumption, might effectively improve dairy consumption in children.³⁶

In both genders, peers had a strong influence, acting as both a barrier and facilitator in different circumstances, in male and females not meeting requirements. In previous research, peers' personal food choices and encouragement, or lack thereof, have been reported to have a significant impact on the food choices children and adolescents make.¹⁹ Previous research has also noted the importance of peers' attitudes or choices and its effect on adolescent dietary intake.^{25,31,33,37} Therefore, the observation of both positive and negative influences on dairy intake behavior in this study is not surprising.

Similar to peers, parental influence was observed to act as both a barrier and a facilitator to dairy product intake. Parents were found to be an important facilitator in the "meets requirements" group of both genders, although males meeting requirements also noted that parents could be a barrier to consumption. In contrast, males not meeting requirements did not discuss parents as influencing dairy intake, while females not meeting requirements noted parents as both a barrier and a facilitator (see Tables 1 and 2). Regardless of these between-group differences, parents in general were clearly noted as an important influence, which is not surprising, as social cognitive theory notes the importance of the environment, including having appropriate role models and expectations, to shape behaviour.^{38,39} Previous research in children also supports the important impact parents can have on their food choices^{25,30,31} and specifically the influence that maternal milk consumption can have on their daughters.⁴⁰ These results, along with other research,¹⁹ suggest that parents may continue to play a role in determining their child's consumption of dairy foods during adolescence.

Previous interventions have addressed some of these factors, including parents,⁴¹⁻⁴⁴ knowledge of dairy products,^{36,44-47} taste,^{42,48} and peers^{41,42,45} with mixed success.⁴⁹ The findings of the present study should contribute to the development of future interventions by highlighting several potential targets to address when aiming to change dairy intake in adolescents and the potential difficulties in addressing these factors.

There are several limitations to this study that must be considered. First, although the sample size was moderate, it was limited to a single geographical region.

Following this, we did note that in comparison to the previously published national averages,⁹ more of our population appeared to meet the recommended dairy requirements. This may be due to reasons such as the close proximity to rural farm land and the strong agricultural influence on the city, both of which can increase milk consumption.^{34,50} Racial or ethnic breakdown was not measured in this study, so the specific demographics of the subjects are unknown. In general, Guelph is a relatively fast growing, rural-influenced, prosperous city in southern Ontario. Recent census data of the city of Guelph found that 84.3% of the total population was white,⁵¹ so it can be assumed that the ethnic breakdown of subjects was relatively homogeneous. Focus groups also have limitations as facilitators may have poor control over what is said, participants may not be expressing their own individual view in an attempt to impress their peers or facilitators, and participants may be uncomfortable discussing personal or sensitive topics, such as body image.⁵² To mitigate this limitation, researchers were formally trained, and facilitators of the focus groups remained with the same group across each school (eg, males who do not meet requirements or females who meet requirements). Overall, however, these limitations are not likely to have had an appreciable impact on the reliability of results, which is supported by the consistency of the present research findings to previously published studies.

Conclusion

Overall, we found that specific factors considered important by males and females across different levels of habitual intake include personal knowledge about dairy products, misconceptions regarding dairy foods and their associated health benefits, taste, habits or routines, parental and peer influence, availability of dairy products, skipping meals, and the convenience of dairy products. Some gender differences were noted such as sports being a predominant facilitator in choosing to consume dairy in males only and eating out as a facilitator or barrier to dairy product consumption depending on gender. These results suggest several potential targets for interventions that aim to increase dairy consumption, such as increasing knowledge regarding the benefits of dairy consumption, clarifying misconceptions surrounding dairy product consumption and weight gain, making time for breakfast, serving milk or dairy with meals, exposing children to a variety of foods, making dairy tasteful, and suggesting strategies to consume more dairy in the context of peer pressure and eating out. Addressing these barriers and facilitators as part of intervention development, with tailoring to the needs of the target population, is recommended in order to increase effectiveness.

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Author Contributions

Development of focus group scripts was completed by MP, GN, MR. Authors MR, JB, KC, DF, VK, DM all contributed to conducting and recording of focus group sessions. Data analysis was completed by MR, JB, KC. Author MR was responsible for writing of the manuscript with final approval and edits from GN and MP.

Declaration of Conflicting Interests

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