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Exploration of Awareness, Knowledge, and Perceptions of Traumatic Brain Injury Among American Youth Athletes and Their Parents

Bonny Bloodgood, M.A.[a], **Derek Inokuchi, M.H.S., C.H.E.S.**[b], **Willis Shawver**[b,*], **Kristina Olson, M.H.S.**[b], **Rosanne Hoffman, M.P.H.**[a], **Elyse Cohen, M.P.H.**[a], **Kelly Sarmiento, M.P.H.**[c], and **Kavitha Muthuswamy, M.P.H.**[c]

[a]ICF International, Fairfax, Virginia

[b]FHI 360, Washington, District of Columbia

[c]Centers for Disease Control and Prevention, Atlanta, Georgia

Abstract

Purpose: Although much effort is underway by the Centers for Disease Control and Prevention (CDC) and other organizations to highlight the seriousness of traumatic brain injury, including concussions, among young athletes, little is known about how these athletes and their parents view this injury and how much they know about it.

Methods: Online surveys were conducted with youth who participate in sports (n = 252) and with the parents of youth who participate in sports (n = 300) to explore the ways in which these audiences view concussion and messaging related to concussion.

Results: More than four out of five youth and parents reported that they had heard about concussions, although awareness was significantly higher for some subgroups, including parents of children 10–13 years old, and parents who reported using the Internet several times daily. Youth ages 13–15 years were significantly more likely to strongly agree that concussions are a "critical issue," as compared with youth ages 16–18 years. Among parents, significantly more mothers than fathers agreed that concussions are a critical issue. More than half of youth participants strongly disagreed that their friends would think they were "dumb for caring about concussions," with girls significantly more likely to strongly disagree than boys. When parents were asked to identify organizations they would trust as a reliable source of information for concussions, the most frequently cited organization was the CDC.

Conclusions: Results of this study demonstrate a high level of awareness about concussion among youth athletes and parents of youth athletes. However, important distinctions among subgroups of both youth and parentsd—such as by race/ethnicity, age, sex, and Internet use—suggest directions for future communication and research efforts.

*Address correspondence to: Willis Shawver, FHI 360 Social Marketing and Communication Center, 1875 Connecticut Ave, NW, Washington, DC 20009. wshawver@fhi360.org (W. Shawver).

Keywords

Brain injuries; Traumatic brain injury; Concussion; Adolescents; Athletic injuries; Awareness; Health knowledge; Health attitudes; Health practices

Traumatic brain injury (TBI) is a serious health problem in the United States, contributing to a significant number of injury-related deaths and cases of permanent disability. Each year, an estimated 1.7 million Americans sustain a TBI [1]. TBI is a contributing factor in one-third of all injury-related deaths in the United States, and direct and indirect medical costs for TBI total an estimated $60 billion [1,2]. Children ages 0–14 years diagnosed with TBI account for nearly half a million emergency department visits annually [1].

Most of the TBIs that occur each year are concussions or other forms of mild TBI [3]. A concussion is a type of TBI caused by a bump, blow, or jolt to the head—or by a hit to the body—that causes the head and brain to move rapidly back and forth. Concussions can have a serious effect on a young, developing brain, causing short- and long-term problems that affect a child's thinking, language, learning, behavior, and/or emotions [3]. Although most children and adolescents with a concussion recover quickly and fully, some will have symptoms that last for days or even weeks. A more serious concussion can last for months or longer [3]. Although the vast majority of athletes with concussion will become asymptomatic within a week of their concussion, numerous studies have demonstrated a longer recovery of full cognitive function in younger athletes compared with college-aged or professional athletes—often 7 to 10 days or longer. Because of this longer cognitive recovery period, although they are asymptomatic, there should be a more conservative approach to deciding when pediatric and adolescent athletes can return to play [4].

Youth (both children and adolescents) are at increased risk for sustaining a TBI, including concussions [1]. From 2001 to 2009, the number of annual emergency department visits for TBI, including concussions, increased by more than 60%, from 153,375 to 248,418, with the highest rates among males ages 10–19 years [5]. Recent literature on youth athletes reports that concussions account for 9% of all high school athletic injuries [6].

Some studies suggest that the effects of concussion vary considerably between youth and adult athletes, as young athletes often recover more slowly than adult athletes and may be at increased risk for long-term sequelae [7–16]. Also, some research indicates that concussions sustained earlier in life may present greater secondary consequences that may significantly affect physical and cognitive development [8,9,17–19].

Still, concussions often are under-reported by youth athletes, because of a lack of perceived seriousness and fear of being removed from competition [20,21]. Recent studies report that many misconceptions and inaccurate beliefs about concussion persist, even among healthcare professionals [22–25]. These studies found that although individuals might have basic knowledge of concussion, there is confusion surrounding brain-injury sequelae, including misperceptions about memory problems, unconsciousness, and recovery time [22,23]. The literature suggests a need for ongoing education of the general public about concussion to build greater awareness and understanding of this injury [22,23,26].

Previous research points to a growing need to improve early diagnosis of concussion in youth athletes, as well as to increase education among parents, coaches, healthcare professionals, and other audiences about the signs, symptoms, and appropriate management (including return-to-play) of youth athletes with a concussion [8,9,13,27–31].

In an effort to reduce TBI incidence—and recognizing the role of increased awareness of the diagnosis and management of TBI in doing so—the Centers for Disease Control and Prevention's (CDC) National Center for Injury Prevention and Control launched the "Heads Up" national educational initiative in 2003.

This multi-pronged initiative is aimed at educating Americans of all ages about ways to prevent, recognize, and appropriately respond when a TBI is suspected and focuses on the development of audience-specific messages and educational materials. As such, educating youth athletes and those who surround them (e.g., parents, coaches, healthcare and school professionals, and others) about the dangers of concussion and the importance of prevention and proper recognition and management is one of the main goals of the Heads Up initiative. The CDC is dedicated to increasing public knowledge about concussion prevention and this research complements previous message development activities to enhance public awareness and understanding of concussion through the Heads Up initiative.

In an effort to guide this national concussion education initiative and inform the development of the aforementioned materials, the CDC conducted formative research activities to better understand the concussion knowledge and media habits of both the youth who participate in sports and their parents. Existing research clearly demonstrates the growing need to reach and educate youth and adolescent athletes, along with their parents, to ensure that concussion is properly identified and managed by those on the front lines of this serious health problem.

Methods

Online surveys were conducted with youth ages 13–18 years who participate in sports, and with the parents of children and youth ages 5–18 years who participate in sports, to explore the ways in which these audiences view concussion and messaging related to concussion. Sample sizes were developed to split both youth (i.e., approximately 125 per youth athlete age group, ages 13–15 and 16–18) and parents (i.e., 100 per child age group, ages 5–9, 10–13, and 14–18) samples by age of youth/child. Instruments for the parent and youth surveys were developed to address constructs identified in the literature (e.g., knowledge, attitudes, and behaviors related to concussion), and were reviewed by experts. Institutional Review Board (IRB) and Office of Management and Budget (OMB) approvals for this CDC-funded data collection were obtained.

This research followed a series of CDC initiatives aimed at different audiences and was not part of a larger research effort by CDC. The purpose of this effort was to learn about needs and knowledge of concussions for parents and adolescents. The sample for this research was selected independently from previous research conducted by CDC and was primarily

focused on learning about parents' and adolescents' needs and knowledge around concussions.

Participants self-selected to respond to the survey after receiving an invitation via e-mail from one of several youth-sports organizations who agreed to distribute the survey announcement. Youth athletes were also recruited through a panel service. Individuals from the same family were eligible to complete the survey, but each individual could only complete the survey once.

Participants were screened to ensure diversity of demographic characteristics including age, sex, racial and ethnic background (Hispanic/Latino, white/Caucasian, black/African-American), and geographic location (South, Midwest, Northeast, West; Table 1). All participants read a screen online with informed consent information before completing the survey. Youth participants received a $5 incentive for participation, while parents were provided an incentive of $10. Both surveys took approximately 15 minutes to complete and were hosted through the Qualtrics survey software [32].

Participants were asked questions regarding their awareness and knowledge of concussions, their attitudes about concussions, and information-seeking behavior. Nearly all of the items were closed-ended dichotomous and Likert-type questions; however, for the open-ended item, "What can you tell me about concussions?" responses were coded into nine categories, which were not mutually exclusive. This query was asked of participants who indicated that they had previously heard of concussions. Several responses appeared to be direct quotes from online sources (most likely accessed while taking the survey online); these responses were excluded from analysis.

Data from the online surveys were recorded in a database through the Qualtrics software (Qualtrics, Provo, UT) and subsequently imported to SPSS (SPSS Inc, Chicago, IL) for data cleaning and analysis. Quantitative analysis included descriptive statistics, as well as significance testing. Comparisons between groups were calculated using t-tests and the Bonferroni correction; an alpha level of .05 was used for all statistical tests.

Results

The online survey for youth was completed by 252 athletes aged 13–18 years. The parent online survey was completed by 300 parents or guardians of youth ages 5–18 who participate in sports.

Awareness and knowledge of concussions

More than four out of five youth (84%) and parents (85%) reported that they had heard about concussions (Tables 2a and 2b). Black (79%) and Hispanic youth (77%) were significantly less likely to have heard of concussions than were Caucasian respondents (92%). Hispanic parents (74%) were significantly less likely than parents of other racial and ethnic backgrounds to have heard of concussions.

Nearly all parents whose oldest child was 10–13 years of age (99%) reported that they had heard about concussions. These parents were significantly more likely to report they had

heard of concussions than were parents of children 14–18 years of age (85%) and parents of children 5–9 years of age (72%).

Among parents, prevalence of awareness about concussions increased with age up to age 50. All parents ages 46–50 years (100%) had heard about concussions, while 71% of parents older than 50 years of age had heard about them. Only one-fifth of parents ages 18–25 years (20%) reported hearing about concussions.

Concussion awareness also increased with frequency of Internet use. Parents who reported using the Internet several times daily (93%) were significantly more likely to have heard about concussions as compared with parents who accessed the Internet either every 3–5 days or every 1–2 days each week (33% and 40%, respectively).

Among participants who had heard about concussions, approximately one-quarter of youth and one-quarter of parents reported a basic understanding of concussions, using a definition that satisfied both of the following criteria: (1) brain/head injury or injury caused by an impact to the brain/head; and (2) one or more concussion symptoms.

Attitudes about concussions

Among youth respondents, 70% indicated they would agree or strongly agree that concussions are a “critical issue.” (Table 3a). Notably, respondents ages 13–15 years (54%) were significantly more likely to strongly agree with this statement than were older youth (ages 16–18 years; 34%).

Among parents overall, 84% said they agreed or strongly agreed that concussions are a “critical issue” (Table 3b). Significantly more mothers (68%) than fathers (34%) said they would strongly agree that concussions are a critical issue. Differences were also observed according to the age of the participants’ children: Parents of children ages 10–13 years (77%) were significantly more likely to strongly agree that concussions are a critical issue than were parents of children 5–9 years of age (40%) or parents of children 14–18 years of age (56%).

Also, parents who access the Internet several times a day (63%) were significantly more likely to report that they strongly agree that concussions are a “critical issue,” as compared with parents who accessed the Web once a day (38%) or less.

More than half of youth participants (53%) reported strongly disagreeing with the statement “I am fearful that my circle of friends would think I was dumb for caring about concussions” (Table 4). Younger respondents (21%) were significantly more likely than older respondents to disagree with this statement; conversely, older youth respondents (11%) were significantly more likely to agree with it. Similarly, female youth respondents (59%) were significantly more likely to strongly disagree that their friends would think they were “dumb for caring about concussions,” as compared with male respondents (45%), who were more likely to strongly agree (9%) with the statement.

Seeking out concussion information

Slightly more than half (55%) of parents reported that concussions are a topic of interest about which they seek out information (Table 5). Parents of younger children (33%) and parents ages 18–25 years (20%) were less likely to report concussions as a topic of interest when compared with other parent groups. Additionally, parents who reported using the Internet several times a day were significantly more likely than parents who reported less frequent Internet use to say that they seek information about concussions (60%).

Parents who reported seeking information about concussions most commonly reported use of an Internet search engine (39%). Many specifically mentioned Google, while some additionally or instead reported seeking concussion information through a specific health-related Web site (i.e., CDC, WebMD). Other reported sources of concussion information included doctors and nurses (14%); friends, other parents, or family members (6%); and social media sites (3%), such as Facebook, Twitter, and online forums.

When parents were asked to identify organizations they would trust as a reliable source of information for concussions, nearly one-quarter (24%) named the CDC, the most commonly named organization. A doctor or other healthcare professional was the second most cited source of trusted information about concussions (10%).

Discussion

This article is believed to be one of the first investigations of the awareness, knowledge, and perceptions of concussion among American youth athletes and their parents. The findings are promising in many ways. For instance, this study demonstrates that efforts to raise awareness about concussion in youth sports are making an impact. Most youth in this sample said they had heard of concussions, believe them to be a “critical issue,” and do not believe their friends would think they are “dumb” for caring about concussion. Moreover, about a quarter of youth were able to provide a description of concussion that suggested some level of knowledge about this injury.

Results suggest that younger youth (13–15 years) may be more receptive to messages about concussion, given that they were more likely than older youth (16–18 years) to consider concussion a “critical issue” and to hold positive social norms about the importance of concussion. Similar findings have been published relating to health communication messages about other topics, such as antismoking campaigns [33]. The early teen years (or even younger), therefore, may be a critical period during which to instill positive social norms around concussion safety and return-to-play protocols. However, due to the exploratory nature of this study, more research is warranted to further explore this finding; these data do not suggest a potential explanation for the discrepancy between age groups, and many potential factors may be present, including developmental or social issues, as well as external factors such as school curricula and potentially different practices and policies in sports at these different ages.

Similarly, awareness of concussions peaked among parents with children ages 10–13 years old; these parents were also the most likely to indicate they had actively sought information

about concussion and to consider concussion a “critical issue.” These findings suggest that parents are most receptive to messages about concussion when their children are 10–13 years old, a time at which many youth transition to more contact sports, thereby making concussion a more salient concern [34]. Despite this peak, concussion messaging must reach all parents.

It is also interesting to note that mothers were significantly more likely to consider concussions to be a “critical issue” than fathers. This may suggest a dichotomy in the way men and women view sports injuries and relate to lower levels of interest in health issues and use of healthcare services by men than women in general [35,36]. Coupled with the finding that significantly more female youth than male youth strongly disagreed that their friends would think they were “dumb for caring about concussions,” these data suggest that efforts to address concussion should take sex distinctions into account. Other research has also noted a discrepancy in recognition of concussions between males and females; for example, researchers found that mothers were better able than fathers to differentiate between true and false signs and symptoms of concussion [37].

Taken together, findings from this study suggest that awareness of concussion does exist among both youth athletes and parents of youth athletes and that these groups are receptive to hearing about and seeking out this information. Moreover, reaching athletes and their parents during the early teen years or before—when both appear more interested in and receptive to information about concussion—may be not only advantageous in terms of message salience, but also critical to instilling positive social norms about concussion that will last into the later teen years and beyond.

The CDC intends to develop comprehensive educational materials such as Web sites, and electronic and print materials designed specifically for youth and parents based on the results of the research activities described in this article. A new initiative, Heads Up to Parents, will be launched in 2013. This initiative is focused specifically on educating parents on concussion and more serious brain injury, as well as other child injuries associated with their children’s involvement in organized and unorganized sports and other recreation activities.

The CDC involves a range of diverse audiences that represent organizations beyond the medical field, such as school, parent, and sports organizations that interact with youth and parents and address health and safety issues such as concussions. To date, the CDC has partnered with over 85 organizations to disseminate information on concussion to healthcare and school professionals, parents, coaches, and youth. Findings from this study are helping to inform future CDC efforts focused on addressing social norms about concussion among youth through public service announcements with professional athletes.

Given that this study was exploratory, further research is warranted to examine many of the issues outlined. For example, future avenues could include a more thorough investigation of the knowledge of concussion among youth and parents, which is linked to specific characteristics of concussion, such as symptoms, mode of injury, and awareness of risks for

later sequelae as a result of concussion. Additional research is also warranted on the potential differences in perception of concussion by sex and age of youth/child.

Similarly, between 2009 and 2012, over 41 states and the District of Columbia passed policies on sports-related concussions in youth. These study findings may help lay the ground work to evaluate the effect local policies and action plans have moving forward on increasing awareness about concussion and social norms around this injury among parents and youth.

Limitations

The findings of this research should be considered with some limitations in mind. The study included a nonrandom group of youth and parents who were available through existing youth-sports organizations. Given that individuals self-selected into the survey group, their decisions to complete the survey may have been influenced by their level of concussion awareness and whether or not they considered concussion to be a “critical issue.” Further, the term “critical issue” was not defined for survey participants and was thus open to their interpretation. The use of an online survey methodology potentially presents another limitation, in that it may have resulted in more “heavy” Internet-users being included in the sample, possibly impacting the conclusion that “heavier” Internet users are more aware of concussion. The online methodology also allowed for some respondents to reference information sources while taking the survey, which may have impacted their responses to some items. Finally, recruitment of African-American participants proved challenging, and as a result, researchers were unable to reach intended recruitment totals of African-Americans in either the parent or youth surveys. Although this may reflect a lower proportion of African-Americans among the pool of potential participants in the sample used for the survey, it may also reflect a historically greater reluctance to participate in public health research among African-Americans as compared with other ethnicities [38].

Despite high overall levels of awareness about concussion, there are subgroups of youth athletes and parents of youth athletes whose awareness and knowledge about concussion could be improved. Although all individuals are at risk for concussion, that risk is higher among young athletes, and there appears to be a need for information developed and delivered in a way that reaches these athletes and their parents over time to create and maintain interest in the topic as well as an appreciation for the dangers of concussion and the importance of prevention and proper recognition and management.

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IMPLICATIONS AND CONTRIBUTION

This study's findings provide insight into awareness, knowledge, and perceptions of youth athletes and parents of youth athletes related to concussion. Findings from this study can help inform future educational materials and/or programs that encourage proper prevention, recognition, and management of this injury.

Table 1

Online survey participant characteristics

	Parents (n = 300) n(%)	Youth (n = 252) n(%)	Total (n= 552) n(%)
Sex			
Male	90 (30)	117(46)	207 (38)
Female	210 (70)	135 (54)	345 (63)
Age, youth			
13–15		127 (50)	
16–18		125 (50)	
Age, parent			
18–25	5 (2)		
26–30	13 (4)		
31–40	173 (58)		
41–50	95 (32)		
>50	14(5)		
Age of oldest child			
5–9	100 (33)		
10–13	100 (33)		
14–18	100 (33)		
Race/ethnicity			
Black/African-American	24 (8)	70 (28)	94 (17)
Hispanic/Latino	112 (37)	79 (31)	191 (35)
White/Caucasian	143 (48)	100 (40)	243 (44)
Asian	9 (3)	1 (0)	10 (2)
Other	12 (4)	2 (1)	14 (3)
Education			
Grade school	1 (0)		
Some high school	0		
High school graduate	7 (2)		
Some college	57 (19)		
Received 4-year degree	128 (43)		
Some postgraduate studies	38 (13)		
Received advanced degree	69 (23)		
Location			
West	94 (31)	77 (31)	171 (31)
Midwest	39(13)	48 (19)	87 (16)
Northeast	70 (23)	45 (18)	115 (21)
South	97 (32)	82 (33)	179 (32)

Table 2a

Youth – Have you heard about concussions?

	Yes n(%)	No n(%)	Don't know n(%)
Overall (n = 252)	211 (84)	31 (12)	10 (4)
Race/Ethnicity			
Black/African-American (n = 70)	55 (79) *	12 (17)	3 (4)
Hispanic/Latino (n = 79)	61 (77) *	13 (16)	5 (6)
White/Caucasian (n = 100)	92 (92)	6 (6)	2 (2)
Asian (n = 1)	1 (100)	0	0
Other (n = 2)	2(100)	0	0

* $p < .05$.

Table 2b

Parents – Have you heard about concussions?

	Yes n(%)	No n(%)	Don't know n(%)
Overall (n = 300)	256 (85)	43 (14)	1 (0)
Age			
18–25 (n = 5)	1 (20)	4 (80)	0
26–30 (n= 13)	9 (69)	4 (31)	0
31–35 (n = 71)	55 (78)	15 (21)	1 (1)
36–40 (n= 102)	93 (91)	9 (9)	0
41–45 (n = 73)	66 (90)	7 (10)	0
46–50 (n= 22)	22 (100)	0	0
>50(n= 14)	10 (71)	4 (29)	0
Age of oldest child			
5–9 (n = 100)	72 (72)	28 (28)	0
10–13 (n= 100)	99 (99)*	1 (1)	0
14–18 (n= 100)	85 (85)	14 (14)	1 (1)
Race/Ethnicity			
Black/African-American (n = 24)	21 (88)	3 (13)	0
Hispanic (n = 112)	83 (74)*	29 (26)	0
Caucasian (n= 143)	133 (93)	9(6)	1 (1)
Asian (n = 9)	9 (100)	0	0
Other (n = 12)	10 (S3)	2 (16)	0
Internet use			
Several times a day (n = 246)	230 (93)*	16 (7)	0
About once a day (n = 40)	21 (53)	18 (45)	1 (3)
3–5 days a week (n= 9)	3 (33)	6 (66)	0
1–2 days a week (n= 5)	2 (40)	3 (60)	0

*$p < .05$.

Table 3a

Youth – I think concussions are a critical issue

	Strongly disagree n(%)	Disagree n(%)	Neither agree nor disagree n(%)	Agree n(%)	Strongly agree n(%)
Overall (n =252)	12 (5)	12 (5)	50 (20)	66 (26)	112 (44)
Age					
13–15 (n= 127)	4 (3)	8 (6) *	15 (12)	31 (24)	69 (54) *
16–18 (n= 125)	8 (6)	4 (3)	35 (28)	35 (28)	43 (34)

* $p < .05$.

Table 3b

Parents – I think concussions are a critical issue

	Strongly disagree n(%)	Disagree n(%)	Neither agree nor disagree n(%)	Agree n(%)	Strongly agree n(%)
Overall (n = 300)	7(2)	15(5)	28(9)	77(26)	173 (58)
Sex					
Male (n = 90)	3 (3)	5 (6)	12(13)	39(43)	31 (34)
Female (n = 210)	4 (2)	10 (5)	16(8)	38 (18)	142 (68) *
Age of oldest child					
5–9 (n = 100)	6 (6)	10 (10)	15 (15)	29 (29)	40 (40)
10–13 (n= 100)	1 (1)	0	6 (6)	16 (16)	77 (77) *
14–18 (n= 100)	0	5 (5)	7 (7)	32 (32)	56 (56)
Race/ethnicity					
Black/African-American (n = 24)	0	1 (4)	1 (4)	5 (21)	17 (71)
Hispanic (n = 112)	6 (5)	8 (7)	12 (11)	32 (29)	54 (48)
Caucasian (n= 143)	1 (0)	6 (4)	14 (10)	28 (20)	94 (66)
Asian (n = 9)	0	0	0	4 (44)	5 (56)
Other (n = 12)	0	0	1 (8)	8 (67)	3 (25)
Internet use					
Several times a day (n = 246)	1 (0)	5 (2)	20 (8)	64 (26)	156 (63) *
About once a day (n = 40)	4 (10)	6 (15)	5 (12)	10 (25)	15 (38)
3–5 days a week (n=9)	2 (22)	2 (22)	1 (11)	3 (33)	1 (11)
1–2 days a week (n=5)	0	2 (40)	2 (40)	0	1 (20)

* $p < .05$.

Table 4

Youth – I am fearful that my circle of friends would think I was dumb for caring about concussions

	Strongly disagree n(%)	Disagree n(%)	Neither agree nor disagree n(%)	Agree n(%)	Strongly agree n(%)
Overall (n =252)	133 (53)	41 (16)	47 (19)	18 (7)	13 (5)
Sex					
Male (n =117)	53 (45)	18 (15)	26 (22)	10 (9)	10 (9)*
Female (n= 135)	80 (59)*	23 (17)	21 (16)	8 (6)	3 (2)
Age					
13–15(n= 127)	64 (50)	27 (21)*	23 (18)	4 (3)	9 (7)
16–18(n= 125)	69 (55)	14 (11)	24 (19)	14 (11)*	4 (3)

* $p < .05$.

Table 5

Parents – Are concussions a topic of interest about which you seek out information?

	Yes n(%)	No n(%)
Overall (n = 300)	164 (55)	136 (45)
Age		
18–25 (n = 5)	1 (20)	4 (80)
26–30 (n = 13)	7 (54)	6 (46)
31–35 (n = 71)	36 (51)	35 (49)
36–40 (n = 102)	58 (57)	44 (43)
41–45 (n = 73)	39 (53)	34 (47)
46–50(n = 22)	15 (68)	7 (32)
>50(n= 14)	8 (57)	6 (43)
Age of oldest child		
5–9 (n = 100)	33 (33)	67 (67)
10–13 (n = 100)	75 (75)	25 (25)
14–18 (n = 100)	56 (56)	44 (44)
Internet use		
Several times a day (n = 246)	148 (60) *	98 (40)
About once a day (n = 40)	14 (35)	26 (65)
3–5 days a week (n = 9)	1 (11)	8 (89)
1–2 days a week (n = 5)	1 (20)	4 (80)

* $p < .05$.