

LEGAL ISSUES**An Analysis of Florida
Physical Educators' Knowledge
of Bicycle Laws**

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Abstract

Bicycling among youth is a popular activity, but like all modes of travel it is not without risk. Florida has a particularly high rate of bicycle-related fatalities and injuries. To reduce such risks, the Florida Department of Transportation and Florida Department of Education have developed a youth bicycle safety educational program (Florida Traffic and Bicycle Safety Education Program [FTBSEP]) and mandated pedestrian/bicycle safety be taught in school (K–5) physical education classes. The FTBSEP provides bicycle safety curricula and workshops for Florida's physical education teachers. The primary purpose of this study was to examine Florida physical educators' knowledge of state bicycle laws. After a comprehensive review of literature and a test of content validity by a panel of experts, a survey was developed with 17 items that measured knowledge of Florida bicycle laws. Items were phrased as true or false statements, with an optional answer of unsure. Additionally, demographic and bicycle background variables were included in the survey. After obtaining Institutional Review Board approval, current physical educators (N = 142) were recruited via

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*convenience sampling from (a) 10 FTBSEP bicycle safety teacher-training workshops delivered during the 2009–2010 academic year and (b) a bicycle safety exhibition booth at the 2009 Florida Alliance for Health, Physical Education, Recreation, Dance, and Sport conference. Approximately 77% of the respondents were elementary teachers. Although 53% of the respondents had never taught bicycle safety, over 77% of them intended to teach it. Of the 17 items measuring bicycle law knowledge, 12 had a mean score greater than 1.0 (i.e., unsure), and one sample *t* test confirmed that the positive differences, when compared to the neutral effect (i.e., 1.0), were statistically significant ($p < .05$), suggesting that respondents were more likely to answer them correctly. While the results suggest an overall positive level of bicycle law knowledge, specific areas were identified where knowledge was lacking and should be addressed in the FTBSEP teacher-training workshops and curricula. Additional research investigating bicycle safety educators' perceptions, attitudes, and knowledge is warranted.*

Bicycling is a popular recreational activity among youth. It was estimated, that in 2009, 29% of American youth (6 to 17 years old) participated in bicycling (Outdoor Foundation, 2010). The bicycle also provides a means for children to travel to and from school and increases their daily physical activity. A study of over 900 youth living in Denmark reported that those who bicycled to school had significantly better cardiovascular fitness compared to those who were driven to school or walked (Cooper et al., 2006). However, like all means of travel, bicycling has risks. To reduce the risks associated with bicycling, safety education is often used to teach children safe behaviors when interacting in traffic (e.g., with motor vehicles, pedestrians, and other bicyclists and road users). Bicycling safely among traffic is a complex task that requires bicyclists to correctly apply rules of the road, obey laws, recognize unsafe situations, and anticipate other road users' behaviors. This all occurs in an environment where a large amount of information must be quickly processed to make appropriate decisions. Children are not born with the necessary skills to do this, but rather they must learn and

practice such skills. Therefore, bicycle safety education programs are offered in many schools and communities, and several research studies have demonstrated their effectiveness (Borglund, Hayes, & Eckes, 1999; Kirsch & Pullen, 2003; McLaughlin & Glang, 2009; Nagel, Hakenhof, Kimmel, & Saxe, 2003).

Because age helps determine transportation mode choice, bicycling rates are significantly higher for younger age groups compared to older ones (Pucher & Renne, 2003). In 2009, approximately 14.7 million American youth (6 to 17 years old) participated in bicycling (Outdoor Foundation, 2010). The nearly 62 million children in the United States, in 2009, aged 14 and younger, made up approximately 20% of the total resident population (National Highway Traffic Safety Administration [NHTSA], 2010a). This age group (14 and younger) rides their bicycles approximately 50% more than the average bicyclist, but accounts for about 21% of all bicycle-related deaths and almost half of all bicycle-related injuries (National Safe Kids Campaign [NSKC], 2004). The Centers for Disease Control and Prevention (CDC, 2009) states, “Children are at particularly high risk for bicycle related injuries” (para. 2). Besides the automobile, bicycles are associated with more childhood injuries than any other consumer product (Consumer Product Safety Commission [CPSC], 1994; Safe Kids Worldwide, 2007). In 2001, children 15 years old and younger accounted for 59% of all bicycle-related injuries treated in U.S. hospital emergency departments (CDC, 2009). Additionally, it is estimated that children sustain more than 275,000 nonfatal bicycle-related injuries annually and that nearly 690 children are injured daily from bicycle-related crashes (Safe Kids Worldwide, 2007).

Bicycle-related deaths and injuries have created significant public health and economic concerns. Sinclair, Smith, and Xiang (2007) estimated that in 2003 approximately 10,700 children were hospitalized for bicycle-related injuries, with a 3-day average hospital stay. Bicycle-related injuries among children and adolescents aged 20 years and younger resulted in almost \$200 million in hospital inpatient costs in 2003 (Sinclair et al., 2007). Furthermore, the National Safety Council estimated the comprehensive cost of

each individual traffic-related fatality to be \$3.84 million in 2005 (bicyclinginfo.org, 2011). When multiplying this number by the 716 pedalcyclists (bicyclists and other cyclists including riders of two-wheeled nonmotorized vehicles, unicycles, and tricycles powered solely by pedals) who were fatally injured in 2008, the total is almost \$3 billion (bicyclinginfo.org, 2011; NHTSA, 2009). These injuries, deaths, and subsequent health care and economic costs clearly demonstrate that bicycle crashes are a significant national issue. Acknowledging this, many national organizations have addressed the topic of bicycle safety education for children including, but not limited to, the American Academy of Pediatrics; American Alliance for Health, Physical Education, Recreation, and Dance; American Academy of Family Physicians; American Automobile Association; Brain Injury Association of America; Centers for Disease Control and Prevention; Children's Safety Network; Consumer Product Safety Commission; League of American Bicyclists; National Highway and Traffic Safety Administration; National Safe Kids Campaign; National Safe Routes to School; and the U.S. Department of Transportation.

In 2009, Florida led the nation in the number of pedalcyclists killed in traffic crashes with 107 (NHTSA, 2010b). From 2000 to 2009, 1,094 bicyclists were fatally injured on Florida roads (Florida Department of Highway Safety & Motor Vehicles [FDHSMV], 2010). During the past 10 years, bicycle fatalities in Florida have increased 20.5%, while the state's population has increased 17.7% (FDHSMV, 2010). With the increasing popularity of bicycling, Florida's large population, millions of visitors, increase in the number of motor vehicles on the roads, and year-round climate, bicyclists' exposure to crashes in Florida will continue to be a major public health burden and safety issue.

In an effort to reduce bicycle-related injuries and deaths in Florida, the Florida Department of Transportation (FDOT) and the Florida Department of Education (FDOE) have taken initiatives. The FDOT developed the Florida Traffic and Bicycle Safety Education Program (FTBSEP), and the FDOE, in 2009, mandated that pedestrian and bicycle safety education be taught in Florida schools.

The FTBSEP was developed with the primary goal of reducing the severity and number of injuries and deaths among child pedestrians and bicyclists by providing them with the knowledge and skills needed to be competent and safer in traffic. Additionally, the hope is that teaching children to be safer pedestrians and bicyclists will also, in turn, help them later become safer motor vehicle operators.

The FTBSEP, a FDOT Safety Office funded program, provides voluntary, 1-day teacher-training workshops to Florida's elementary and middle school teachers, school resource/police officers, school volunteers, and others who teach bicycle safety to children. These workshops provide attendees with knowledge, skills, and curricula to teach pedestrian and bicycle safety to children. Comprehensive curricula (separate for elementary and middle schools) incorporate both classroom instruction and on-bike skill instruction and practice. Classroom topics include, but are not limited to, the significance of having a pedestrian/bicycle safety education program, overview of the Florida Safe Routes to School program, pedestrian safety (e.g., school bus safety, finding the edge, stop and search, visual barriers, model street crossing, and intersections), and bicycle safety (e.g., helmet importance and fitting, seeing and being seen, hazard identification and avoidance, rules of the road, and applicable traffic and bicycle laws). The on-bike skill instruction and practice elements of the curriculum primarily address the following issues: bicycle fit and safety check, hazard identification and avoidance, stopping, scanning, signaling, turning, road position, and navigating intersections. Teacher-training workshops are taught by bicycle safety experts who are certified instructors by the League of American Bicyclists and have completed an extensive training program through the FTBSEP (Crider & Hall, 2005; FTBSEP, 2008). The FTBSEP has a fleet of bicycles that are used for teacher-training workshops. Schools, however, typically obtain bicycles for student instruction from Florida's *Safe Routes to Schools* grant program.

Noting the importance of pedestrian and bicycle safety education in schools, the FDOE (2010) mandated the teaching of pedestrian and bicycle safety topics in grades K–5 (see Table 1). These benchmarks represent the minimum pedestrian/bicycle safety

Table 1

*Pedestrian and Bicycle Benchmarks in Florida’s Next Generation
Sunshine State Standards for Physical Education*

Grade	Benchmark
Kindergarten	Verbally state the search “look left, look right, look left again” used before crossing a roadway.
First	Identify edges, pedestrians, vehicles, and traffic.
Second	Identify the proper crossing sequence.
Third	Differentiate between the correct and incorrect way to fit a bicycle helmet.
Fourth	Discuss the importance of wearing a bicycle helmet.
Fifth	Discuss the importance of being visible, being predicable, and communicating when bicycling.

knowledge and skills required to be taught in Florida’s elementary schools (FDOE, 2010). While physical education teachers primarily teach these benchmarks, teachers of other subjects, school resource/police officers, teacher’s aides, and/or volunteers may also provide or assist in such mandatory education.

Examining bicycle safety educators’ knowledge levels is important. An educator’s knowledge influences his or her own behaviors and ultimately impacts his or her students’ knowledge, attitudes, and behaviors (Ajzen, 1985; Ajzen & Fishbein, 1980). From a practical perspective, to best promote student learning of bicycle safety knowledge, weaknesses in educators’ knowledge should be addressed. Research data identifying participant weaknesses can be used to improve teacher-training workshops and program curricula. The primary purpose of this study was to examine Florida physical

educators' knowledge of state bicycle laws (§ 316.2065). Secondary purposes included obtaining demographic and bicycle background data that were used for data analyses. Results from this study can be utilized to (a) examine and modify the bicycle law unit in the FTBSEP curricula and training workshops that may need more attention and (b) better understand physical educators who attend FTBSEP bicycle safety teacher-training workshops.

Method

Research participants ($N = 142$) were current physical education teachers in Florida. They were recruited via convenience sampling from (a) 10 bicycle safety teacher-training workshops that were delivered throughout the state during the 2009–2010 academic year ($N = 96$; representing a 93% response/participation rate from a total of 104 workshop attendees) and (b) a bicycle safety booth located in the exhibit hall at the 2009 Florida Alliance for Health, Physical Education, Recreation, Dance, and Sport (FAHPERDS) state conference ($N = 46$).

After a comprehensive review of literature, a questionnaire was developed that contained the following three sections: (a) demographic, (b) bicycle background, and (c) knowledge of Florida's bicycle laws and overall bicycle risks. Inclusion of these three sections was consistent with the purposes of the study. The demographic section included the following eight variables: gender, ethnicity, age, educational level, college major, geographical location (county) of employment, school grade level of teaching, and length of school teaching experience. These items were phrased in a multiple choice format. The bicycle background section included the following five variables: How often do you bicycle? When you ride a bicycle, how often do you wear a helmet? Is bicycle safety taught in your school? Have you taught bicycle safety in your school? If you have never taught bicycle safety in your school, do you plan to teach bicycle safety in the future? These items were phrased in dichotomous choice or Likert scale format. The bicycle law knowledge section included a total of 17 variables addressing Florida's bicycle laws (14 items), overall risks associated with bicycling (two items), and the 2009 FDOE standards mandating pedestrian/bicycle safety education in

the schools (one item). These items were phrased in a Likert 3-point scale (*True*, *Unsure*, and *False*). Providing the *Unsure* option was done to reduce the possibility of guessing. Items within each section were listed in random order. Of the knowledge items, 60% consisted of *True* being the correct answer with the remaining 40% consisting of *False* as the correct answer.

After the questionnaire was developed, it was submitted to a panel of eight individuals with expertise in physical education, bicycle safety education, risk management of sport and physical activities, survey design, and/or measurement and evaluation. The panel members were asked to examine the relevance, representativeness, and clarity of each item. Following the feedback of the expert panel, the original instrument was slightly modified in areas of item adequacy and word clarity. Permission to conduct this study was obtained from the Institutional Review Board for use with human subjects. The questionnaire, along with an informed consent form, was administered at the beginning of 10 FTBSEP teacher-training workshops held throughout Florida and at a bicycle safety booth located in the exhibit hall at the 2009 FAHPERDS state conference. Participation in the survey was completely voluntary and anonymous. All participants at the teacher-training workshops were informed that they would not be penalized for refusing to participate in the study or failing to answer any of the items in the questionnaire. Nevertheless, the vast majority of workshop participants willingly participated in the study.

Procedures in the SPSS computer program were utilized to conduct statistical analyses. Descriptive statistics were calculated for the demographic, bicycle background, and bicycle law knowledge variables. One sample *t* tests were conducted to compare the mean score of each of the 17 bicycle law knowledge variables with 1.0, a neutral point of a Likert 3-point scale. For each of the law items, a correct answer received 2 points, an unsure answer received 1 point, and an incorrect answer received 0 points. A mean score greater than 1.0 would be considered a positive score for an item, and a mean score close to 2.0 would be considered a high score. Analyses of Variance (ANOVA) were conducted to compare the mean score

of total bicycle law knowledge with respect to the demographic background variables. Simple regression analyses were conducted to examine the relationships of bicycle background variables on the total bicycle law knowledge of the respondents.

Results

Descriptive statistics for the demographic variables are presented in Table 2. Survey respondents represented 39 of the 67 counties (school districts) in Florida, and the majority (60.6%) of the survey respondents were female and Caucasian (91.5%). Respondents evenly represented all adult age categories ranging from 20 to 29 years old to over 60 years old. Over 47% of the respondents held a bachelor's degree, while 36.6% also had a graduate degree. Over 73% of the respondents reported majoring in physical education, while the others majored in education (10.6%), health education (8.5%), or other majors when they attended college. Approximately 77% of the respondents were elementary school teachers, followed by middle school teachers (15.5%) and high school teachers (5.6%). Although 23.4% of the respondents were newer teachers with 5 or less years of teaching experience, respondents represented teachers with a wide range of teaching experience.

Descriptive statistics for the bicycle background variables are presented in Table 3. Responses ranged from *never* to *every day* in terms of how often the respondents rode a bicycle, with about 40% riding a bicycle a few times a month to every day. About 54% of respondents seldom or never rode a bicycle. Of respondents who did ride a bicycle, 37.7% always wore a helmet, 10% rarely did, and 27.7% never wore one. Only 46% of the respondents revealed that bicycle safety was taught in their schools, while 50.4% answered that it was not and 3.6% were unsure. Of the respondents, 53% had never taught bicycle safety in their schools and approximately 29% had taught it a few to many times. Nonetheless, of those who had never taught bicycle safety, 77.3% indicated that they intend to teach it.

Descriptive statistics for the bicycle law knowledge variables are presented in Table 4. Of the 17 law knowledge items, 12 items (i.e., 70.6%) had a mean score greater than 1.0 (i.e., neutral/unsure), and

Table 2*Descriptive Statistics of Demographic Variables (N = 142)*

Variable	Category	N	%
Gender	Male	56	39.4
	Female	86	60.6
Ethnicity	Caucasian	130	91.5
	African American	9	6.3
	Hispanic	2	1.4
	Other	1	0.7
Age	20–29 years old	24	16.9
	30–39 years old	31	21.8
	40–49 years old	44	31.0
	50–59 years old	37	26.1
	60 years or older	6	4.2
Education Level	Bachelor’s Degree	67	47.2
	Some Graduate Work	23	16.2
	Master’s Degree	49	34.5
	Doctoral Degree	3	2.1
College Major	Health Education	12	8.5
	Physical Education	104	73.2
	Fitness and Wellness	2	1.4
	Education	15	10.6
	Other	9	6.3
School Grade Level of Teaching	Elementary School	109	76.8
	Middle School	22	15.5
	High School	8	5.6
	Other	2	1.4
Years of Teaching School	5 years or less	33	23.4
	6–10 years	15	10.6
	11–20 years	46	32.7
	21–30 years	33	23.4
	Over 30 years	14	9.9

Table 3*Descriptive Statistics of Bicycle Background Variables*

Variable	Category	N	%
How often do you bicycle?	Never	18	12.5
	Once a year	18	12.5
	Once every few months	42	29.4
	Once a month	7	5.1
	A few times a month	31	22.1
	A few times a week	20	14.0
	Everyday	6	4.4
When you ride a bicycle, how often do you wear a helmet?	Never	34	27.7
	Rarely	12	10.0
	Occasionally	10	7.7
	Often	21	16.9
	Always	47	37.7
Is bicycle safety taught in your school?	Yes	65	46.0
	No	72	50.4
	Unsure	5	3.6
Have you taught bicycle safety in your school?	Never	75	53.1
	Once	12	8.6
	A couple of times	13	9.4
	A few times	18	12.5
	Many times	23	16.4
If you have never taught bicycle safety in your school, do you plan to teach bicycle safety in the future?	Yes	58	77.3
	No	3	4.5
	Unsure	14	18.2

Table 4*Descriptive Statistics of Bicycle Law Knowledge and Overall Bicycle Risk Variables*

Variable	Frequency (%)				<i>t</i>
	Correct	Unsure	Incorrect	<i>M</i> (<i>SD</i>)	
Motorists are required to regard bicycles as any other vehicle. (T)	92.3	4.2	3.5	1.90 (0.38)	27.88*
By law, bicyclists must use hand signals when making turns. (T)	87.9	7.8	4.3	1.84 (0.47)	21.03*
Bicycles should be ridden on the left side of the street, against traffic. (F)	85.7	5.7	8.6	1.77 (0.59)	15.42*
By law, bicyclists must have front (white) lights, rear (red) lights and (red) (T)	17.7	19.1	63.1	0.55 (0.78)	-6.92*
Riding on the sidewalk is legal, unless prohibited by local ordinances. (T)	64.3	18.6	17.1	1.47 (0.77)	7.22*
An audible warning must be given before passing pedestrians on a sidewalk. (T)	82.3	9.2	8.5	1.74 (0.61)	14.47*
Bicycles must yield to pedestrians. (T)	92.8	5.1	2.2	1.91 (0.36)	29.54*
Bicycles are considered as vehicles. (T)	45.0	15.0	40.0	1.05 (0.92)	0.64

Table 4 (cont.)

Variable	Frequency (%)				
	Correct	Unsure	Incorrect	<i>M</i> (<i>SD</i>)	<i>t</i>
It is legal for a bicyclist to continue slowly through a red light or stop sign if they think it is safe to do so. (F)	85.6	8.6	5.8	1.80 (0.53)	17.86*
Under Florida Law, a bicyclist must have operational brakes, a fixed seat and may not carry riders on the handlebars. (T)	82.1	10.7	7.1	1.75 (0.58)	15.38*
Per capita, Florida leads the nation in bicycle-related deaths. (T)	58.6	38.6	2.9	1.56 (0.55)	11.92*
Under Florida Law, motorists must provide at least 3 feet of clearance when passing a bicyclist. (T)	16.5	31.7	51.8	0.65 (0.75)	-5.54*
Under Florida Law, bicyclists under 16 years of age must wear a helmet when bicycling. (T)	25.9	15.8	58.3	0.68 (0.86)	-4.43*
It is unwise, but not illegal to wear headphones while riding a bicycle on public rights of way. (F)	35.7	13.6	50.7	0.85 (0.92)	-1.93
Bicycles are not legally defined as vehicles. (F)	72.3	13.5	14.2	1.58 (0.73)	9.48*
Besides automobiles, bicycles are associated with more injuries to children than any other commercial product. (T)	64.5	26.2	9.2	1.55 (0.66)	9.96*
The Florida Department of Education has mandated traffic/bicycle safety benchmarks for grades K–5. (T)	74.5	19.1	6.4	1.68 (0.59)	13.72*
TOTAL	-----	-----	-----	25.20 (3.40)	27.33*

Note. * = significant at .05 level; T = true; F = false.

the one sample *t* test confirmed that the positive differences were statistically significant ($p < .05$). This suggests that respondents were more than unsure about the questions measuring bicycle law knowledge and were more likely to answer these questions correctly. Conversely, three items had mean scores significantly ($p < .05$) less than 1.0 (i.e., unsure), and two other items had mean scores not significantly ($p > .05$) different from 1.0, suggesting an inadequacy of bicycle law knowledge in these areas. Additionally, when the scores of the 17 items were combined, the mean score was 25.20 ($SD = 3.40$) out of a total possible score of 34 points, which was significantly ($p < .05$) greater than the summed midpoint parameter (i.e., $\mu = 17$) and suggests an overall positive level of bicycle law knowledge among the respondents.

ANOVA revealed that the mean scores of bicycle law knowledge were not found to be significantly ($p > .05$) different with respect to gender, age, education level, and grade level of teaching (Table 5). Furthermore, regression analyses revealed that the bicycle background variables (i.e., How often do you bicycle? When you ride a bicycle, how often do you wear a helmet? Is bicycle safety taught in your school? Have you taught bicycle safety in your school?) were not significantly ($p > .05$) related to the total score of bicycle law knowledge (Table 6).

Discussion

The primary purpose of this study was to examine Florida physical educators' knowledge of state bicycle laws (§ 316.2065). Secondary purposes included obtaining demographic and bicycle background data from the respondents. Because operating a bicycle safely in traffic is a cooperative activity governed by rules and laws, addressing the law knowledge items where respondents scored low is important. These deficiencies should be addressed in bicycle safety teacher-training workshops and curricula. It is imperative that physical educators and others teaching bicycle safety to children properly educate them about traffic and bicycle laws (Crider & Hall, 2006). Bicycle crashes in traffic are typically caused by avoidable errors and are often a result of a bicyclist and/or motorist violating a traffic/bicycle law(s). For instance, in 70% of police-reported

Table 5*ANOVA Comparing Mean Differences in Bicycle Law Knowledge With Respect to Background Variables*

Variable	Category	<i>M</i>	<i>SD</i>	<i>ss</i>	<i>df</i>	<i>ms</i>	<i>F</i>	<i>p</i>	η^2	<i>1-β</i>
Gender	Male	13.830	2.799	3.218	1	3.218	0.432	.512	.003	.100
	Female	14.146	2.681							
Ethnicity	Caucasian	14.200	2.676	42.718	2	21.359	3.012	.032	.065	.699
	African American	11.857	2.545							
	Hispanic	13.000	1.414							
Age	20–29 years old	13.391	3.100	35.124	4	8.781	1.192	.318	.035	.366
	30–39 years old	13.742	2.955							
	40–49 years old	14.023	2.464							
	50–59 years old	14.844	2.665							
	60 years or older	13.400	0.894							
Education	Bachelor’s Degree	13.894	2.780	13.785	3	4.595	0.615	.607	.014	.176
	Some Graduate Work	13.524	2.892							
	Master’s Degree	14.413	2.517							
	Doctoral Degree	14.500	4.950							
Grade Teaching	Elementary School	14.288	2.609	29.528	2	14.764	2.036	.112	.045	.513
	Middle School	13.050	2.928							
	High School	13.600	3.062							

Table 6

Regression Analyses Examining the Influence of Bicycle Background Variables on Bicycle Law Knowledge

Bicycle Background Variable	<i>R</i>	<i>R</i>²	<i>ss</i>	<i>df</i>	<i>ms</i>	<i>B</i>	<i>SE.B.</i>	<i>F</i>	<i>p</i>
How often do you bicycle?	.078	.006	5.888	1	5.888	14.469	.567	0.782	.378
When you ride a bicycle, how often do you wear a helmet?	.123	.015	12.472	1	12.472	0.190	.139	1.858	.175
Is bicycle safety taught in your school?	.015	.000	0.230	1	0.230	0.028	.163	0.030	.862
Have you taught bicycle safety in your school?	.099	.010	8.058	1	8.058	0.164	.151	1.182	.279

bicycle–motor vehicle crashes, the bicyclists involved had violated traffic laws; in approximately 45%, motorists had violated traffic laws (Florida Bicycle Association [FBA], 2010).

Bicycle Law Variables

Respondents scored the lowest on the law variable addressing what lighting equipment is required on a bicycle that is ridden between sunset and sunrise. The risk of fatal or serious injury increases greatly at night. Approximately 60% of fatal bicycle crashes in Florida happen during non-daylight hours (FBA, 2010). Florida law (§ 316.2065[8]) requires that a bicycle operated between sunset and sunrise be equipped with a lamp on the front exhibiting a white light visible from 500 feet to the front and both a red reflector and a lamp on the rear exhibiting a red light visible from 600 feet to the rear. The statute recommends and permits additional lighting.

Respondents also scored low on the law variable pertaining to how much clearance a motorist must provide a bicyclist when passing. Florida law (§ 316.083, § 316.085) requires a driver of a vehicle that is overtaking a bicycle to pass the bicycle at a safe distance of not less than 3 feet between the vehicle and the bicycle. About 1% of bicycle–motor vehicle crashes involve motor vehicle operators who misjudge the width or length needed to pass a bicyclist (FBA, 2010). Additionally, close passing results in some bicyclists “hugging the curb” or riding on sidewalks where crash risk may increase (FBA, 2010).

Another low scoring law variable regarded helmet use for those under 16 years old. Florida law (§ 316.2065[3][d,e]) requires a bicycle rider under 16 years old to wear a bicycle helmet that is properly fitted, securely fastened, and meets a nationally recognized standard. Twenty-one states, the District of Columbia, and at least 201 municipalities have enacted some type of bicycle helmet legislation. Thirteen states have no state or municipal helmet laws at all (Bicycle Helmet Safety Institute, 2011).

Head injury is the number one cause of death in bicycle crashes and is the most important determinant of bicycle-related death and permanent disability (NSKC, 2004). Properly fitted and secured

bicycle helmets have been shown to be very effective in reducing the incidence and severity of head, brain, and facial injuries. One study estimated that bicycle helmets could reduce the risk of head injury by up to 85% and severe brain injury by up to 88% (Thompson, Rivara, & Thompson, 1989). Estimates also indicate that 75% of fatal head injuries among child bicyclists could have been avoided with the use of a bicycle helmet (Safe Kids Worldwide, 2007). In 2009, only 12% of fatally injured bicyclists in Florida were wearing helmets at the time of their crash and only 13.1% of injured bicyclists were wearing helmets at the time of their injury (FDHSMV, 2010).

Use of bicycle helmets by adult role models promotes use among youth. Alarming, only 37.7% of the respondents reported they always wear a helmet when they ride a bicycle. Schools and organizations should consider rewarding children who properly wear a helmet and warn those that do not. Furthermore, adults should be strongly encouraged to wear a helmet every time they bicycle.

Survey respondents also scored low on the law variable addressing the wearing of headphones while bicycling. Wearing headphones while bicycling can be distracting and can also limit the ability to effectively hear motor vehicles, other bicycles, and/or pedestrians that may be approaching. Florida law (§ 316.304) does not permit a bicyclist to wear a headset, headphone, or listening device, other than a hearing aid, while riding.

The variable addressing whether bicycles are considered vehicles was another issue in which the combined respondents scored low. Bicyclists operating on roads fare best when they act and are treated as drivers of vehicles (FBA, 2010). Riding as a driver makes a bicyclist more visible and predictable. Under Florida law (§ 316.003[2]), a bicycle is defined as a vehicle. A person in control of a vehicle on a street or highway is a driver (§ 316.003[1]). As a driver, a bicyclist must follow the traffic rules common to all drivers as well as obey rules adopted specially for bicycles. A bicyclist has all the rights to the roadway applicable to any driver, except as to the special regulations for bicycles (§ 316.2065[1]).

The respondents scored the highest on the following law variables: Bicycles must yield to pedestrians, motorists are required

to regard bicycles as any other vehicle, bicyclists must use hand signals when making turns, bicycles should not be ridden on the left side of the street against traffic, and it is illegal for a bicyclist to continue slowly through a red light or stop sign if they think it is safe to do so. Although the results suggest the respondents had a good understanding of these variables, bicycle safety educators should still stress these laws when teaching bicycle safety to children. Among children 14 years old and under, more than 80% of bicycle-related fatalities are associated with the bicyclist's behavior, including violating traffic laws. Examples of such violations contributing to these fatalities include not using hand signals when turning left, riding against the flow of traffic, and running a stop sign or traffic signal (NSKC, 2004). In addition to educating children about relevant traffic laws, bicycle safety educators should also stress the potential consequences, including the increased injury and fatality risk and potential monetary fines, for those who violate such laws.

Bicycling Risk Variables

Among the three knowledge variables that pertained to overall bicycling risk, respondents scored the lowest on the bicycling risk variable regarding the number of injuries to children with which bicycles are associated compared to other commercial products. Many people view a bicycle as a toy rather than a vehicle. Besides the automobile, bicycles are associated with more injuries to children than any other commercial product (CPSC, 1994; NSKC, 2004).

Additionally, the respondents had a mean score of 1.56 ($SD = 0.55$) on the variable associated with whether Florida led the nation in bicycle-related deaths. In 2009, of the estimated 630 pedalcyclist deaths nationwide, the following five states had approximately 49% of the total U.S. fatalities: Florida (107), California (99), Texas (48), New York (29), and Arizona (25; NHTSA, 2010b). Finally, of the three bicycling risk variables, the respondents scored the highest on the item regarding the Florida Department of Education's recent physical education mandate of pedestrian/bicycle safety education for grades K–5. While this suggests that many respondents were aware of this mandate, greater efforts should be made publicizing

this new requirement. The more aware school administrators and physical educators become of this mandate, the more likely bicycle safety education will be provided.

Conclusion

The findings of the law knowledge variables suggest that the respondents had basic knowledge of many Florida bicycle laws and overall bicycling risks. However, results of this study suggest that overall educational efforts regarding Florida bicycle laws should be enhanced in FTBSEP teacher-training workshops and curricula. Physical educators and others who teach bicycle safety should be well versed in their jurisdiction's traffic and bicycle laws. Such laws are often implemented to improve safety (Petty, 2001). For instance, in a large percentage of police-reported crashes involving a bicycle and a motor vehicle, the bicyclist and/or the motorist had violated traffic laws (FBA, 2010). Furthermore, for children 14 years old and younger, greater than 80% of bicycle-related fatalities are associated with the bicyclist's behavior. Many behaviors that contributed to child bicycle fatalities were illegal actions such as failing to obey (signs, traffic control devices, law enforcement officer), failing to yield right of way, riding against the traffic flow, improperly crossing the roadway, operating without required equipment, and turning or swerving into traffic, that is, coming from behind without signaling (NSKC, 2004; NHTSA, 2010b). Traffic and bicycle laws can typically be obtained from each state's Department of Transportation. Table 7 provides links to national organizations that provide bicycle safety resources.

Table 7

National Organizations That Provide Bicycle Safety Resources

Organization	Website
National Center for Bicycling and Walking	www.bikewalk.org
National Highway Traffic Safety Administration	www.nhtsa.gov
National Safe Routes to School	www.saferoutesinfo.org
League of American Bicyclists	www.bikeleague.org
Pedestrian and Bicycle Information Center	www.bicyclinginfo.org

Limitations of this study must be noted. First, research participants were recruited via convenience sampling. Had a random sampling technique been utilized, the results may have differed. Additionally, since the study was limited to Florida physical educators, laws, and crash data, the results are not generalizable to other states. While this study was specific to Florida physical educators and Florida statutes, with modifications to reflect differences in state laws, it could be replicated and applied in other states and organizations that provide bicycle safety education. Furthermore, additional research is needed to better understand the background and knowledge level of bicycle safety educators and to subsequently improve bicycle safety teacher-training workshops and curricula. Future research may also include investigating the safety attitudes and beliefs of bicycle safety educators.

While bicycling is a relatively safe activity, like all forms of travel, it has risks. In an effort to reduce children's risk of bicycle-related injuries and fatalities, proper safety education should be provided and can be included in physical education curricula. By teaching most of the nations' children, physical educators can play an important role in providing such education and should be encouraged to get involved in their state.

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