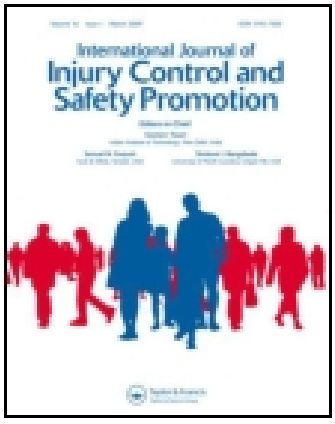

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Kimberly J. Rauscher [a b] & Douglas J. Myers [a b]

[a] Department of Occupational and Environmental Health Sciences , School of Public Health, West Virginia University , Morgantown , WV , USA

[b] West Virginia University Injury Control Research Center , Morgantown , WV , USA

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Occupational health literacy and work-related injury among US adolescents

Kimberly J. Rauscher[a,b]* and Douglas J. Myers[a,b]

[a]*Department of Occupational and Environmental Health Sciences, School of Public Health, West Virginia University, Morgantown, WV, USA;* [b]*West Virginia University Injury Control Research Center, Morgantown, WV, USA*

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Building on the concept of 'health literacy' used in the US, we developed an analogous measure specific to safety in the workplace labeled 'occupational health literacy' (OHL) and investigated whether OHL is a protective factor against work-related injury (WRI) among adolescents. Using cross-sectional survey data from 2262 14 to 18-year olds in five high schools across the US, we found that OHL (level of occupational safety and health (OSH) information and training received combined with knowledge and awareness of OSH information and concepts) is positively associated with WRI prevalence. This association appears to be largely driven by the OHL subscale on respondents' receipt of safety training, which likely represents job hazardousness and may be overwhelming any protective effect of OHL on work injury. This exploratory study has shown that more precise measurement of OHL and confounding variables (job hazardousness) will be crucial in further studies exploring a OHL–WRI relationship.

Keywords: adolescent; young workers; occupational health literacy; work-related injury

1. Introduction

Hundreds of thousands of young workers are injured at work every year (Estes, Jackson, & Castillo, 2010; National Institute for Occupational Safety and Health, 2005) and over the last decade, an annual average of 40 youths under the age of 18 died from injuries sustained at work (United States Bureau of Labor Statistics, 2012). Numerous efforts have been made to educate young people about workplace safety to help reduce the number of injuries suffered by this population of workers (Bush & Baker, 1994; Young Worker Safety Resource Center, 2005, 2007). Little research, however, has been done to explore whether young workers' understanding of health and safety issues has impacted their safety at work. Drawing from the health literacy field, we looked at this issue by developing the concept of 'occupational health literacy' (OHL) and investigating whether it is associated with injury prevalence in an adolescent worker population.

Defined by the US Department of Health and Human Services (US DHHS), health literacy is 'the degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions' (United States Department of Health and Human Services, 2000). We adapted this definition to create a parallel concept related to occupational safety and health (OSH) called OHL, which we define as 'the degree to which individuals have the capacity to obtain, process, and understand basic *OSH* information and services needed to make appropriate decisions *with regard to health and safety at work*.'

As *general* health literacy is important to good health (Baker, 2007; Cotugna & Vickery, 2003; Lee, Arozullah, & Cho, 2004; Volandes & Paasche-Orlow, 2007; Weiss et al., 2005), and safety training can be protective against work injury (Jensen & Sinkule, 1988; Knight, Castillo, & Layne, 1995; Massachusetts Occupational Health Surveillance Program, 1998; Perkins, 1995), particularly among young and inexperienced workers (Schulte et al., 2003), we suggest that OHL, which embodies much more than the acquisition of safety training, can affect one's capacity to stay safe at work. The extent of OHL's protective effect on young worker injury is unknown, but is a question that this study aims to explore.

2. Methods

2.1. Data source and sample

This study analyses data from two unique pre-existing cross-sectional surveys conducted in 1999 with students in five public high schools across the US (Oakland, and Los Angeles, CA, Brockton, and Lowell, MA, and Philadelphia, PA). The purpose of the original studies was to learn about the working conditions and work-related injury (WRI) experiences of youth in the US. These data acquired via questionnaires include variables on WRI,

*Corresponding author. Email: krauscher@hsc.wvu.edu

demographics, and several items used to construct a measure of OHL. Recently gaining access to such unique a data-set has allowed us to conduct the current exploratory study.

Data from participants at all five schools were collected using the same self-administered, anonymous questionnaire developed by researchers at the University of North Carolina, Chapel Hill (Dunn, Runyan, Cohen, & Schulman, 1998). In Brockton, a purposive sample of classrooms in grades 10–12 was surveyed. In Oakland and Los Angeles, students in a randomly selected sample of required English (literature and writing) classes in grades 9–12 were surveyed. In Philadelphia, students in grades 9–12 were surveyed in their homerooms. (Runyan, Bowling, Schulman, & Gallagher, 2005). In Lowell, all students in grades 9–11 were surveyed in homeroom classes (seniors did not participate as their classes had ended for the year before the survey was conducted) (Rauscher & Myers, 2008). In all surveys, work was defined as "a paid job for someone outside the home, excluding baby-sitting or odd jobs." Further details on these studies can be found elsewhere (Delp, Runyan, Brown, Bowling, & Jahan, 2002; Rauscher & Myers, 2008; Runyan, Schulman, & Hoffman, 2003).

Because the focus of this work is on adolescent workers' OHL, we omitted any respondents over age 18 and under age 14 and included only students with current or prior work experience. This resulted in a final sample of 2262.

2.2. Variables and measures

2.2.1. OHL

We distinguish between two components of OHL which are parallel to those of health literacy defined by the US DHHS. These are the capacity to (1) obtain OSH information and services (i.e. safety training) and (2) process and understand OSH information.

2.2.1.1. OSH Information and training. This first component was operationalised as the extent to which respondents obtained OSH information from sources outside the workplace such as a teacher, a parent or friend, and the extent to which they received health and safety services in the form of employer provided safety training. To measure this component we used responses from two survey items. The first asked respondents' to name all the sources from which they have received OSH information including teachers, school nurses, school counsellors, parents, friends, the media, or some other source. We summed the number of sources named to create an 'information' subscale with a range of 0–7. The second item asked respondents whether they had ever received employer provided safety training on the following topics: how to do their job; why and how to use safety equipment; how to keep their workplace clean; their rights as workers; and what to do if they notice something dangerous on the job. We summed the number of affirmative responses to create a 'safety training' subscale with a range of 0–5. These two subscales were combined to create a total score for 'OSH information and training' (range 0–12).

2.2.1.2. OSH knowledge and awareness. The second component was operationalised as one's awareness and knowledge of select child labour laws and key OSH concepts. To measure this component, we first summed the number of correct answers to 10 questions about the child labour laws (such as whether 16- and 17-year olds are allowed to drive a car to deliver food) and created a subscale for 'knowledge' with a range of 0–10.We then summed the number of affirmative responses (agree vs. disagree) to the following five statements about workplace safety: 'work accidents don't "just happen",' 'teen workers' injuries are preventable,' 'teen jobs are not necessarily all safe,' 'teen workers should have safety training,' and 'teens can make a difference in job safety' and made a subscale for 'awareness' with a range of 0–5. These two subscales were combined to create a total score for 'OSH knowledge and awareness' (range 0–15).

2.2.1.3. Overall OHL. Lastly, the two component scores ('OSH information and training' and 'OSH knowledge and awareness') were summed to create a final score measuring respondents overall OHL (range of 0–27).

2.2.2. Work-related injury

We measured injury using responses to the single survey item: 'While working for someone outside your household, have you ever had any of the following injuries?' (options included a back injury, any other muscle injury, a burn, etc.). A dichotomous measure of ever having had one or more of these injuries, regardless of type or severity, versus having none was created and used in all analyses.

2.2.3. Additional variables

We created a work history duration variable by subtracting the age at which respondents first worked in a formal job from their age at the time of survey completion. This variable represents a maximum possible duration of employment since any period of unemployment between jobs was not measured. We also created a job hazardousness variable using respondents' self-reported current/most recent job and age-specific injury data from the US Bureau of Labor Statistics (BLS). Because our data were collected in 1999, we used BLS injury rates from this same year. We coded job responses into 1 of the 13 'minor occupational groups' using the 1990[11] US Census

Occupation Codes (U.S. Census Bureau, 1990) and then assigned each respondent their grouping's 1999 BLS age-specific injury rate per 10,000 workers (United States Bureau of Labor Statistics, 1999).

In addition to age and gender, self-reported race/ethnicity was collected. To measure socio-economic status (SES), we used the survey item on the mother's highest level of education achieved (Day & Newberger, 2002; Entwisle & Astone, 1994; Hauser, 1994; Krieger, Williams, & Moss, 1997). Since teenagers' SES is a function of their parents, measures of parental SES are recommended for the studies of SES and children's health (Entwisle & Astone, 1994; Hauser, 1994). We categorised mother's education as: less than high school diploma, high school diploma/some college, college degree, and at least some graduate education. We also used a secondary SES measure, whether respondents worked to help financially support their families. An indicator variable was created based on subjects' responses regarding the reasons why they decided to take their job.

2.3. Analysis

Descriptive analyses were conducted for all OHL scores by demographic and employment characteristics. T-tests and linear regression were used to test associations between OHL scores and demographic variables. OHL and its component scores were modelled as continuous measures. Because the prevalence of WRI is high (41%) in this dataset, logistic regression was not appropriate for modelling the association between OHL and injury outcomes (Spiegelman & Hertzmark, 2005). Thus, Cox regression was used in a manner described by Barros to obtain prevalence ratios (Barros & Hirakata, 2003). This model obtains prevalence ratios since it calculates model parameters by looking to the first 'failure' event which, in this design, is the instant in which all events occur.

Injury incidence rates provided by the BLS were included to adjust for job hazardousness. Gender, age, race, SES, work history duration, and school indicator variables were also included to adjust results. Finally, robust standard errors were used, as recommended by Barros (Barros & Hirakata, 2003). All analyses were conducted using STATA (STATA Version 11, 2009). The Institutional Review Board of West Virginia University approved this study.

3. Results

3.1. Sample characteristics

The characteristics of the sample are presented in Table 1. The majority is between the ages of 15 and 17 and females outnumbered males in all schools except Philadelphia. Race and SES varied dramatically across schools (chi-square $p < 0.001$ for associations between school and race, and school and SES). As for job hazardousness, the age-specific injury rate ranged from 0 to 150.7 per 10,000 full-time equivalent (FTE) and had a mean of 45.3 (S.D. = 42.8). Forty-one percent of respondents reported being injured at work at least once.

3.2. OHL scores

OHL scores by demographic characteristics are displayed in Table 2. Respondents showed a moderate level of OHL with a mean score of 14.5 (S.D. = 3.1). The mean score for OSH information and training was low at 2.8 (S.D. = 1.9), while the score for OSH knowledge and awareness was moderate at 11.5 (S.D. = 2.2).

3.3. OHL and injury prevalence

The prevalence ratios and 95% CIs for OHL scores and injury prevalence are shown in (Table 3). Adjusted regression modelling revealed a positive association between the overall OHL score and WRI prevalence (PR = 1.03, 95% CI [1.02, 1.05]) (Model 1). This association appears to be driven by the OSH information and training component as it was positively associated with injury prevalence (PR = 1.05, 95% CI [1.02, 1.09]), while the OHS knowledge and awareness component were not (PR = 1.01, 95% CI [0.98, 1.05]) (Model 2).

We found that the information and the safety training subscales were each positively associated with injury prevalence (information PR = 1.06, 95% CI [1.00, 1.09] and safety training PR = 1.05, 95% CI [1.01, 1.10] (Model 3). An examination of the OSH knowledge and awareness subscales (Model 4) showed that neither subscale was positively associated with injury prevalence. When all four subscales were modelled together, only the safety training subscale remained positively associated with injury prevalence (Model 5).

Crude results (not shown) revealed a nearly identical pattern as that observed in the adjusted models. With regards to the statistical significance of associations, the main difference between crude and adjusted results was that in Model 3 (containing the information and training subscales) the information subscale was not significantly associated with injury prevalence in the crude model as it was in the adjusted model. There were minor changes in coefficients in the fully adjusted model; therefore only adjusted measures are presented.

3.4. Stratified models

Regression models were stratified to explore differences in associations by schools in the sample (Table 4). Since

Table 1. Sample characteristics by school location.

Characteristic	All Locations ($n = 2262$)	Brockton, MA ($n = 282$)	Los Angeles, CA ($n = 169$)	Lowell, MA ($n = 1430$)	Oakland, CA ($n = 177$)	Philadelphia, PA ($n = 204$)
			Percent			
Age						
n	1974	257	146	1236	162	173
14	6.2	1.9	5.5	7.6	0.0	9.3
15	25.5	13.7	22.6	29.9	19.4	20.8
16	32.3	31.2	26.0	33.8	28.5	32.4
17	26.2	36.5	29.5	23.5	26.7	26.6
18	9.8	16.7	16.4	5.3	24.5	11.0
Gender						
n	2026	257	153	1260	170	186
Female	53.0	53.7	50.3	53.3	63.5	41.9
Male	47.0	46.6	49.7	46.7	35.8	58.1
Race/ethnicity						
n	1928	245	140	1205	160	178
White	38.6	57.1	0.0	49.7	1.9	1.7
Black/African American	18.5	26.9	10.0	2.4	63.8	82.0
Asian	25.6	4.1	0.7	37.8	15.6	1.1
Hispanic (all races)	14.8	10.6	87.9	8.1	10.0	12.4
Other race	2.4	1.2	1.4	1.9	8.8	2.8
Mother's education						
N	1471	210	89	872	142	158
<HS Diploma	18.5	12.6	66.3	18.8	11.7	3.8
HS Diploma/some college	47.4	50.5	27.0	43.9	48.3	73.4
College graduate	24.0	28.0	5.6	24.8	30.3	18.4
Graduate education	10.2	8.9	1.1	12.5	9.7	4.4
			Mean			
Work history duration*	2.1	1.9	2.3	2.0	2.3	2.5
n	1755	255	142	1025	160	173
Job hazardousness+	45.3	47.4	48.5	44.3	44.0	46.3
n	1427	216	117	828	114	152

*In years.
+1999 work injury rate/10,000 workers between the ages of 14 and 19.

the data were too sparse to examine the schools individually, schools were stratified by combining Lowell and Brockton (B/L), and contrasting them with schools in Los Angeles, Oakland, and Philadelphia (L/O/P) combined. These groupings were the extension of an effort to examine the possibility that results obtained by combining all five schools were driven by the large proportion of the sample represented by Lowell, MA. Stratified results of Lowell versus the other four schools (not shown) indicated that the overall pattern was not substantially different between Lowell and the other schools. We then combined Brockton with Lowell as these two schools were more similar to each other than they were to other schools, particularly with regard to racial composition as Brockton and Lowell were primarily white and the others were mostly Hispanic (Los Angeles) and black (Oakland and Philadelphia). The examination of model coefficients provided empirical support for these groupings; differences, where observed, were strongest using these groupings.

The overall OHL score showed a significant association with injury prevalence in the B/L grouping (PR = 1.03, 95% CI [1.01, 1.05]) and a similar but non-significant association in the L/O/P grouping (PR = 1.04, 95% CI [0.98, 1.09]) (Model 1). Looking at the two OHL components (Model 2), the OSH information and training component showed a significant association with injury prevalence in the B/L grouping (PR = 1.05, 95% CI [1.02, 1.09]) and a similar but non-significant association in the L/O/P grouping (PR = 1.06, 95% CI [0.98, 1.14]), while the OSH knowledge and awareness component showed no significant association with injury prevalence in either the B/L grouping or the L/O/P grouping (Model 2).

Further analysis of the OHL subscales (Model 3) showed that the information subscale was positive but non-significant for both the B/L and L/O/P strata. The safety training subscale, however, was positive and significantly associated with injury prevalence for B/L (PR = 1.06, 95% CI [01.02, 1.11]) but not significant for L/O/P (PR = 1.03, 95% CI [0.93, 1.13]). Model 4 shows that the

Table 2. Mean occupational health literacy (OHL) scores by demographic characteristics.

Characteristic	Overall OHL (range 0–27)	OHL components	
		OSH Information & Training[a] (range 0–12)	OSH Knowledge & Awareness[b] (range 0–15)
Total sample	14.37	2.82	11.54
n	1782	1933	1848
Age			
n	1729	1824	1782
14–15	13.51***	2.45***	11.04***
16	14.48	2.82	11.57
17	15.12	3.05	12.00
18	15.44	3.24	12.00
Gender			
n	1765	1871	1822
Female	14.90***	2.90*	11.92***
Male	13.97	2.73	11.14
Race/Ethnicity			
n	1710	1808	1762
White	14.11***	2.55***	11.46
Black/African American	15.10	3.20	11.73
Asian	14.44	2.78	11.63
Hispanic (all races)	14.71	3.04	11.55
Other race	14.11	2.64	11.32
Mother's education			
n	1326	1400	1361
<HS Diploma	14.87**	3.00	11.80**
HS Diploma/some college	14.70	2.88	11.71
College graduate	14.48	2.83	11.60
Graduate education	14.05	2.66	11.17
School location			
n	1781	1932	1847
Brockton, MA	15.38***	3.10***	12.04***
Lowell, MA	14.02	2.55	11.42
Los Angeles, CA	14.41	2.91	11.46
Oakland, CA	15.37	3.43	11.88
Philadelphia, PA	15.02	3.48	11.37

[a]Level of occupational safety and health information and training obtained by respondents.
[b]Level of respondents' knowledge and awareness of occupational safety and health information and concepts.
Significance levels: $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

knowledge and the awareness subscales were both not significantly associated with injury prevalence in either school grouping. Finally, Model 5, which contains all four subscales, shows that only the training subscale remains significant and only for the B/L grouping (training PR = 1.05, 95% CI [1.01, 1.10]).

To explore whether the role of OHL differed by race/ethnicity and SES, we did additional stratified analyses

Table 3. Adjusted* prevalence ratios and 95% CIs for OHL scores and injury prevalence.

Scores	Model 1 ($n = 939$)	Model 2 ($n = 939$)	Model 3 ($n = 982$)	Model 4 ($n = 950$)	Model 5 ($n = 939$)
Overall OHL	1.03 (1.01, 1.05)	–	–	–	–
OSH Information & Training[a]		1.05 (1.02, 1.09)	–	–	–
Information			1.06 (1.00, 1.12)	–	1.05 (0.99, 1.12)
Safety training			1.05 (1.01, 1.10)	–	1.05 (1.00, 1.09)
OSH knowledge and awareness[b]		1.01 (0.98, 1.05)	–	–	–
Knowledge				1.00 (0.97, 1.04)	1.01 (0.97, 1.04)
Awareness				1.04 (0.98, 1.10)	1.03 (0.97, 1.09)

*All models adjusted for age, gender, race, work history duration, school, and job hazardousness.
[a]Level of occupational safety and health information and training obtained by respondents.
[b]Level of respondents' knowledge and awareness of occupational safety and health information and concepts.

Table 4. Adjusted* prevalence ratios and 95% CIs for OHL scores and injury prevalence, stratified by school groupings.

	Model 1		Model 2		Model 3		Model 4		Model 5	
Scores	B/L ($n = 699$)	L/O/P ($n = 241$)	B/L (699)	L/O/P ($n = 241$)	B/L ($n = 724$)	L/O/P ($n = 258$)	B/L ($n = 706$)	L/O/P ($n = 244$)	B/L ($n = 699$)	L/O/P ($n = 240$)
Overall OHL	1.03 (1.01, 1.05)	1.04 (0.98, 1.09)	–	–	–	–	–	–	–	–
OSH information and training[a]			1.05 (1.02, 1.09)	1.06 (0.98, 1.14)	–	–	–	–	–	–
Information					1.05 (0.98, 1.12)	1.09 (0.96, 1.23)	–	–	1.05 (0.98, 1.12)	1.09 (0.95, 1.24)
Safety training					1.06 (1.02, 1.11)	1.03 (0.93, 1.13)	–	–	1.05 (1.01, 1.10)	1.03 (0.93, 1.15)
OSH knowledge and awareness[b]			1.01 (0.98, 1.04)	1.02 (0.93, 1.10)	–	–	–	–	–	–
Knowledge							1.00 (0.96, 1.04)	0.99 (0.90, 1.09)	1.00 (0.97, 1.04)	1.00 (0.93, 1.10)
Awareness							1.03 (0.97, 1.09)	1.05 (0.91, 1.22)	1.02 (0.96, 1.08)	1.05 (0.89, 1.23)

*All models adjusted for age, gender, race, work history duration, and job hazardousness.
[a]Level of occupational safety and health information and training obtained by respondents.
[b]Level of respondents' knowledge and awareness of occupational safety and health information and concepts.
Notes: B/L = Brockton/Lowell; L/O/P = Los Angeles, Oakland & Philadelphia.

based on white versus non-white (because after missing data accrued, the sample of Hispanics became too small to analyse as a separate group) and high versus low SES (mother with college degree or higher versus having less than college a degree). These results were surprisingly very similar to the grouping based on school/city (Table 4). The biggest difference from Table 4 is that in the models stratified by SES, the information variable (Model 3) is stronger and significant for the high SES category (PR = 1.13, [1.04–1.23]) and weak and non-significant for the low SES group (PR = 1.02, [0.94, 1.10]). In Table 4, the prevalence ratio for the information variable in the Brockton/Lowell group was 1.05 [0.98, 1.12] and for the Los Angeles/Oakland/Philadelphia group it was 1.09 [0.96, 1.23]. Otherwise results did not substantially differ from those presented to the extent that the discussion would be presented differently. More importantly, these results are still indicating positive associations between the various components of OHL and prevalence of WRIs. No stratification revealed negative associations that were originally hypothesised.

4. Discussion

Young workers in this sample showed moderate levels of OHL with high levels of OSH knowledge and awareness and low levels of OSH information and training. OHL, however, was not found to be protective against work injury among youth, as we hypothesised; rather it was *positively* associated with work injury. This unexpected association appears to be driven mostly by our measure of safety training received and, to a lesser extent, the level of OSH information received by respondents from non-employer sources. The positive association found between safety training and work injury may suggest that where jobs are more dangerous teen workers are more likely to receive safety training from their employers. That is, we suspect job hazardousness is driving the safety training-work injury relationship and overwhelming any protective effect of OHL on work injury. It is also quite possible that the safety training provided to teens may have been inappropriate, incomplete or inadequately delivered thereby limiting its ability to have a preventative impact. In addition, this unexpected association, like all statistically significant associations observed here, is not particularly large in magnitude.

Our attempt to control for job hazardousness using the BLS injury data did not impact the association between safety training and work injury. This suggests that, with regard to teen workers, the groupings of jobs by BLS category are not sufficient for controlling for job hazardousness. When a variety of jobs is included in a sample, as was the case in this school-based survey, the hazards of the workplace must be measured very precisely to be able to sufficiently control for them and determine the effects

of OHL broadly, and safety training in particular. Future work on the subject of OHL and its effect on work injury may best be conducted using a limited number of job types for which hazards can be more precisely measured. Future OHL studies that do not adequately account for job hazardousness are likely to mask the potential protective effect of OHL on work injury.

The results of the stratified analyses indicate that the overall results were not produced by the uneven sample size by school (i.e. the large proportion of teens from Lowell did not dominate results). The groupings of strata by school showed that there was no major modification of the role of OHL in schools that had predominantly minority students and those that had higher proportions of whites. Additional stratification by race/ethnicity and by SES did not demonstrate any substantial differences in the effect of OHL on injury prevalence. In no subset of the data was any protective effect of OHL found as originally hypothesised.

4.1. Strengths and limitations

One limitation to the present study is the fact that it is cross-sectional and therefore we could not ascertain whether work injury or various components of OHL came first. The null associations observed here could partly be the result of injured teens seeking out or being given information after being injured. While it was reasonable to suspect that teens would be trained before being injured at work, particularly in dangerous jobs, several issues arose that make this issue more complex. Teens change jobs rather frequently (National Institute of Medicine, 1998; Weller, Cooper, Basen-Engquist, Kelder, & Tortolero, 2003) and it is possible that some may have reported on safety training or OSH information obtained during jobs they worked after they were injured. It is also possible, though we think less likely, that injured teens received information after being injured, *because* they were injured. Information on workplace safety, when given at all, is likely given to workers before they begin a job rather than after they have been injured, although we acknowledge this can happen as well. However, for employers to do so, they need to be aware of the injury and many non-serious injuries (as were the majority of injuries in this study) go unreported by adults and youth alike (United States House of Representatives. Committee on Education and Labor, 2008).

However, we speculate that an association between the amount of OSH information received and injury prevalence may be the most susceptible to this possible reverse association. This association was positive and significant in Model 3 and nearly so in the fully adjusted Model 5 and it may be because injured teens seek or are simply provided safety information after being hurt on the job.

Another limitation relates to missing data. Teens often fail to provide responses on survey questionnaires and for various reasons often cannot, for example, answers to items pertaining to their parents such as their education and/or income (Entwisle & Astone, 1994; Hauser, 1994). The accumulation of missing responses produced adjusted regression models that included less than half the total sample surveyed. However, the crude regression models, which did not suffer a substantial loss of missing data, showed results very similar to adjusted results. This suggests little impact of missing data on the adjusted results presented here.

Finally, this study was limited by the OHL scale construction and that of its components. This was an exploratory study and the survey data provided a convenient way to construct a measure of OHL and explore its association with injury prevalence; it was not designed to study OHL from the start. Equally weighting each survey item into their respective component scores may have diluted the importance of some items. While the scale construction was not validated ahead of time, we believe the scales do have some measure of face validity.

These limitations notwithstanding, this exploratory study is the first to consider the concept of OHL and to attempt to understand whether OHL can prevent work injury among youth. Some of the particular strengths of this study include: the large sample size representing working youth from diverse geographic and demographic backgrounds; the use of self-reported survey data to capture injury rather than using administrative records, which are known to undercount injuries (Azaroff, Levenstein, & Wegman, 2002); and the inclusion of all injury severities providing adequate statistical power to analyse injury as an outcome, which is somewhat rare in young worker survey research (Dunn et al., 1998; Weller et al., 2003; Zierold & Anderson, 2006).

5. Conclusions

We believe there is a theoretical basis for the concept of OHL and for its potential to protect young workers from injury, as presented earlier in this paper. We believe that the mainly null and counterintuitive findings of this exploratory study are more likely due to limitations of the data-set and the difficulties in examining the potential value of OHL for protecting teens from WRI than to a truly absent or inverse association between OHL and WRI among youth.

The current exploratory study indicates that more precise measurement of OHL and confounder variables is crucial to understanding the relationship between OHL and work injury. Much work needs to be done to fully understand the complexities of the OHL concept and how it operates as a potential protective factor for young worker injury. Like any form of health literacy, OHL may

be partly derivative of or mediated by personal characteristics such as self-efficacy, and future research might attempt to strengthen and better measure the construct by including scale components that explicitly represent these attributes. Future investigations of this subject would benefit from having a clearly established causal order of receipt of information and training and injury experiences and may find it advantageous to examine a more narrowly focused group of teens performing similar job tasks in similar workplaces to narrow the variance in job hazardousness.

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Note

1. Because our job hazardousness measure is based on 1999 BLS injury rates, which use the 1990 Census Occupation Codes, we used the same occupational coding scheme as the Bureau. (United States Bureau of Labor Statistics, 1999).

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