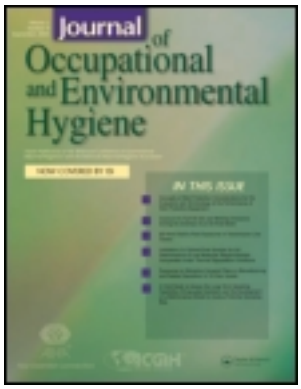

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Understanding Factors That Influence Protective Glove Use Among Automotive Spray Painters

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Dermal contact with isocyanate-based coatings may lead to systemic respiratory sensitization. The most common isocyanates found in sprayed automotive coatings are monomeric and oligomeric 1,6-hexamethylene diisocyanate (HDI) and isophorone diisocyanate (IPDI). Most spray painters use thin (4–5 mil) latex gloves that are not effective at preventing dermal exposures when spraying isocyanate paints. Personal interviews with collision repair industry personnel and focus groups with spray painters were held to characterize risk awareness, to examine perceptions and challenges concerning protective glove use and selection, and to generate ideas for protective glove use interventions. The most popular gloves among spray painters were thin (4–5 mil) and thick (14 mil) latex. We found that medium to thick (6–8 mil) nitrile were not always perceived as comfortable and were expected to be more expensive than thin (4–5 mil) latex gloves. Of concern is the user's difficulty in distinguishing between nitrile and latex gloves; latex gloves are now sold in different colors including blue, which has traditionally been associated with nitrile gloves. Even though spray painters were familiar with the health hazards related to working with isocyanate paints, most were not always aware that dermal exposure to isocyanates could contribute to the development of occupational asthma. There is a need for more research to identify dermal materials that are protective against sprayed automotive coatings. Automotive spray painters and their employers need to be educated in the selection and use of protective gloves, specifically on attributes such as glove material, color, and thickness.

[Supplementary materials are available for this article. Go to the publisher's online edition of Journal of Occupational and Environmental Hygiene *for the following free supplemental resource: personal interview guide, focus group spray painters guide, and focus group spray painters questionnaire.]*

Keywords focus groups, interviews, automotive paints, spray painters, car painters, protective glove, nitrile, latex, butyl rubber

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INTRODUCTION

Spray painters in autobody shops are exposed to many hazardous chemicals, particularly isocyanates and solvents, found in polyurethane paint systems. The most common isocyanates found in automotive sprayed coatings are monomeric and oligomeric 1,6-hexamethylene diisocyanate (HDI) and isophorone diisocyanate (IPDI). [1]Clear coat formulations contain a wide variety of solvents including ketones, acetates, and aromatic hydrocarbons. [2–5]Skin exposures to isocyanates and solvents may be an important route of exposure for spray painters[6,7]and may cause irritation and contact dermatitis. [8]Also, animal studies suggest that respiratory sensitization may be initiated by dermal exposure to isocyanates increasing the risk for developing occupational asthma. [9–14] Further, dermal exposure to solvents contributes to workers' body burden, [6,15,16,17]increasing their risk for developing acute and chronic neurological symptoms. [15,18]

The collision repair industry is comprised of numerous small businesses. [19,20] Many shops face safety and health challenges, resulting from a combination of misinformation within the industry, insufficient funds to address workplace health and safety concerns, and social barriers to enforcing best practices within the shops. [19] Most notably, inappropriate selection and use of respirators and gloves likely contribute significantly to painters' isocyanate exposures. [21,22] Parker et al. [20] documented employers as conflicted between allowing employees a certain level of independence and maintaining a safe workplace. Parker et al. [20] also documented employees not always being given adequate personal protective equipment to ensure safe work.

When using automotive paints, most autobody spray pain ters wear thin (2–5 mil) latex gloves, which do not provide adequate chemical protection. [4] Only limited and conflicting information is available on the effectiveness of protective gloves for spray painters. [3] This is not surprising, because

conventional permeation testing methods do not work with complex mixtures or materials that polymerize or cure, like isocyanate-based paint.[3] Commercial compatibility charts may only provide recommendations for protection against immersion in individual isocyanates or solvents. A new permeation test method has been developed that allows the efficacy of glove materials to be tested against sprayed automotive coatings.[3] The new test method is different from ASTM test methods[23] in that it allows the glove materials to be tested against chemicals in a mixture, such as two-part polyurethane paint systems, as opposed to testing individual chemicals as pure substances in isolation from each other. New information on glove efficacy for spray painters is therefore now available.[3,5,24]

The glove most frequently used by automotive spray pain ters is currently made of disposable thin (2–5 mil) rubber latex material,[21] a poor choice given that this latex glove material has allowed permeation of both isocyanates[3,24] and solvents[5] in sprayed coatings. Thin (2–5 mil) nitrile gloves have also shown permeation of isocyanates and solvents in a sprayed automotive coating but to a lesser extent than latex of the same thickness.[3,24] Thick nitrile gloves (8 mil or greater) have been hypothesized to provide better protection against isocyanates and solvents found in typical automotive coating formulations compared to thin (2–5 mil) latex and nitrile gloves.[3,24] Ceballos et al.[25] showed that thick nitrile gloves (8 mil) provide adequate protection against sprayed coatings. Gloves made of butyl rubber were also found to be effective against isocyanates in sprayed coatings,[24] but are not typically used by automotive spray painters.[21] Nitrile and butyl gloves are recommended for isocyanate-based coatings by the Environmental Protection Agency (EPA)[2] and PPG Industries,[26] however these publications do not address glove thickness, a factor that has been recognized to affect glove efficacy.[27] Recommendations from chemical protective clothing literature based on common solvents found in automotive coatings would usually result in the selection of butyl, Viton, or laminate film gloves, none of which is used by automotive painters. Thus, more research is needed to be able to provide adequate guidance to automotive painters in terms of glove selection.

There is a need to educate spray painters and the industry to adopt research-based glove recommendations. To do so effectively, the factors that affect spray painters' choices and glove use must be understood. Formative research was needed to explore the perceptions of spray painters towards potential intervention and the resultant barriers to glove use. We performed personal interviews with managers and industry personnel and convened focus groups with spray painters to discuss perceptions about protective glove efficacy, desirability, comfort, fit, and the adoption of different gloves. Our study goals were to (1) determine the level of risk awareness among spray painters for exposure to the solvents and isocyanates found in automotive paints, (2) examine perceptions and challenges that spray painters have with protective glove use and selection, and (3) generate ideas for future protective glove use interventions. Fulfilling these goals will help guide future interventions on glove use aimed to minimize isocyanate and solvent exposures so that spray painters' risk of asthma and hand dermatitis can be reduced.

METHODS

Personal Interviews with Managers and Industry Personnel

In fall 2009 and winter 2010, we conducted seven interviews with representatives from the following key industry segments: two collision repair shop managers, three trainers (one from a paint manufacturer and two from trade schools), one glove distributor, and one glove manufacturer. Individuals were chosen for their knowledge and experience in the collision repair industry and spray-painting. We approached potential interviewees by telephone, email, or face-to-face following protocols approved by the University of Washington's Institutional Review Board (IRB). If the person agreed to an interview, we conducted face-to-face interviews at his or her workplace during the workday. Audio and written informed consents were explained and the appropriate forms were signed.

While individual interviews required more staff resources, we used this approach instead of a focus group format for the convenience it offered to the interviewee. It was industry leaders themselves who suggested the interview format, indicating that attendance would be poor for an off-site focus group held outside of the workday. During the unstructured interview, following the script in Supplement B, we asked questions regarding protective glove use and health of spray painters. The interviews took 30 to 60 minutes to complete. To some interviewees, we posed additional questions to help develop the focus group guide for spray painters.

Spray Painter Focus Groups

We conducted two focus groups among autobody spray painters in June 2010. The focus groups were moderated, audio-recorded, transcribed, and summarized by the Gilmore Research Group (Seattle, Wash.). The focus group guide (Supplement A) was designed in conjunction with the Gilmore Research Group. Focus Group 1 was held at a community college's autobody training program (trade school) with 10 participating students. Focus Group 2 was held at a paint-manufacturer training center with 10 professional spray pain ters. The disparate level of training between Group 1 and Group 2 was intentional so that we could access a range of experience and perspective. Each focus group lasted 75 to 90 minutes. Sessions were audio-recorded and transcribed. During the focus groups, the subjects received food, soft drinks, and a modest monetary incentive as reimbursement for their time. The reimbursements were also intended to motivate subject's involvement during the focus group activities.

Each session consisted of the following processes. First, study objectives and procedures were explained to all, and those who wished to participate completed the IRB-approved

written informed consent process. Enrolled participants then completed a brief self-administered questionnaire regarding demographics (including race/ethnicity and age), job title, job and industry tenure, and a description of the safety equipment they use (Supplement B). These data are intended to clarify the nature of participants' subsequent responses during the focus group discussion. Next, two facilitators (a moderator and an assistant note taker /audio recorder) presented several discussion questions and exercises. The first exercise, designed in part as an ice-breaker, asked spray painters to describe the personal protective equipment (PPE) used during paint mixing and spraying. In the second exercise, un-labeled as to brand but numbered samples of gloves either commonly used or suitable for use during spray painting were provided for participants to review, try on, and informally discuss among themselves. Following this review period, the facilitators asked open-ended questions to engage participants in a structured discussion of the protective gloves. Participants also discussed the factors that influence glove choice and work practices, as well as issues that may affect glove adoption or rejection.

Data Analysis

Data from the personal interviews and focus groups were stored, transcribed, handled, and analyzed following IRB protocols and qualitative data methods. [28] Data for the personal interviews were analyzed by grouping responses into the following categories: risk awareness, use and selection of protective gloves, and potential interventions. Subcategories for the use and selection of protective gloves from the personal interviews were identified as: thickness, color, material type, and difficulty discerning nitrile material from latex. Data for the focus groups were analyzed by grouping responses into two categories: risk awareness and the use and selection of protective gloves. No category for potential interventions was included because there were too few responses given on this topic. Responses from the focus groups were also grouped by the glove type discussed.

RESULTS

Personal Interviews with Managers and Industry Personnel

Risk Awareness

All industry personnel were knowledgeable of the collision repair industry, autobody painting, and the use of personal protective equipment. Many interviewees indicated that they primarily used gloves to minimize paint unattractively staining their hands as well as to prevent dermal irritation. Industry personnel were familiar with the health effects caused by isocyanate-based paints. For example, many reported that experienced spray painters tend to have dermal symptoms, such as cracked, rough, irritated hands, symptoms that are commonly accepted by the industry. Some of the interviewees were not aware that skin exposure to isocyanates can place spray painters at risk for occupational asthma. Most industry personnel acknowledge lack of risk awareness: "there is lack of knowledge with respect to chemical exposures, how they are introduced into the body, and the long term health effects."

Use and Selection of Protective gloves

Industry personnel agreed that there is no glove manufacturer chemical compatibility chart information on what gloves to choose for spray painting. Industry personnel related that they rely on glove distributors for this information. Some interviewees agreed that thickness, color, and material type were attributes considered in the selection of protective gloves. Some believed that cost, comfort, and availability were key features affecting glove use by spray painters. One interviewee suggested that "painters neglect changing into heavy gloves for cleaning their guns; [it] takes too much time, [they] lose the dexterity needed to clean the small parts, and most shops don't buy them."

Thickness: Some of the interviewees agreed that thickness was an important variable when selecting gloves. Thin gloves are preferred for greater comfort and dexterity compared to thick gloves. Some noted that it is difficult to determine glove thickness because this information is not always printed on the box or included in the product description. The glove manufacturer who we interviewed acknowledged that many brands package gloves without thickness information on the box. The glove manufacturer explained that many gloves are manufactured overseas and packaged before U.S. distributors are able to conduct quality testing to ensure proper thickness. Glove packaging, therefore, often does not include statements about the thickness of the gloves inside, because the thickness cannot be guaranteed.

Color: Industry personnel mentioned that glove color is a factor when choosing gloves. One interviewee suggested that workers choose gloves in a specific (favorite) color, even if it means wearing the wrong size. Another industry opinion was that spray painters want white gloves (e.g., latex) so that they can see paint contamination. Conversely, another opinion was that black nitrile gloves are becoming popular among male autobody painters because the color black is "manly."

Material Type and Difficulty Discerning Nitrile from Latex: All industry personnel used gloves in the past or currently in their work, and the type and frequency of glove use varied between interviewees. Most said that they used both latex and nitrile. On two separate instances, once with an experienced spray painter/trainer and once with an experienced spray painter/owner, interviewees said that they used thick nitrile gloves. When asked to show the specific box of thick nitrile gloves used, in both cases they were actually using thick latex gloves (powder-free exam grade, 14 mil). The blue latex gloves were specifically marketed for automobile technicians and spray painters. The trainer had placed an order from a glove distributor specifically asking for "those nice thick nitrile gloves" and had received the blue latex gloves instead. The glove manufacturer explained that blue and purple were traditionally the colors of nitrile gloves, and white was the color of latex gloves. Latex and nitrile are now manufactured in a variety of colors; blue is no longer specific to nitrile gloves. The

glove manufacturer who was interviewed explained that blue latex originated from use in the food industry where broken glove bits can be recognized in the food manufacturing and removed, because blue is not a color typical of food items.

Potential Interventions

Most industry personnel agreed that interventions to improve the selection and use of gloves by autobody shops are needed. They added that multiple approaches would be necessary; one said: "[There is] no one best method for getting the word out and educating the industry; must use many methods." Another interviewee suggested: "a combination of agency checks, without immediate fines, more time for compliance or fixing problems, solid safety information, and education programs would be good for creating a cooperative environment." Another interviewee added "glove use is an everyday need in our profession so we would need reminders." Industry trainers all agreed that computer and Internet-based training was very useful for their students. However, one professional interviewee cautioned "referring someone to a website is useless, since they are too confusing with too much information." Another said "Simplify safety information and not necessarily on computers and the Internet, since there are not many [computers] in the shops; those computers are used by bill keeping and ordering people."

Some industry personnel thought that management enforcement within the shops would help increase the use of gloves. However, they acknowledged that management enforcement of glove use is difficult in autobody shops considering that most shop owners want to keep their painters "happy" as it is challenging to find good workers and spray painters. Safety training takes a backseat to production and must be done on the side, unless sponsored by the employer.

Educational refresher sessions at training facilities or sales meetings that discuss personal protective equipment selection and use were mentioned as necessary. It was also mentioned that industry vendors interact closely with autobody schools and shops regularly, and that vendors would make desirable partners in getting any safety message out. Interestingly, rewards or contests were brought up as potential incentives for spray painters: "rewards for keeping LNI [WA-OSHA] offenses down in a shop; send spray painters to classes for free with time off to attend; shops should get creative," and "rewards like free I-CAR training classes."

Focus Groups

Demographic information and glove use reported by the spray painters from the two focus groups are presented in Table I. The first group was younger and had fewer years of experience than the second group. All participants in group 1 were students, and a few were concurrently employed as spray painters. Among the participants of the second group, almost all currently worked or had previously worked in a body shop with some painting experience. In group 2, one person worked painting boats and another worked primarily as a supplier of paint and autobody products but had some painting experience.

TABLE I. Spray Painter's Demographics and Glove Use from Self-Administered Survey

Spray Painter Characteristics	Focus Group 1 Trade-school students from Seattle, Wash.	Focus Group 2 Paint Manufacturer Technical Training Facility - Students from U.S. West coast
Number of participants	10	10
Participants who filled out the questionnaire	9	10
Ethnicity/Race [A]		
Caucasian	9	9
Hispanic	1	3
Filipino	1	—
Average age (years)	29	40
Years of experience	1	16
Glove use type [A, B]		
Latex	5	6
Thin	2	1
Medium	2	3
Thick	—	1
Nitrile	10	7
Thin	—	2
Medium	8	4
Thick	1	2
Who purchases gloves? [A]		
Spray painter	2	10
Other	8	2

[A] Sum of individuals of a particular answer may sum higher than the number of participants in the focus group because some answered more than one selection.

[B] The glove reported was not specific to the different tasks that a spray painter may do in a collision repair shop.

Risk Awareness

During the focus groups, both groups of spray painters indicated knowledge of the inhalation hazards related to working with isocyanate paints; however, none was familiar with the concept that dermal exposure to isocyanates could contribute to the development of occupational asthma. When asked about the health hazards related to working with isocyanate-based paints, both groups mentioned the following health effects: respiratory problems including asthma and emphysema, dermal problems such as rashes and burns, and vision problems which may lead to loss of vision. Group 2, comprised of more experienced spray painters, named additional effects of long-term exposure including neurologic symptoms, liver problems, and possibly cancer. Finally, Group 1 mentioned balding and

Group 2 mentioned hearing loss as possible effects of exposure to the paint.

Use and Selection of Protective gloves

During the first exercise, spray painters reported that they used some type of glove for most tasks including sanding, body filling, mixing paint, paint thinning, painting, and gun cleaning. Both groups indicated similar reasons for not using gloves: "when one is lazy or in a hurry," "when certain tasks are more difficult to perform with gloves on," and "when gloves are not available, either because the supply has run out or they have the wrong size." A few gave reasons such as gloves make their hands sweat and restrict their ability to feel. During the second exercise, spray painters were given the glove samples listed in Table II. The spray painters tried the unlabeled glove samples and discussed within subgroups. Group 1 participants mentioned the use of nitrile gloves often, as if they had been taught that in school. Group 2 participants mentioned both latex and nitrile as gloves they had used in their workplaces. In each group, one person mentioned using thick orange "dishwashing" type gloves for work with paint; they did not know the material of the gloves. In Group 1, which was mixed in terms of past usage, some said they used latex for cost reasons, others said they used nitrile whenever they were dealing with paint, and one person said he used latex for body work and nitrile for mixing and spraying paint.

Autobody spray painters in both groups wanted gloves that would allow them to carry out all the functions of their jobs easily and well. The glove characteristics most commonly mentioned as preferable among the two groups were good fit, durability, appropriate thickness (enough to protect but not so much that one cannot feel things), texture (to prevent things slipping out of the hand), and color. Group 1 also mentioned cost, while Group 2 also mentioned protection from or resistance to solvents and length of the glove cuff. Some in Group 2 preferred the black color for gloves. Group 1 did not verbally rank the gloves in terms of characteristics. Group 2 spray painters favored thick latex gloves (gloves #2) and medium nitrile (glove #5) for being resistant to solvents, having a good texture or grip, having good performance, and ease of use. Group 2 favored thick latex gloves (gloves #2) for thickness and durability, thin nitrile gloves (glove #4) for their black color, and thin latex gloves (glove #1) for fit and "ability to feel." Some in Group 2 correctly guessed that thick latex gloves (glove #2) were made of latex and not nitrile material (Table III).

DISCUSSION

We found through our personal interviews and focus groups that most spray painters use gloves to avoid visual contamination of paint on their skin (which minimizes cleanup at the end of the work shift), or to avoid skin issues. While there is an awareness of the need for dermal protection, we found that all spray painters and many of the most knowledgeable individuals in the collision repair industry do not understand the relationship between skin and occupational asthma due to isocyanate exposures. There is a need to include this health information in future educational materials. Exposure to chemicals present in automobile paints can adversely impact the health of spray painters. Using protective gloves continues to be an important means to minimizing dermal exposures.[12] The best strategy for reducing occupational asthma is reducing all potential exposures. [29]

Color was repeatedly a variable that affects spray painter's perception of glove use. We documented that color may affect choices for two reasons: (1) some painters infer type of material of the glove by the color, and (2) spray painters may choose a particular glove because they prefer a certain color. One example of the first reason is that from both the personal interviews and focus group we found that almost all workers liked and frequently used the thick latex gloves. It was encouraging to see that spray painters are embracing the use of thicker gloves and liked their feel and durability. It is worrisome that they all thought they were using nitrile gloves based on the fact that they were dark blue, even though the box does state the gloves are made from latex. Thick latex gloves are more protective than thin latex gloves and even more protective than many thin nitrile gloves, however workers may use these gloves with a sense of protection beyond what they offer. This mistaken sense of protection can be detrimental because it may lead to less frequent glove changing or glove re-use. There is a need to educate spray painters in the selection of gloves and clarify that latex and nitrile gloves come in different colors. One example of the second reason stated above was a spray painter trainer in the personal interview suggesting that black nitrile gloves, as opposed to typical purple or blue, were highly desired among his students. Preference for the color black also was evident in some of the responses from the focus groups. We hypothesize that color, marketing, and knowledge of effectiveness or a combination of these factors may have an impact on glove use decisions. This should be verified in a larger study.

Thickness is also an attribute that is considered when choosing gloves. During previous studies in autobody shops, one spray painter indicated that he selected nitrile gloves based on the Environmental Protection Agency (EPA) document, "Choosing the Right Gloves for Painting Cars." [2] Unfortunately, he was using low-quality, thin nitrile gloves that were perforated even before being donned. Such poor quality gloves would offer little or no protection from exposure, but probably were chosen because of low cost. In our focus groups, we found that thickness plays a role in glove selection as it may affect both comfort and price. However, thickness is not always accurately known, as many spray painters and glove sales representative reported glove boxes that do not always state the glove thickness. It is important that future interventions include glove manufacturers so that thickness information can be stated on the boxes in which gloves are sold. If a manufacturer cannot guarantee the quality of its product at a certain thickness then perhaps a range of thicknesses could be given. A range would be more informative to the user of gloves than no information.

TABLE II. Glove Samples Tried On and Discussed in Spray Painter's Focus Groups

Glove #	Category	Description by manufacturer			
		Grade	Thickness	Powder	Color
1	Thin latex	Exam	5 mil	Powder free	Clear/beige
2	Thick latex	Exam	14 mil	Lightly powdered	Dark blue
3	Thin nitrile	Industrial	5 mil	Powder free	Light blue
4	Thin nitrile	Exam	5 mil	Powder free	Black
5	Thin/Medium nitrile [A]	Exam	5–6 mil	Powder free	Blue
6	Thick nitrile	Industrial	8 mil	Lightly powder	Light blue
7	Medium latex/nitrile	Industrial	6 mil	Lightly powdered	Dark blue
8	Thin tri polymer[B]	Industrial	5 mil	Powder free	Purple

[A]Interior polymer coating for easy on/off.
[B]Latex/Neoprene/Nitrile.

There are some commercially available brands that do include a thickness range on the box of gloves.

Training is a factor that may affect choice of gloves. From the focus groups we identified that nitrile gloves were accepted as better protection by the younger group of student spray painters. This could reflect the difference between those who have recently been through an educational training program as well as an emphasis to switch to nitrile in educational materials, i.e., the previously-mentioned EPA publication. [(2)]

Comfort, fit, and ease of donning/doffing were the biggest barriers for spray painters to choose more protective gloves and increase glove use. This was mentioned in the industry personnel interviews and became clearer with the focus group responses (Table III); these properties were repeatedly

TABLE III. Glove Preferences Discussed in Spray Painter's Focus Group

Glove #	Category	Group 1 comments	Group 2 comments
1	Thin Latex	Fit well, easy to don/doff, and least expensive.	Comfortable, easy to don/doff, latex, and less durable.
2	Thick Latex	Durable, good thickness, nice color, likely to be expensive; some also liked the fit.	Recognized them, assumed they would be resistant to chemicals (some thought they were nitrile), and useful for most tasks.
3	Thin Nitrile	Thought they had the best fit, but some said they were inexpensive and would not last long.	No comments made.
4	Thin Nitrile	A few liked the black color, and a couple found them easy to don/doff.	Recognized them as nitrile, thought they would be durable for painting, and liked the black.
5	Medium Nitrile	No comments made.	Described this glove as a little thicker nitrile than #4 and #8.
6	Thick Nitrile	Response was mixed with several thinking it was durable and one saying it ripped when he put it on. Two perceived it as expensive, one liked the blue color, and one disliked the powder inside.	Only one person in Group 2 commented that he liked the #6 glove almost as well as the #5.
7	Medium Latex/Nitrile	No comments made.	No comments made.
8	Tripolymer	Thought the #8 glove was most stretchy and easy to don/doff.	Made little mention of #8, but one said he would use them for sanding. It was mentioned as one of the least desirable along with #7.

mentioned during the discussion about gloves in the second exercise. Availability is another factor that was discussed in both the personal interviews and focus groups. Students reported that gloves were typically provided to them whereas professional spray painters reported providing their own personal protective equipment (Table I).

The preference of latex over nitrile is concerning as recent studies have shown that latex material provides less protection against isocyanates and solvents. [3,5,24] Even though spray painters are using more nitrile gloves than in the past, latex gloves of any thickness continue to be preferred among both industry personnel and focus group participants. Overall, thick nitrile was not perceived as comfortable and was expected to be more expensive than latex. However, during the interview with the glove manufacturer we learned that latex is not always cheaper than nitrile because price fluctuates depending on the market and cost of glove raw materials. Lastly, thicker nitrile gloves were perceived as affecting painters' dexterity (i.e., the thicker the glove the less dexterity while spray painting) as they are not as stretchy as thicker latex gloves.

The results of these industry personnel interviews and spray painter focus groups were intended to provide systematic and impartial pilot information that can be used in educational campaigns meant to change behaviors. Although our group sessions may give useful insights, effectively implementing good practices and educating the collision repair industry may require sophisticated social marketing strategies, as those suggested by Whittaker and Reeb-Whitaker. [19]

One limitation of our study was that it involved a small number of industry personnel and spray painters. The results of the focus groups were not quantitative as we were not able to hold more than two focus group discussions. Regarding qualitative analysis, we feel that we reached saturation in many of the discussions among the two groups studied. Another limitation of this study was that it was performed in Washington state. Some of the conclusions may be extrapolated to other regions, but there is a need for a larger study to do any nationwide U.S. intervention efforts. Another limitation of the focus groups is that time was limited so we were not able to obtain enough information on potential interventions from the participants to present in this article. A final limitation of our study is that we did not include butyl rubber gloves in the samples provided to spray painters for discussion. Butyl gloves are not commonly used by spray painters for mixing or spraying of isocyanate paints. Butyl gloves should be included in future discussions with the industry as butyl rubber does provide protection against both isocyanates and solvents in sprayed coatings.

Regardless of the limitations, focus groups are particularly advantageous in determining how workers and their employers decide to integrate new safety issues into work practices, and the manner in which adoption of new practices takes place. [30–33] It is difficult to conduct extensive interviews with spray painters during work hours as they typically work according to busy production schedules and do not have spare time to engage in extensive conversations. Focus groups provide a convenient and efficient method to identify a range of issues that researchers may not discover independently. [34–38] Convening focus groups conferred several advantages over one-on-one interviews between researchers and their study subjects. Focus groups promote self-disclosure among participants and allow the subjects ample opportunity to comment, explain, and share experiences and attitudes, just like that reported by Krueger and Casey. [39]

Results of this research are being used to provide insight and guidance in the preparation of educational materials with an appealing health message, but this is the topic of a follow-up publication. Using the personal interviews and focus group results will help provide potential interventions that are practical and effective for use across the collision repair industry to improve the use of protective gloves. This study model may also serve as an example for a larger follow-up project to develop and implement potential interventions for the use of protective coveralls.

CONCLUSION

Most popular gloves among spray painters in this study were thin (4–5 mil) and thick (14 mil) latex. We found that medium to thick (6–8 mil) nitrile were not always perceived as comfortable and were expected to be more expensive than the thin (4–5 mil) latex gloves. Of concern is the difficulty distinguishing between nitrile and latex gloves; latex gloves are now sold in different colors including blue, which has traditionally been associated with nitrile gloves. Even though spray painters were familiar with the health hazards related to working with isocyanate paints, they were not always aware that isocyanate dermal exposure could contribute to the development of occupational asthma.

There is a need for more research on material efficacy against sprayed automotive coatings and to educate automotive spray painters and their employers in the selection and use of protective gloves. Educational materials that describe the link between dermal exposures with automotive paints and health hazards would be important to increase risk awareness among spray painters and their employers. Training materials should also discuss glove attributes important to the spray painters, such as type, color, and thickness. Successful future interventions should include a multi-pronged approach involving spray painters, autobody shops, glove distributors, glove manufacturers, and spray painter training institutions.

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