



## Fear of needles and vasovagal reactions among phlebotomy patients

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### Abstract

Anxiety associated with blood and injections is a common problem in medical settings and, in severe cases, affects sufferers' ability to receive medically essential treatment. The present study was conducted to examine incidence of adverse reactions to venipunctures among phlebotomy patients, as well as to understand the demographic and psychological characteristics associated with such reactions. A large sample of participants undergoing venipuncture ( $N = 3315$ ) was recruited from hospital-based phlebotomy laboratories. Participants completed a brief questionnaire assessing psychological and physiological reactions to having their blood drawn. Results indicated that a small minority of patients experienced significant anxiety symptoms during venipuncture. Vasovagal reactions and vasovagal syncope were extremely infrequent. A tendency to experience pain, disgust, and fear of fainting during injections was associated with anxious responding to the venipuncture and a probable diagnosis of needle phobia. Theoretical and practical implications are discussed. © 2006 Elsevier Ltd. All rights reserved.

*Keywords:* Specific phobia; Blood-injection-injury phobia; Needle phobia; Venipuncture; Medical patients

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Fear of injections is a common concern among patients in healthcare settings. Approximately 10% of individuals in medical settings report an excessive fear of

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needles that causes significant avoidance, distress, and/or impairment (Hamilton, 1995; Mollema, Snoek, Ader, Heine, & van der Ploeg, 2001; Nir, Paz, Sabo, & Potasman, 2003; Page, 1996). For some individuals, this fear may be severe enough to warrant a diagnosis of specific phobia, blood-injection-injury type (hereafter referred to as “needle phobia”). Needle phobia, characterized by an intense and persistent fear of injections, affects approximately 1.6% of individuals in the general population (Bienvenu & Eaton, 1998). The associated fear and avoidance may adversely restrict important aspects of sufferers’ lives including career choice, willingness to have children, and the ability to receive medically necessary treatments, such as self-injected insulin for individuals with diabetes (Marks, 1988; Zambanini, Newson, Maisey, & Feher, 1999).

In contrast to other specific phobias (e.g., fear of animals, fear of heights), blood-injection-injury phobias are associated with feelings of faintness upon exposure to feared stimuli (i.e., “vasovagal reactions”). Indeed, many needle phobics experience “vasovagal syncope,” or actual loss of consciousness, in the presence of needles. To illustrate, Ost (1992) reported that 56% of needle phobics had fainted upon exposure to needles, while vasovagal reactions in the presence of feared stimuli occurred in 0% of individuals with animal phobias, dental phobia, and claustrophobia. Individuals with needle phobia often exhibit a “diphasic” response, characterized by an initial increase in arousal upon exposure to needles followed by a sharp decrease below baseline levels of arousal that may lead to fainting if the individual cannot leave the situation (Ost, Sterner, & Lindahl, 1984).

Vasovagal reactions in the presence of blood-injection-injury stimuli are not limited to individuals with needle phobias. Fainting in the presence of blood-injection-injury stimuli is relatively common among late adolescents (13–19%; Page, 1994), while fainting is observed in 8.0% of high school students and 2.6% of adults who donate blood (Newman, 2003). Although vasovagal reactions are usually harmless, on rare occasions some individuals may suffer syncope-induced injury or even death (Hamilton, 1995; Newman & Graves, 2001). A more common consequence of vasovagal reactions is avoidance of medical procedures involving injections. For example, fear of experiencing fainting symptoms is the most common reason that blood donors do not return for repeat donations (Sauer & France, 1999). Given the shortage of blood supply in the United States, consequences of needle fear and vasovagal reactions pose a significant public health problem.

Researchers have identified several important demographic and psychological characteristics associated with needle fear and vasovagal reactions. Studies conducted with voluntary blood donors indicate that younger age, lower body weight, and first-time donor status are significant predictors of vasovagal reactions (e.g., Newman, 2003; Trouern-Trend, Cable, Badon, Newman, & Popovsky, 1999). Psychological factors such as blood and injury fears and pain sensitivity appear to predict vasovagal reactions more strongly than do demographic characteristics (Meade, France, & Peterson, 1996). In addition,

the “fear of fainting” has been implicated as a psychological factor that may contribute to needle fear. Kleinknecht and Lenz (1989) reported that, compared to individuals without a history of fainting, those with a history of fainting during medical procedures were more afraid of medical procedures and avoided them due to the possibility of fainting. Page (1994) suggested that individuals who have fainted during injections might subsequently develop a conditioned fear of fainting that could exacerbate anxiety upon exposure to injections in a manner similar to how the “fear of fear” exacerbates panic attacks (Clark, 1986).

Research also suggests that in addition to fear, the emotion of disgust plays a role in fear of injections and fainting. Disgust reactions to phobic stimuli are believed to promote sanitation by preventing direct contact and subsequent infection from noxious or contaminated stimuli (Olatunji, Williams, Sawchuk, & Lohr, 2006). Accordingly, disgust rather than fear reactions are often observed among individuals who fear potentially contaminated stimuli such as small animals (Davey, 1994), blood (Koch, O’Neill, Sawchuk, & Connolly, 2002), and injections (Tolin, Lohr, Sawchuk, & Lee, 1997). Moreover, because disgust reactions are typically associated with parasympathetic activity (Levenson, 1992), they place individuals at risk for vasovagal reactions. To illustrate, Page (2003) found that self-reported faintness in response to injection stimuli among individuals afraid of needles was only evident among those high in disgust. Thus, disgust appears to play a particularly important role in both needle phobia and vasovagal reactions associated with needles.

Despite recent advances in understanding prevalence and associated features of needle fear and vasovagal reactions, most studies have either been conducted in non-medical settings with healthy participants or have been carried out in blood donations settings with volunteer blood donors. Results of studies with blood donors are of questionable generalizability to patients receiving injections in community and general medical settings, as the blood donation setting likely selects for individuals without the fear of needles and with low levels of other psychological characteristics associated with adverse reactions to injections. Furthermore, because of the relatively large amount of blood collected during the blood donation procedure, variables associated with adverse reactions in this setting (e.g., body weight) might be less applicable to other settings involving injections in which less blood is collected. As a result, relatively little is known about the typical experiences of individuals in medical settings who receive injections.

The hospital-based phlebotomy department provides an excellent setting in which to study needle fear and vasovagal reactions among medical patients. At the Mayo Clinic, phlebotomists perform over 1000 venipunctures (i.e., blood draws) each week on individuals undergoing medical work-ups. Given the base rates of needle fears and vasovagal reactions in the general population, a significant percentage of patients in this setting would be expected to experience adverse reactions during the venipuncture procedure. This large patient population is also heterogeneous and is likely more representative of the general population than

voluntary blood donors. Thus, the phlebotomy setting presents a unique opportunity to examine the incidence of adverse reactions to injections among medical patients and to understand the demographic and psychological characteristics associated with such reactions.

To our knowledge, the present study represents the first attempt to characterize the experiences of patients receiving venipunctures in a hospital-based phlebotomy department. The purpose of the present study was threefold: (a) to assess the incidence of adverse reactions (anxiety, vasovagal reactions) to venipunctures among phlebotomy patients, (b) to explore patients' previous adverse experiences with and psychological reactions to injections, and (c) to examine the demographic and psychological factors associated with vasovagal reactions and fear of injections.

## 1. Method

### 1.1. Participants

Participants included 3315 adults between the ages of 19 and 99 years ( $M = 57.5$ ;  $S.D. = 15.7$ ) who received a venipuncture at one of three study sites. About half the participants were women ( $n = 1704$ ; 51.4%) and most ( $n = 2650$ ; 79.9%) had fasted prior to their venipuncture. The vast majority of patients ( $n = 3167$ , 95.5%) had received at least one venipuncture in the past year, while only three individuals had never previously had their blood drawn.

### 1.2. Setting and procedure

Patients were recruited from three hospital-based outpatient phlebotomy clinics staffed by highly trained and experienced phlebotomists. During the three-week study period, all patients receiving venipunctures were asked by their phlebotomist to complete a survey assessing reactions to the venipuncture and previous experiences with blood draws and injections (see below). For each consenting patient, phlebotomists concurrently completed a separate portion of the survey assessing the patient's reaction to the procedure. Individuals under the age of 18 and those who refused to complete the survey were excluded from the study.

### 1.3. Materials

Immediately following the venipuncture procedure, participants completed a 14-item survey constructed for the present study. The survey entailed three parts. The first part assessed demographic and related variables (gender, age, weight, fasting prior to venipuncture, number of venipunctures in the past year). The second part assessed responses to the present venipuncture, including how

anxious and faint the patient felt (both rated on a 1–5 scale; 1 = “not at all,” 2 = “very little,” 3 = “somewhat,” 4 = “very much,” 5 = “extremely”) and whether or not the patient actually lost consciousness. The third portion assessed patients’ previous experiences with venipunctures and injections, including psychological reactions (fear of fainting, pain, disgust, and concerns that injections might pose a health hazard; each rated on a 1–5 scale from “not at all” to “extremely”), vasovagal reactions (whether or not the patient had ever felt faint or actually lost consciousness during injections), and needle phobia symptoms (excessive fear of injections, avoidance of injections, and interference and/or distress due to fear of injections, each rated categorically as “no” or “yes”). Completed surveys were deposited in a designated area in the waiting room. Following each patient’s venipuncture, the phlebotomist assessed how anxious the patient appeared (rated on a 1–5 scale from “not at all” to “extremely”) and whether various strategies were used to manage the patient’s distress or fainting symptoms (e.g., distraction, reclining the patient’s chair). A copy of the survey is available from the corresponding author.

## 2. Results

### 2.1. Responses to the venipuncture

Ratings of self-reported anxiety ( $M = 1.40$ ,  $S.D. = 0.77$ ) and phlebotomist-rated anxiety ( $M = 1.57$ ,  $S.D. = 0.84$ ) indicate that overall levels of anxiety elicited by the venipuncture were very low. For each anxiety variable, only 3.0% of the sample experienced “very much” or “extreme” anxiety. The correlation between phlebotomist and patient anxiety ratings was  $r = .38$  ( $p < .001$ ). Incidence of vasovagal reactions was particularly infrequent: only 13 patients (0.4%) reported feeling “very much” or “extremely” faint, while only 7 patients (0.2%) reported actually losing consciousness during the venipuncture. Consistent with these patient reports, phlebotomist ratings indicate that clinicians seldom used strategies to manage patients’ fainting symptoms. While distraction was used with 12.6% of patients, more elaborate strategies such as reclining the patient’s chair, asking patients to place their head between their legs, or using a cold towel were utilized with only 0.9% of study patients.

### 2.2. Predicting anxiety in response to the venipuncture

To examine the relative contribution of demographic and psychological variables to the expression of needle fear during the present venipuncture, we conducted multiple regression analyses examining predictors of self-rated and phlebotomist-rated anxiety. In each analysis, demographic variables (gender, age, weight, fasting) and psychological variables (fear of fainting, pain, disgust, and health concerns) were simultaneously entered into the regression equation as

predictors of anxiety. Results of these analyses are presented in Table 1. In the first analysis, the predictor variables explained a significant proportion of the variance in self-rated anxiety ( $R^2 = .34$ ,  $p < .001$ ). Among demographic variables, younger age was the only significant predictor of anxiety. Three psychological variables contributed significant, unique variance to the model: pain, fear of fainting, and disgust. Results from the second analysis predicting phlebotomist-rated anxiety indicated that the predictors explained a significant portion of the variance ( $R^2 = .34$ ,  $p < .001$ ; see Table 1). The pattern of significant predictors replicated the first analysis, with younger age, pain, fear of fainting, and disgust again emerging as the only significant, unique predictors of anxiety.

### 2.3. Psychological reactions to previous injections

We examined patients' previous experiences with needles to better understand the psychological variables associated with reactions to blood draws and injections. Ratings of the fear of fainting ( $M = 1.16$ ,  $S.D. = 0.50$ ), pain ( $M = 1.60$ ,  $S.D. = 0.68$ ), disgust ( $M = 1.18$ ,  $S.D. = 0.56$ ), and concerns that injections might pose a health hazard ( $M = 1.21$ ,  $S.D. = 0.51$ ) indicate that these issues were not a concern for the vast majority of patients. Less than 2.0% of the sample endorsed any of these concerns to more than a moderate extent during injections or venipunctures.

Table 1  
Demographic and psychological predictors of anxiety during venipuncture

| Variable                                     | <i>B</i> | S.E. <i>B</i> | <i>B</i> | <i>t</i> | Zero-order, <i>r</i> | Partial, <i>r</i> |
|--|----------|---------------|----------|----------|----------------------|-------------------|
| <i>Predicting self-rated anxiety</i>         |          |               |          |          |                      |                   |
| Gender                                       | 0.04     | 0.03          | 0.02     | 1.37     | .12                  | .03               |
| Age  | 0.00     | 0.00          | -0.05    | -3.48*   | -.19                 | -.06              |
| Weight                                       | 0.00     | 0.00          | -0.01    | -0.28    | -.05                 | -.01              |
| Fasting                                      | 0.03     | 0.03          | 0.01     | 0.96     | -.01                 | .02               |
| Fear of fainting                             | 0.36     | 0.03          | 0.22     | 12.55*   | .43                  | .22               |
| Pain   | 0.37     | 0.02          | 0.31     | 18.02*   | .48                  | .31               |
| Disgust                                      | 0.28     | 0.03          | 0.19     | 10.65*   | .43                  | .19               |
| Health concerns                              | 0.02     | 0.03          | 0.02     | 0.94     | .20                  | .02               |
| <i>Predicting phlebotomist-rated anxiety</i> |          |               |          |          |                      |                   |
| Gender                                       | 0.02     | 0.03          | 0.01     | 0.74     | .11                  | .01               |
| Age  | -0.01    | 0.00          | -0.11    | -6.38*   | -.20                 | -.11              |
| Weight                                       | 0.00     | 0.00          | -0.03    | -1.92    | -.06                 | -.03              |
| Fasting                                      | 0.00     | 0.03          | 0.00     | -0.10    | -.02                 | .00               |
| Fear of fainting                             | 0.28     | 0.03          | 0.19     | 9.87*    | .35                  | .17               |
| Pain   | 0.21     | 0.02          | 0.19     | 10.00*   | .34                  | .18               |
| Disgust                                      | 0.22     | 0.03          | 0.16     | 8.17*    | .34                  | .15               |
| Health concerns                              | -0.01    | 0.03          | -0.01    | -0.56    | .13                  | .00               |

Note.  $R^2$  for self-rated anxiety = .34,  $F(8, 3104) = 196.62$ ,  $p < .001$ .  $R^2$  for clinician-rated anxiety = .21,  $F(8, 3103) = 100.28$ ,  $p < .001$ .

\*  $p < .001$ .

2.4. Needle phobia symptoms and vasovagal reactions

Table 2 presents the frequency with which participants endorsed symptoms of needle phobia and fainting. Although the majority of patients indicated no fear of needles, a substantial minority reported usually feeling anxious about blood draws or injections (14.8%) and that this fear was excessive (7.5%). For less than 4% of the sample, this fear was associated with avoidance, distress, or impairment. To estimate the point prevalence of needle phobia, we determined the number of participants who endorsed symptoms consistent with the DSM-IV-TR (APA, 2000, p. 449) criteria for specific phobia (i.e., marked and excessive fear of injections, avoidance of injections and/or distress or impairment due to fear of injections). This analysis revealed that 2.2% of the sample ( $n = 72$ ) might qualify for a diagnosis of specific phobia, blood-injection-injury type. With regard to vasovagal reactions, approximately 10% of patients reported a history of feeling faint during venipuncture or injections, while slightly less than half of these individuals reported actually losing consciousness during an injection.

2.5. Associated features of needle phobia

To investigate the demographic and psychological features associated with needle phobia, we conducted a series of analyses examining differences between individuals with needle phobia ( $n = 72$ ) and individuals who did not endorse any needle phobia symptoms ( $n = 2787$ ). Compared to individuals with no needle fear, needle phobics were more likely to be women (68.1% vs. 48.9%;  $\chi^2 [1] = 10.26, p < .001$ ) and of younger age (43.3 years vs. 59.0 years;  $t [1] = 8.59, p < .001$ ). Needle phobics were also much more likely to report having experienced vasovagal reactions (63.9% vs. 4.8%;  $\chi^2 [1] = 417.94, p < .001$ ) and vasovagal syncope (23.6% vs. 2.4%;  $\chi^2 [1] = 109.06, p < .001$ ) during previous injections.

Table 2  
Number of patients (%) endorsing needle phobia and fainting symptoms

| Question  | <i>n</i> | Percent |
|---|----------|---------|
| Do you usually feel nervous or afraid when receiving a blood draw or injection?   | 490      | 14.8    |
| Do you think that you are more afraid of blood draws or injections than you should be?  | 247      | 7.5     |
| Have you ever avoided having your blood drawn or receiving an injection because of this fear?   | 91       | 2.7     |
| Has the fear of blood draws or injections negatively affected important areas of your life (e.g., work, social activities, health) or caused you a lot of distress? | 33       | 1.0     |
| Have you ever felt like you were going to faint when having your blood drawn or receiving an injection?   | 314      | 9.5     |
| Have you ever actually fainted (lost consciousness) when having your blood drawn or receiving an injection?   | 141      | 4.3     |

Table 3

Psychological differences between individuals with needle phobia and no fear of needles

| Variable  | Needle phobia<br>( <i>n</i> = 72), mean (S.D.) | No needle fear<br>( <i>n</i> = 2787), mean (S.D.) | <i>t</i> (2857) | ES   |
|---|--|---|-----------------|------|
| <i>Reactions to the venipuncture</i>              |  |   |                 |      |
| Self-rated anxiety                                | 3.32 (1.10)                                    | 1.35 (0.59)                                       | 27.01*          | 2.94 |
| Clinician-rated anxiety                           | 2.77 (1.39)                                    | 1.27 (0.58)                                       | 20.49*          | 2.31 |
| Faintness   | 1.88 (0.95)                                    | 1.04 (0.24)                                       | 25.30*          | 2.90 |
| <i>Typical psychological reactions to needles</i> |  |   |                 |      |
| Fear of fainting                                  | 2.36 (1.21)                                    | 1.05 (0.24)                                       | 35.59*          | 3.51 |
| Pain  | 2.85 (1.02)                                    | 1.47 (0.55)                                       | 20.44*          | 2.13 |
| Disgust   | 2.46 (1.43)                                    | 1.08 (0.29)                                       | 31.65*          | 3.26 |
| Health concerns                                   | 1.67 (1.01)                                    | 1.16 (0.43)                                       | 9.26*           | 1.09 |

Note. Responses were coded on a 1–5 scale. ES = effect size, calculated as the difference between group means divided by the pooled standard deviation.

\*  $p < .001$ .

Table 3 presents comparisons of differences in psychological variables between needle phobics and individuals with no needle fear. In addition to reporting descriptive statistics and *t*-tests, we report effect sizes to facilitate the interpretation of group comparisons. Based on Cohen's (1988) descriptions of a small effect size as approximately .20, a medium effect size as approximately .50, and a large effect size as approximately .80, each psychological variable demonstrated a large between-groups effect. In particular, individuals with needle phobia reported experiencing substantially more fear of fainting and disgust when receiving injections than did individuals with no needle fear. Health concerns showed the smallest effect size of the psychological variables. Lastly, compared to patients with no needle fear, needle phobics reported experiencing substantially more anxiety and faintness in response to the present venipuncture.

## 2.6. Disgust and adverse reactions to needles

Because disgust has been shown to play an important role in needle fear and vasovagal reactions, we conducted a series of analyses examining the association of disgust with response to the venipuncture and typical psychological reactions to needles. We dichotomized participants into those who reported finding injections "not at all disgusting" ( $n = 2898$ , 87.4%) and those who described injections as "very disgusting" or "extremely disgusting" ( $n = 51$ , 1.5%). Compared to individuals low in needle disgust, patients in the high disgust group were younger (42.5 years vs. 58.4 years,  $t [2851] = 7.25$ ,  $p < .001$ ) and more likely to be women (84.3% vs. 50.6%,  $\chi^2 [1] = 22.86$ ,  $p < .001$ ). High-disgust participants were also much more likely to report having experienced vasovagal reactions (60.8% vs. 6.8%;  $\chi^2 [1] = 204.76$ ,  $p < .001$ ) and vasovagal syncope (23.5% vs. 3.2%;  $\chi^2 [1] = 59.52$ ,  $p < .001$ ) in response to previous injections. Finally, there was a particularly strong association between disgust and needle



Table 4

Psychological differences between individuals with high disgust and no disgust regarding needles

| Variable  | High disgust<br>( <i>n</i> = 51), mean (S.D.) | No disgust<br>( <i>n</i> = 2898), mean (S.D.) | <i>t</i> (2947) | ES   |
|---|---|---|-----------------|------|
| <i>Reactions to the venipuncture</i>              |   |   |                 |      |
| Self-rated anxiety                                | 3.63 (1.11)                                   | 1.46 (0.73)                                   | 20.73*          | 2.94 |
| Clinician-rated anxiety                           | 2.88 (1.28)                                   | 1.32 (0.67)                                   | 16.22*          | 2.28 |
| Faintness   | 1.94 (0.99)                                   | 1.05 (0.29)                                   | 19.70*          | 2.82 |
| <i>Typical psychological reactions to needles</i> |   |   |                 |      |
| Fear of fainting                                  | 2.67 (1.45)                                   | 1.09 (0.34)                                   | 28.73*          | 4.09 |
| Pain  | 3.12 (0.99)                                   | 1.51 (0.60)                                   | 18.70*          | 2.65 |
| Health concerns                                   | 2.20 (1.27)                                   | 1.16 (0.43)                                   | 15.99*          | 2.27 |

*Note.* Responses were coded on a 1–5 scale. ES = effect size, calculated as the difference between group means divided by the pooled standard deviation.

\*  $p < .001$ .

phobia: only 2/2787 (0.1%) individuals with no needle fear were high in disgust, whereas 42.0% ( $n = 21$ ) of needle phobics were high in disgust ( $\chi^2 [1] = 1002.09$ ,  $p < .001$ ).

Table 4 presents comparisons (descriptive statistics, *t*-tests, and effect size estimates) between individuals low and high in needle disgust with respect to reactions to the venipuncture and previous experiences with injections. These analyses reveal large between-group differences on each psychological variable that mirror the group differences found between needle phobics and individuals with no needle fear presented in Table 3.

To explore the role of disgust in needle phobia, we examined differences between needle phobic patients who reported finding needles “not at all

Table 5

Psychological differences between individuals with needle phobia who have high disgust and no disgust regarding needles

| Variable                                  | High disgust<br>( <i>n</i> = 21), mean (S.D.) | No disgust<br>( <i>n</i> = 29), mean (S.D.) | <i>t</i> (48) | ES   |
|---|---|---|---------------|------|
| <i>Reactions to the venipuncture</i>      |   |   |               |      |
| Self-rated anxiety                        | 4.10 (1.0)                                    | 2.97 (1.02)                                 | 3.91***       | 1.13 |
| Clinician-rated anxiety                   | 3.24 (1.09)                                   | 2.36 (1.39)                                 | 2.40*         | 0.69 |
| Faintness                                 | 2.33 (1.02)                                   | 1.72 (0.92)                                 | 2.21*         | 0.64 |
| <i>Psychological reactions to needles</i> |   |   |               |      |
| Fear of fainting                          | 3.10 (1.41)                                   | 2.03 (1.05)                                 | 3.05**        | 0.88 |
| Pain                                      | 3.19 (1.03)                                   | 2.62 (0.98)                                 | 1.99          | 0.58 |
| Health concerns                           | 2.38 (1.28)                                   | 1.24 (0.64)                                 | 4.14***       | 1.20 |

*Note.* Responses were coded on a 1–5 scale. ES = effect size, calculated as the difference between group means divided by the pooled standard deviation.

\*  $p < .05$ .

\*\*  $p < .01$ .

\*\*\*  $p < .001$ .

disgusting” ( $n = 29$ ) and needle phobics who described needles as “very disgusting” or “extremely disgusting” ( $n = 21$ ). The groups did not differ significantly with respect to age ( $t [48] = 0.73, p > .10$ ) or gender ( $\chi^2 [1] = 0.34, p > .10$ ). In addition, there were no significant differences between low and high disgust individuals with regard to a history of vasovagal reactions (62.1% vs. 76.2%) or vasovagal syncope (27.6% vs. 19.0%) during injections (both  $p$ 's  $> .10$ ). Table 5 presents  $t$ -tests, descriptive statistics, and effect sizes depicting differences between the low and high disgust needle phobic groups in anxious responding to the venipuncture and typical psychological reactions to needles. High needle disgust was associated with significantly greater anxiety and faintness during the present venipuncture, as well as increased fear of fainting and health concerns upon exposure to needles. Effect size estimates indicated large between-group effects for these variables. Disgust was not significantly associated with pain during injections among needle phobic participants.

### 3. Discussion

The present study was conducted to examine the incidence of adverse reactions to venipunctures among phlebotomy patients, as well as to understand the demographic and psychological characteristics associated with such reactions. Our results indicated that only a small minority of patients experienced significant anxiety symptoms during venipunctures. Further, incidence of vasovagal reactions and vasovagal syncope was extremely low; only 7 of 3315 patients reported losing consciousness during the procedure. In describing their previous experiences with blood draws and injections, most patients indicated that they experienced only minimal pain, disgust, fear of fainting, and concerns that needles might pose a health hazard. Taken together, these findings suggests that adverse reactions to venipunctures are rare, particularly when compared to other contexts involving needles such as blood donation (Newman, 1997) and self-injected insulin among diabetic patients (Zambanini et al., 1999).

A number of characteristics of our sample and setting might have contributed to low incidence of adverse reactions to venipunctures. First, study participants largely consisted of older medical patients, almost all of whom had previously received a venipuncture. Given that younger age and inexperience with injections are known to predict adverse reactions (e.g., Trouern-Trend et al., 1999), and more experience with injections is related to less adverse reactions (France, Adler, France, & Ditto, 1994), patients in our study were particularly unlikely to experience anxiety and vasovagal reactions during venipunctures. In addition, venipunctures were carried out by highly trained and experienced phlebotomists in a prestigious medical center, all of which might have reduced patients' anxiety about the procedure. In addition, small needle size, small amount of blood collected, and relatively brief exposure to the needle associated with the blood

draw procedure may have resulted in less anxiety and vasovagal reactions than would occur upon exposure to needles in other contexts.

A number of variables evidenced specific associations with anxiety during the venipuncture. Among demographic characteristics, younger age was significantly (albeit weakly) associated with greater levels of self-rated and phlebotomist-rated anxiety. This result complements the well-established finding that younger age is associated with greater vasovagal reactions among blood donors (e.g., Trouern-Trend et al., 1999). In contrast, gender, body weight, and fasting prior to venipuncture were unrelated to anxiety, suggesting that variables related to adverse reactions among blood donors are less important among patients receiving venipunctures. Consistent with previous research (Meade et al., 1996), psychological variables were stronger predictors of anxiety than demographic characteristics. Specifically, patients who reported experiencing pain, the fear of fainting, and disgust during injections were more anxious during the venipuncture. These results are consistent with previous research implicating pain sensitivity (Meade et al., 1996) and disgust (Tolin et al., 1997) in adverse reactions to injections. Our findings also lend credence to Page's (1994) suggestion that the fear of fainting exacerbates anxiety during injections.

Although few patients reported significant anxiety symptoms during the present venipuncture, approximately 15% of the sample reported usually feeling afraid during injections. An additional 7.5% described their fear of injections as excessive. Similarly, while vasovagal reactions were extremely rare during the venipuncture, 9.5% of the sample reported a history of vasovagal reactions and 4.3% reported experiencing vasovagal syncope during previous injections. These results indicate that needle fears and vasovagal reactions are not uncommon among medical patients. Using a conservative definition modeled after the DSM-IV-TR (APA, 2000) diagnostic criteria for specific phobia, 2.2% of participants were classified as having probable needle phobia. This finding closely resembles the lifetime prevalence of 1.6% reported in a large epidemiological sample by Bienvenu and Eaton (1998). However, we should note the possibility that our results underestimate the true point prevalence of needle phobia due to the unique characteristics of our sample (e.g., older age, frequent exposure to injections). In addition, we were not able to ascertain the percentage of medical patients whose fear of needles prompted them to avoid the venipuncture procedure altogether.

Compared to individuals who endorsed no needle phobia symptoms, patients with probable needle phobia experienced higher anxiety and greater feelings of faintness during the venipuncture. They were much more likely to have a history of vasovagal reactions and reported significant fears of fainting, disgust, pain, and health concerns during injections. Taken together, our findings indicate that most individuals with probable needle phobia experience moderate distress but minimal vasovagal reactions during venipuncture, and typically experience moderate amounts of pain, disgust, and fear of fainting during injections. In

contrast, most individuals with no needle fear do not experience any distress or vasovagal reactions during venipunctures and have no apparent psychological concerns about injections.

Our results highlight the importance of disgust in needle fears and vasovagal reactions. Needle disgust was strongly associated with needle phobia and was virtually absent among patients with no needle fear. Individuals who were highly disgusted by injections evidenced emotional, vasovagal, and psychological reactions to needles that were virtually indistinguishable from those of individuals with probable needle phobia. In contrast, patients who were not disgusted by needles appeared largely unconcerned with injections and were indistinguishable from patients who reported no needle fear. Disgust appeared to exacerbate the symptoms of patients with probable needle phobia. Compared to needle phobics with no needle disgust, those with high needle disgust evidenced more anxiety and faintness during the venipuncture as well as more psychological concerns about needles. To our knowledge, the present study is the first to demonstrate an association between disgust and concerns that injections might pose a health hazard. This association is consistent with the notion that disgust is designed to prevent contact and infection from contaminated stimuli (Olatunji et al., 2006).

Blood-injury-injection stimuli, such as injections, appear relatively unique in their capacity to elicit both fear and disgust. Given that disgust is associated with parasympathetic nervous system activation (Levenson, 1992), phobic responses to injections often involve vasovagal reactions. Our results are consistent with those of Page (2003) in suggesting that faintness among individuals with needle fears is most evident among those highest in disgust. Moreover, we found that disgust was associated with increased anxiety in response to the venipuncture. Thus, phobic patients who are disgusted by needles appear to have a more extreme form of needle phobia. Our findings are consistent with the notion that emotional responses to injections lie at the crossroads of fear and disgust. In contrast to the present findings, other researchers (e.g., Olatunji et al., 2006) have found that the apparent role of disgust in vasovagal reactions is illusory and mediated by needle fear. It is possible that the disgust-fainting relationship is complex and might depend on the interaction between the specific content of one's disgust (e.g., watching one's blood fill the syringe) and the specific context of the injection (Olatunji et al., 2006).

Our findings support emerging theoretical models (e.g., Page, 2003) in which various psychological and biological factors interact to produce the fear of injections. Given that disgust appears to exacerbate both pain and vasovagal reactions in response to injections, it is possible that disgust sensitivity is a risk factor for the development of needle phobia. High disgust-sensitive individuals might be more likely to faint during injections and to experience the sort of conditioning experiences that are reported by most needle phobics to be the origin of their fear (Ost, 1991). Having learned that injections reliably elicit faintness and pain, such individuals might come to fear both needles and the psychological

and physiological reactions they elicit. In much the same way that the “fear of fear” maintains panic disorder (Clark, 1986), a vicious cycle characterized by the fear of fainting, fear of pain, and avoidance of injections may maintain needle phobia (Page, 1994). Future research might examine the contributions of disgust sensitivity, conditioning experiences, fear of fainting, and fear of pain in the acquisition of needle phobia.

Our present findings should be interpreted in the context of several limitations. We used a novel questionnaire with unknown psychometric properties. Although we would have preferred to use a psychometrically established measure of responding to injections such as the Blood-Injection Symptom Scale (Page, Bennett, Carter, Smith, & Woodmore, 1997), no existing measure had the breadth of coverage and brevity necessary for efficient integration into the phlebotomy practice setting. A related limitation is that most study variables (e.g., disgust) were assessed with a single questionnaire item. Because of the decreased statistical reliability associated with single-item indices, our results and conclusions should be considered tentative. The cross-sectional nature of our data prohibits causal inferences between study variables. Only data from experimental and longitudinal studies can address issues of causality. Finally, the aforementioned characteristics of our sample (e.g., older age, experienced with venipunctures, largely Caucasian) may inhibit generalization to other samples with different demographic characteristics.

In summary, the vast majority of phlebotomy patients do not appear to have adverse emotional or vasovagal reactions to venipunctures. In fact, our results suggest that this procedure is less distressing to patients than other types of injections. However, a subgroup of approximately 2% of phlebotomy patients endorsed significant concerns about injections. Among these concerns, a probable diagnosis of needle phobia and being disgusted by needles were strongly associated with adverse reactions to injections. In large medical settings where hundreds of patients receive venipunctures each week, even a 2% incidence rate of adverse reactions can cause significant management problems for phlebotomy staff. Although not directly examined in the present investigation, anecdotal reports from the study phlebotomists suggest that patients with needle fears and vasovagal reactions often pose a significant clinical management problem. Future research might examine the effects of screening for such individuals and providing empirically supported interventions such as applied muscle tension to prevent vasovagal reactions (e.g., Ditto, France, Lavoie, Roussos, & Adler, 2003). If effective, such an intervention would help to improve the experience of both patients and phlebotomy staff.

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