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## Psychosocial characteristics of blood donors influence their voluntary nonmedical lapse

Eva-Maria Merz <sup>1,2</sup>, Eamonn Ferguson,<sup>3</sup> and Anne van Dongen<sup>4</sup>

**BACKGROUND:** Approximately 10% of Dutch donors lapse yearly. Common reasons are nonvoluntary medical issues (e.g., low hemoglobin), reaching the upper age limit, and voluntary (e.g., own request, nonresponse). Little is known about predictors of voluntary noncompliance (lapses). Psychosocial characteristics have been linked to various health behaviors, including voluntary noncompliance. Hence, we investigated whether psychosocial characteristics, measured before the first donation, similarly predict subsequent *voluntary nonmedical* lapse.

**STUDY DESIGN AND METHODS:** New donors (n = 4861) randomly received a blood donation survey between July 2008 and March 2009, before their first appointment at the blood bank. Voluntary lapses included personal reasons, nonresponse to invitations, donor who could not be reached, and no show. Univariate and multivariate Cox regression models of lapse on psychosocial characteristics and confounders (e.g., demographics) were estimated.

**RESULTS:** Of 2964 donors who took the questionnaire, more than one-third (36.5%) had voluntarily lapsed due to nonmedical reasons by 2016. Univariate regression showed that lapse negatively associated with norms, attitudes, and intentions toward blood donation; self-efficacy; and more donation experience. Lapse positively associated with anxiety. Multivariate Cox models showed that lapse was primarily driven by anxiety and need for information.

**CONCLUSION:** Certain psychosocial characteristics increase risks of voluntary lapse. Especially donors with higher donation anxiety had increased lapsing risks. They might benefit from extra attention during donation. Donors with more information need or wish about procedure and patients were less likely to lapse, indicating that binding with the blood bank might prevent lapse. Generally, this study showed that donor lapse and donor return are determined by different psychosocial factors not just the reverse of each other.

Ensuring a sufficient number of blood donors to safeguard stable stock in blood products is of utmost importance for blood establishments. Many Western countries, however, have faced a decrease in numbers of blood donors during the past decade.<sup>1-3</sup> For example, in the Netherlands, the active donor population decreased from approximately 400,000 registered donors in 2011 to less than 330,000 donors in 2016. Each year, approximately 10% of the Dutch blood donors lapse. Several reasons for lapse are mentioned and registered in the blood bank system. Most are nonvoluntary and reflect common medical reasons (e.g., repeated low hemoglobin levels) or reaching the upper age limit for donating (70 years in many Western countries). Some are voluntary such as inactivation on donor's own request and nonresponse to repeated invitations.<sup>4</sup> Psychosocial characteristics and personality traits have been linked to a wide variety of behaviors, ranging from prosocial behavior (types of behavior that benefit others, often strangers, and (can) incur personal costs for the giver, also referred to as altruism as opposed to mutualism or benevolence where giver and receiver may be benefitted),<sup>5-7</sup> health behaviors,<sup>8</sup> blood

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donation, and noncompliance with medical treatment.<sup>9</sup> Hence, we extend this type of work to investigate whether psychosocial characteristics would similarly or differently predict voluntary nonmedical lapse from the Dutch donor pool.

### Health behavior and psychosocial characteristics

Individual health and illness behavior (such as compliance, prevention, health checks, symptom reporting, and reaction to diagnoses) but also general (prosocial) behavior (such as volunteer work, donating money to charities, and giving blood) have been associated with psychological and social determinants (e.g., attitudes, intentions to act), personality traits (e.g., agreeableness and conscientiousness), communication, information, and emotions (e.g., anxiety).<sup>8-15</sup>

Personality traits such as conscientiousness have been associated with compensatory health factors and with all-cause mortality and longevity.<sup>10,11</sup> Emotion (i.e., anxiety) has been linked to cancer screening behavior,<sup>12-14</sup> to dental prevention, and to dentist visits.<sup>16</sup> Several of these psychosocial characteristics and personality traits have also been related to blood donation, blood donor motivation, intention, registration, and negative donation events.<sup>6,17-19</sup> Blood donor studies, often based on the Theory of Planned Behavior,<sup>20</sup> have investigated individual donor characteristics in association with donor status, donor return, nonreturn behavior, and donor lapse. Intention to donate has been identified as central predictor of blood donation.<sup>21</sup> A recent review summarized current evidence about determinants of blood donor motivation and blood donor behavior. It showed that intention to donate was robustly correlated with donor behavior while other variables; that is, self-efficacy, subjective and moral norm, and affective and cognitive attitude explained little if any variance after intention was included.<sup>22</sup> Negative donation experiences and anxiety have been mentioned as reasons to stop among lapsed blood donors, although differently for more and less experienced donors, with experienced donors mentioning negative events and anxiety less often as lapsing reasons compared to more novice donors.<sup>4</sup> Most of these previous studies focused on donation intentions, willingness to donate, and few on reasons for stopping, all by using cross-sectional designs. To integrate findings from different strains of literature regarding health and prosocial behavior with blood donation studies, and to paint a fuller picture of the complex interplay among determinants of donor behavior over a longer period of time, we investigate the combined role of various psychosocial characteristics for voluntary nonmedical lapse from the donor pool, taking donation history over time into account. While previous studies mainly focused on donation intention, number of donations, and retention, we explicitly examined donor lapse in the current study. We focus specifically on *voluntary* donor lapse for *nonmedical reasons* and examine factors that were measured before the new donor made his or her first blood donation. We argue that, given the complex and

contradictory results so far (cf. Piersma et al.<sup>22</sup> for a recent literature review) psychosocial factors that have been identified to determine altruism, donor motivation, intention, and actual donation may not necessarily be the same factors that reversely predict donor lapse. Registering and returning for donation is a distinct psychological process from lapsing as a blood donor, especially if it concerns voluntary lapse for nonmedical reasons, and as such, it may be determined by different psychosocial factors.

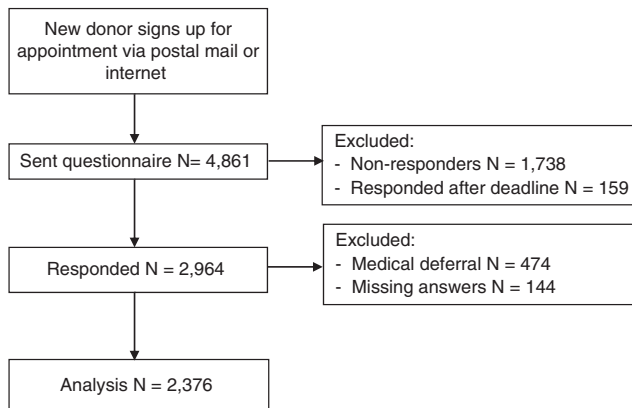
### The current study, blood donation, and hypotheses

Blood donor behavior may be regarded as a specific type of health based prosociality.<sup>17</sup> Blood donating is a costly behavior and requires specific resources such as information, time, and motivation but also an appropriate health status, and robust physical constitution.<sup>23,24</sup> In addition, blood donation can incur minor medical risks for the donor, such as bruising or in more severe cases fainting. We hypothesize that similar to determining voluntary noncompliance regarding health behavior, intention to donate and donation history, psychosocial characteristics, and including emotions and personality, may predict voluntary lapse from the blood donor pool. Those factors that have been identified as motivations of intentions to donate and actual donation may “protect” donors from lapse. Hence, we hypothesize that positive intentions, high affective and cognitive attitude toward blood donation as well as positive subjective and moral norms will be associated with decreased odds to lapse. In addition, we hypothesize that increased anxiety will be positively associated with risk of lapse.<sup>25</sup> While a single blood donation has been predicted by the prosocial personality trait agreeableness,<sup>26</sup> repeat donation has been associated with nonprosocial traits such as conscientiousness.<sup>18</sup> Hence, we expect high levels of conscientiousness to be associated with lower odds of lapse. Furthermore, it has been shown that donation history and feeling a sense of loyalty and commitment to the blood bank are associated with return behavior.<sup>27</sup> Hence we expect that a longer donation history, indicated by more donations and more invitations to donate, protects donors from lapsing. Similarly, we expect that interest and wish for information (i.e., what happens to donor blood and who are the patients) increases commitment with and attachment to the blood bank and thus decreases the risks of lapse from the donor pool. Finally, as planning failure was found to have a strong long-term effect on donor retention,<sup>28</sup> we expect higher levels of planning failure to predict increased risk to lapse.

## MATERIALS AND METHODS

### Participants and procedure

In the Netherlands, donors must register and attend a medical eligibility check before they are invited for their first



**Fig. 1. Flow chart of participants and procedure.**

blood donation. Using the Dutch national donor database, we randomly assigned new donors to receive a survey questionnaire about blood donation and motivation to donate in the period July 2008 to March 2009. Individuals who had donated previously and those living in areas where the nearest donation center was open less than once a month were excluded. Questionnaires were sent out to arrive 10 days before the recipient's first appointment for the medical eligibility check at the blood bank ( $n = 4861$ ). In addition to the questionnaire, donors received an introductory letter explaining the aim of the study and emphasizing that the questionnaire should be completed and returned before donor's medical eligibility check. Although this time frame did not permit reminders, two-thirds of recipients completed and returned the questionnaire ( $n = 2964$ , response rate approximately 61%; for more information on the design of this study, see Van Dongen et al.<sup>29</sup>). In this study, we use data from those participants who provided valid answers to the questions required for our analyses, and we excluded those who had lapsed for medical reasons (leaving  $n = 2376$  for analyses; cf. Fig. 1 for a graphical overview).

In the Netherlands, after having gone through the first medical check, donors receive a post card with an invitation to donate when they are eligible to donate and when their blood type is needed. After having received this postal invitation, they are requested to donate within a 2-week period on a walk-in basis.<sup>27</sup>

## Measures

### Demographics and donation history

The questionnaire measured standard demographics, and a variety of psychosocial characteristics that have been identified as predictors of blood donation intention and donor behavior in previous studies.<sup>30–32</sup> Questions were based on published measures (e.g., Conner et al.<sup>33</sup> and, where possible, were previously tested Dutch translations<sup>34,35</sup>). Donation history was retrieved from the national donor registry and included number of invitations, total number of

donations, blood type, and donor lapse from 2008/2009 until the end of 2016, the censoring date for the current analyses. In addition, age, sex, and donation history were included as control variables in our multivariate final regression model. Two variables were included as indicators of donation history; the ratio of total number of donations by number of invites and a dummy variable for being an experienced ( $>5$  donations) versus a novice donor (0–5 donations).<sup>4</sup>

### Psychosocial characteristics

Variables were measured on a 7-point Likert scale, ranging from 1 = completely disagree to 7 = completely agree. The translated items have been used in previous studies on blood donor behavior, for example, van Dongen et al.,<sup>36</sup> and included *intention to donate* (three items—e.g., I intend to donate blood regularly during the next two years; Cronbach's Alpha [ $\alpha$ ] = 0.85); *affective attitude*, that is, how donation will make the respondent feel (three items—e.g., Donating blood regularly within the next two years would be pleasant/unpleasant;  $\alpha = 0.72$ ); *cognitive attitude*, that is, what respondents think about blood donation (three items—e.g., Donating blood regularly within the next two years would be useful/useless;  $\alpha = 0.78$ ); *subjective, descriptive norms* (two items, e.g., Most people that are important to me think it is a good idea for me to donate blood,  $r = 0.54$ ); *moral norms* (three items—e.g., I feel a moral obligation to donate blood,  $\alpha = 0.65$ ); *self-efficacy* (four items—e.g., I am confident that I will be able to donate blood within the next two years,  $\alpha = 0.69$ ); *anxiety* (three items—I am afraid of needles, I am nervous and/or tense about the donation, I am afraid to feel faint during the blood donation;  $\alpha = 0.72$ ); *expected planning failure* (three items—I expect that in general, it will be difficult for me to make the time to donate blood; I will probably forget some invitations to donate blood; After receiving an invitation, I will probably postpone my visit once or twice;  $\alpha = 0.72$ ); and *wish or need for information* about use of donor blood and patient treatments (three items—I would like to get information about patients who receive donor blood; It is important to me to have enough knowledge about patients who can be helped with donor blood; I would like to know what happens to my blood after donation;  $\alpha = 0.81$ ). Items assessing *conscientiousness* stem from the Big Five Inventory<sup>37,38</sup> ( $\alpha = 0.82$ ). An example item is *I see myself as someone who does a thorough job*.

### Nonmedical lapse

Inactivation of donors is recorded in the national donor registry, using several inactivation codes. The inactivation codes included in these analyses were inactivation on donor's own request for personal reasons, on donor's own request without mentioning a reason, donor does not respond to repeated invitations, donor cannot be reached, and donor has not shown up for his or her appointment.

We coded donors whose lapse had been registered under one of the above-mentioned inactivation codes as 1 = *voluntary nonmedical lapse* compared to donors who kept on donating 0 = *still active as donor*. Donors who were deferred for medical or miscellaneous reasons were excluded.

### Statistical analyses

In addition to standard descriptive analyses, univariate and multivariate Cox regression analyses were performed to predict voluntary nonmedical lapse with a variety of psychosocial characteristics and control variables, including donation history characteristics and demographics. Cox regression analyses were used because after measuring the predictor variables (i.e., demographics, psychosocial characteristics before the eligibility check and the first donation) donors can lapse at different time points, ranging from immediately after the medical check or first donation (between August 2008 and April 2009) until December 31, 2016, which was used as the censoring date. In other words, Cox regression (or proportional hazards regression) is a method for investigating the effect of several variables (demographics, donation history, psychosocial characteristics) upon the time a specified event (voluntary nonmedical lapse) takes to happen. Either donors stop donating and lapse before the censoring date (lapse = 1) or the event does not occur before this date (lapse = 0). In addition to these predictive analyses, we compared mean levels of psychosocial factors between two groups of donors, that is, those who lapse immediately after the medical check or the first donation and those who lapsed after having donated at least twice.

## RESULTS

### Descriptives and correlations

An overview of study variables and correlations between study variables can be found in Tables 1 and 2. By the end of December 2016, the censoring date, 36.5% of the sample had stopped donating due to nonmedical reasons and voluntarily lapsed from the donor pool, and 16.0% had been permanently deferred for medical reasons. The remaining 47.5% continued as active donors. For the following analyses, we restricted our sample to those donors who voluntarily lapsed and compared them with donors who continued donating. Of the final sample (n = 2376) this amounted to 45.5% inactive (n = 1081) compared to 54.5% active (n = 1295) donors. To give an overview not only over the associations between the dependent variable lapse with predictors but also estimate correlations between independent variables, we show bivariate correlations. As can be seen in Table 2, anxiety was negatively related to most psychosocial characteristics, including attitude, intention, self-efficacy, and conscientiousness. Need for information about procedure and transfusion patients positively related to anxiety and subjective and moral norm. Lapse was negatively

**TABLE 1. Descriptive statistics of study variables**

Variables	% or Mean	SD	Range
<b>Dependent variable</b>			
Nonmedical lapse (yes)	45.50%		0/1
<b>Cox survival variable</b>			
Number of donor months	55.89	28.87	0-95
<b>Individual level</b>			
Female	69.73%		0/1
Age	34.33	12.45	17-64
Blood group O-	8.88%		0/1
Number of previous invitations	18.48	11.59	1-86
Number previous donations	9.40	9.29	0-104
<b>Donation experience</b>			
Novice donors	38.80%		
Experienced donors	61.20%		
Intention	6.04	0.95	1-7
Affective attitude	4.91	1.07	1-7
Cognitive attitude	6.51	0.71	1-7
Self-efficacy	5.94	0.93	1-7
Subjective norm	3.89	1.56	1-7
Moral norm	3.54	1.38	1-7
Conscientiousness	5.66	0.78	1-7
Anxiety	2.90	1.45	1-7
Planning failure	2.88	1.27	1-7
Information need	3.35	1.53	1-7

related to a longer donor experience, to most psychosocial characteristics, including attitudes, intentions, and norms, and positively associated with anxiety and planning failure. Comparative analyses between those donors who immediately lapsed after the medical check or the first donation and donors who lapsed after having made two or more donations showed that the early lapsed were higher on anxiety, lower on intentions, attitudes norms, and self-efficacy (exact results not shown but available on request).

### Cox regression models predicting nonmedical lapse on psychosocial characteristics

We estimated a series of univariate models, regressing non-medical voluntary lapse on psychosocial characteristics and control variables. In the univariate models, female donors had higher hazards to lapse compared to men and younger donors compared to older ones. Those donors who had higher donation/invitation ratios had lower hazards of lapse compared to less experienced donors. Being O- decreased the hazards of lapse compared to other blood types.

Higher intention to donate as well as higher positive affective and cognitive attitudes toward blood donation decreased the hazards for nonmedical lapse in the sample. Similarly, higher perceived self-efficacy and stronger moral and subjective norms were associated with lower hazards for nonmedical lapse. Higher donation-related anxiety and expected planning failure were associated with increased hazards for nonmedical lapse. Conscientiousness and the wish or need for information about blood use and patient

TABLE 2. Correlations of study variables\*

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Female	-0.09 <sup>c</sup>	-0.00	-0.05 <sup>a</sup>	-0.09 <sup>c</sup>	0.06 <sup>b</sup>	-0.07 <sup>c</sup>	0.09 <sup>c</sup>	-0.00	-0.06 <sup>b</sup>	0.02	0.09 <sup>c</sup>	0.15 <sup>c</sup>	-0.10 <sup>c</sup>	0.13 <sup>c</sup>	0.05 <sup>b</sup>
2. Age		0.04	0.23 <sup>c</sup>	0.04 <sup>a</sup>	0.11 <sup>c</sup>	0.08 <sup>c</sup>	-0.01	0.09 <sup>c</sup>	-0.16 <sup>c</sup>	0.06 <sup>a</sup>	0.30 <sup>c</sup>	-0.12 <sup>c</sup>	-0.23 <sup>c</sup>	-0.13 <sup>c</sup>	-0.07 <sup>b</sup>
3. O-			0.01	0.05 <sup>a</sup>	-0.01	-0.03	-0.00	-0.02	0.02	-0.01	0.00	0.04 <sup>a</sup>	0.00	-0.01	-0.05 <sup>b</sup>
4. Donations/invitations				0.38 <sup>c</sup>	0.15 <sup>c</sup>	0.14 <sup>c</sup>	0.05 <sup>b</sup>	0.12 <sup>c</sup>	-0.01	0.09 <sup>c</sup>	0.11 <sup>c</sup>	-0.09 <sup>c</sup>	-0.22 <sup>c</sup>	-0.07 <sup>c</sup>	-0.52 <sup>c</sup>
5. Experience <sup>†</sup>					0.14 <sup>c</sup>	0.12 <sup>c</sup>	0.05 <sup>a</sup>	0.11 <sup>c</sup>	0.07 <sup>c</sup>	0.08 <sup>c</sup>	0.03	-0.12 <sup>c</sup>	-0.12 <sup>c</sup>	-0.03	0.05 <sup>a</sup>
6. Intention						0.35 <sup>c</sup>	0.38 <sup>c</sup>	0.74 <sup>c</sup>	0.15 <sup>c</sup>	0.26 <sup>c</sup>	0.28 <sup>c</sup>	-0.28 <sup>c</sup>	-0.32 <sup>c</sup>	-0.09 <sup>c</sup>	-0.12 <sup>c</sup>
7. Aff. att.							0.36 <sup>c</sup>	0.33 <sup>c</sup>	0.10 <sup>c</sup>	0.18 <sup>c</sup>	0.17 <sup>c</sup>	-0.34 <sup>c</sup>	-0.25 <sup>c</sup>	0.02	-0.10 <sup>c</sup>
8. Cog. att.								0.34 <sup>c</sup>	0.12 <sup>c</sup>	0.11 <sup>c</sup>	0.21 <sup>c</sup>	-0.15 <sup>c</sup>	-0.20 <sup>c</sup>	-0.01	-0.06 <sup>b</sup>
9. Self-efficacy									0.11 <sup>c</sup>	0.17 <sup>c</sup>	0.27 <sup>c</sup>	-0.30 <sup>c</sup>	-0.34 <sup>c</sup>	-0.15 <sup>c</sup>	-0.12 <sup>c</sup>
10. Subj. norm									0.11 <sup>c</sup>	0.36 <sup>c</sup>	-0.01	0.03	0.01	0.18 <sup>c</sup>	-0.06 <sup>b</sup>
11. Moral norm									0.11 <sup>c</sup>		0.10 <sup>c</sup>	-0.03	-0.09 <sup>c</sup>	0.14 <sup>c</sup>	-0.08 <sup>c</sup>
12. Conscient.									0.11 <sup>c</sup>		0.10 <sup>c</sup>	-0.17 <sup>c</sup>	-0.35 <sup>c</sup>	-0.00	-0.04 <sup>a</sup>
13. Anxiety									0.11 <sup>c</sup>		0.10 <sup>c</sup>	0.20 <sup>c</sup>	0.20 <sup>c</sup>	-0.00	0.13 <sup>c</sup>
14. Planning fail.									0.11 <sup>c</sup>		0.10 <sup>c</sup>	0.20 <sup>c</sup>	0.20 <sup>c</sup>	0.05 <sup>b</sup>	-0.01
15. Info need									0.11 <sup>c</sup>		0.10 <sup>c</sup>	0.20 <sup>c</sup>	0.20 <sup>c</sup>	0.05 <sup>b</sup>	-0.01
16. Lapse									0.11 <sup>c</sup>		0.10 <sup>c</sup>	0.20 <sup>c</sup>	0.20 <sup>c</sup>	0.05 <sup>b</sup>	-0.01

\* <sup>a</sup>p < .05; <sup>b</sup>p < 0.01; <sup>c</sup>p < .001.

<sup>†</sup> Novice donor (1-5 donations) or experienced donor (>5 donations); 0 = novice, 1 = experienced.

Aff. Att = affective attitudes; Cog. Att = cognitive attitudes; Subj norm = subjective norm; Conscient. = Conscientiousness; Planning fail = planning failure; Info need = need for information; Lapse = voluntary lapse (0 = no, 1 = yes).

TABLE 3. Univariate Cox regression models predicting lapse by study variables

Variables	Hazard ratio	95% CI	p value
Female	1.17*	1.026-1.338	0.020
Age	0.99*	0.987-0.997	0.003
Blood group O-	0.72*	0.567-0.907	0.006
Ratio number donations/invitations	0.02*	0.016-0.029	0.000
Donation experience	0.09*	0.080-0.104	0.000
Intention	0.83*	0.783-0.880	0.000
Affective attitude	0.87*	0.819-0.915	0.000
Cognitive attitude	0.88*	0.818-0.955	0.002
Self-efficacy	0.84*	0.785-0.887	0.000
Subjective norm	0.94*	0.906-0.980	0.003
Moral norm	0.91*	0.873-0.954	0.000
Conscientiousness	0.93	0.864-1.007	0.075
Anxiety	1.11*	1.061-1.152	0.000
Planning failure	1.17*	1.117-1.228	0.000
Information need	0.99	0.951-1.030	0.616

\* p < .05

treatment did not significantly predict hazard rates for non-medical lapse in our sample.

Next, we estimated a final multivariate model, including all predictors. We found higher hazards of lapse for female and younger donors and lower hazards to lapse for a greater donation/invitation ratio. In addition, intention to donate remained a significant protective factor against lapse. Anxiety increased the hazards of lapse and information need became significant in the multivariate model, in the sense that donors with a higher wish for information about procedure and patients had decreased lapsing risks. In contrast to our expectations and earlier studies, higher levels of conscientiousness did not protect donors from lapsing (cf. Table 3).

## DISCUSSION

This study was developed to extend prior knowledge on the link between blood donor characteristics and donation behavior.<sup>29,39,40</sup> Given the ongoing decreases in donor numbers and high percentages of lapsing donors,<sup>4</sup> understanding which donor characteristics either protect new donors from lapsing or decrease their risk for *voluntary nonmedical lapse* is of utmost importance. We examined whether psychosocial characteristics and personality influence voluntary noncompliance in the context of blood donation. More specifically, we investigated whether donation intentions, attitudes, and conscientiousness, measured before the first donation, relate to voluntary nonmedical lapse. In extending previous work, we tried to identify specific factors, measured before the first donation, that contribute to explaining voluntary *lapse* for nonmedical reasons. Hence, we aimed to identify avenues for improved recruitment and retention efforts. Most of our results were in line with expectations, pointing to the universal importance of specific individual factors in explaining

**TABLE 4. Multivariate Cox regression models predicting lapse by study variables**

Variables	Hazard ratio	95% CI	p value
Female	0.87	0.752-1.010	0.068
Age	1.01*	1.003-1.016	0.004
Blood group O-	0.76*	0.598-0.972	0.029
Ratio number donations/ invitations	0.27*	0.186-0.399	0.000
Donation experience <sup>†</sup>	0.14*	0.112-0.163	0.000
Intention	0.91	0.822-1.009	0.072
Affective attitude	1.05	0.971-1.134	0.224
Cognitive attitude	1.04	0.942-1.136	0.476
Self-efficacy	0.97	0.879-1.080	0.617
Subjective norm	0.99	0.945-1.034	0.621
Moral norm	1.00	0.953-1.056	0.901
Conscientiousness	1.09	0.992-1.194	0.074
Anxiety	1.06*	1.005-1.123	0.032
Planning failure	0.97	0.919-1.029	0.332
Information need	0.91*	0.871-0.953	0.000

\*  $p < .05$ .

<sup>†</sup> Donation experience indicates whether donor is a first-time, novice (1-5 donations), or experienced donor (>5 donations).

donor behavior. Most of the variables predicted nonmedical lapse in the expected direction in the univariate analyses, while multivariately, only few variables remained significant predictors of lapse. Interestingly, all psychosocial characteristics were unique predictors of nonmedical voluntary lapse, none predicted medical lapse (analyses are available from the authors on request). In addition, our study indicates that specific psychosocial characteristics, for example, anxiety, in particular blood donation related, indicated by fear of needles or nervousness, at the very beginning of one's donor career, can influence donor behavior, and more specifically lapse, over several years. Most predictors stemming from the theory of planned behavior framework, such as positive attitudes and norms, have been found to determine repeat donation, measured as donor return.<sup>21,27</sup> The fact that these did not reversely determine donor lapse is interesting and shows that repeat donation and donor lapse are two distinct processes, depending on different psychosocial factors. Below, we elaborate on our results, relate them to other fields of health and prosocial behavior, and discuss strengths and limitations of this study.

#### **Psychosocial characteristics and health behavior: the case of blood donation**

Similar to earlier blood donor research, positive attitudes and intentions toward blood donation prevent donors from lapsing.<sup>22</sup> A high blood donation intention has been repeatedly identified as important predictors of actual blood donation. Indeed, within blood, stem cell, and organ donor research, the theory of planned behavior<sup>20</sup> is widely used<sup>21,31,41</sup> to explain variation in donor behavior, especially for repeat donation. However, critique for this theoretical approach addresses its explanatory power for intentions but to a much lesser extent for behavior.<sup>30,42,43</sup> In this study we

could identify various psychosocial characteristics that add to predicting repeat donation, as the opposite of donor lapse. In addition to positive intentions, we found predictive effects of donation attitude, norms, and self-efficacy. However, in our multivariate model only few predictors remained significant determinants. Most variables that have been included in the theory of planned behavior were not predictive of donor lapse in the multivariate model, indicating that norms and attitudes are less important for behavior than intentions. Interestingly, personality traits, in particular conscientiousness, were not associated with donor lapse.

Given prior work on the important direct and indirect role of anxiety in both health and blood donation intention and behavior,<sup>12,16,25,44</sup> it was not surprising that we found a positive association between self-reported anxiety and higher hazards of voluntary lapse from the donor pool. Interestingly, in this study baseline donation-related anxiety, measured before the first donation, could directly predict donor lapse up to 4 years later and beyond. Such evidence offers important knowledge to develop interventions that focus on reducing anxiety, both at the beginning and throughout the donor career.

In addition, we obtained several other interesting results. Donors who, at the beginning of their donor career, indicated that they wished for information about the blood transfusion chain, including processing of blood products and patient information, had decreased risks of lapsing. This may be important initially when the process is new and novel, and the information gives people some sense of control over the process.<sup>18,45</sup> We also think that this might indicate more binding, commitment, and identification with the blood bank and commitment to being a blood donor, hence beneficial for a continuous donor career. Besides, it may also be an indicator of a monitoring coping style in dealing with donation-related anxiety, as increased information seeking might increase perceived control over the donation process. Contrary, less information seeking would indicate blunting, often accompanied by sustained high anxiety and hence higher lapsing risk.<sup>46</sup> Investing in information material and processes before and during the beginning donor career might be a useful effort to increase long-term binding, commitment, and hence repeat donation. However, this may only be the case in those who want information—that is, those with a monitoring information style. For those who are blunterners and do not want information, the provision of information may be detrimental. Thus, the relative balance of blunterners and monitors in a donor sample may influence how effective the provision of information is. It may be better to always offer information and allow the donor to choose if they want it. Thus, future research should examine (both qualitatively and quantitatively) what this “need for information” is exactly, how it works, and how it can be utilized for donor retention.

Furthermore, donation experience proved to be a protecting factor for donor lapse. Those with more previous lifetime donations have more experience with the procedure

and may therefore be less anxious and tense when donating. Another explanation might be that either more anxious donors lapse sooner (which is the case in the current data—donors who had lapsed after one donation had higher values on anxiety compared to those donors who lapse after more than one donation) and/or anxiety leads to vasovagal reactions, which leads to medical deferral.<sup>24,43</sup>

Although representing novel evidence on the association between psychosocial donor characteristics and blood donor behavior, in particular, donor lapse, this study is not without limitations. First, it should be noted that only a selection of psychosocial characteristics could be examined in association with donor behavior. Personality traits included conscientiousness only, although prosocial traits such as agreeableness have also been suggested as determinants of donor behavior. Second, the study focused on Dutch donors in a Dutch blood bank system. The question about generalizability of the current results to other populations of donors in other countries and the universal or contextual nature of determinants remains elusive.

In conclusion, the totality of the presented theory and data suggest that positive donation intention has a consistently positive relation with continuous blood donation, but that donor lapse has different psychosocial determinants than donor return. Anxiety again could be identified as important barrier for an ongoing donor career. In addition, and interestingly for policy making and blood banking, binding with the blood bank and interest in transfusion chain and patient treatment has been identified as important protectors against donor lapse. Hence, future research and policy efforts might consider more information provision and investing in binding with the blood bank in order to safeguard a stable and loyal donor population.

## CONFLICT OF INTEREST

The authors have disclosed no conflicts of interest.

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