Using an extended Theory of Planned Behavior to predict a change in the type of blood product donated

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ABSTRACT

Background: Demand for essential plasma-derived products is increasing.

Purpose: This prospective study aims to identify predictors of voluntary non-remunerated whole blood (WB) donors becoming plasmapheresis donors.

Methods: Surveys were sent to WB donors who had recently (recent *n*=1,957) and not recently donated (distant *n*=1,012). Theory of Planned Behavior (TPB) constructs (attitude, subjective norm, self-efficacy) were extended with moral norm, anticipatory regret and donor identity. Intentions and objective plasmapheresis donation for 527 recent and 166 distant participants were assessed.

Results: Multi-group analysis revealed that the model was a good fit. Moral norm and self-efficacy were positively associated while role identity (suppressed by moral norm) was negatively associated with plasmapheresis intentions.

Conclusions: The extended TPB was useful in identifying factors that facilitate conversion from WB to plasmapheresis donation. A superordinate *donor* identity may be synonymous with WB donation and, for donors with a strong moral norm for plasmapheresis, may inhibit conversion.

Keywords: blood donation; plasma donor; behavior change; identity; moral norm; Theory of Planned Behavior

Multiple blood products are required for life-saving transfusions and specialized medical treatments each and every day. In Australia, as in many other countries (e.g., Canada, the

Netherlands), red blood cells, plasma, and platelets are voluntarily donated blood products essential for sustainable healthcare systems. Plasma and plasma-derived products such as intravenous immunoglobulin are used in the treatment of neurological, haematological, and immunological conditions (1). As the ageing population expands (2, 3) and additional treatments for age-related conditions become available, demand for plasma-derived products (4, 5) will increase in Australia (1), consistent with international trends (6, 7). Plasma donated via apheresis donation (i.e., plasmapheresis donation) is preferred, as it provides a higher plasma volume yield per donation than whole blood (WB) donation (4).

Despite the growing demand and the critical role played in health systems, very little is known about plasmapheresis donors within voluntary non-remunerated settings. Critically we do not know how and why donors transition from WB to apheresis donation (8). For safety and assessment purposes, many countries recruit plasmapheresis donors through WB donation and do not recruit direct to plasmapheresis. If eligible, donors who have successfully completed one or more WB donations are encouraged to convert to plasmapheresis (9). However, the mechanisms which facilitate or deter this transition are unknown.

This gap in our knowledge is a critical one. Identifying these factors will allow blood collection agencies (BCA)s to support and encourage WB donors' transition to apheresis donation and contribute to efficiently meeting plasma demands. Although plasmapheresis donation behavior shares characteristics with WB donation (e.g., physical preparation such as hydration required, appointment and attendance at same venue, needle insertion, withdrawal of body fluids), there are a number of key differences between the two behaviors. Plasmapheresis takes approximately 3 to 4 times longer than WB donation and

also involves the return of fluids (i.e., donors' red blood cells and, in some countries, saline) to the donor. Bagot et al. (9) found in a preliminary qualitative analysis that these differences in procedure were deterrents to WB donors converting to plasmapheresis.

Within a non-remunerated context, to date only two qualitative studies (9, 10) and three quantitative studies (11-13) have been published on plasmapheresis conversion. The two quantitative studies draw on the Theory of Planned Behavior (TPB; 14) and sought to predict plasmapheresis panel membership. In the TPB, intention is the proximal determinant of behavior and intention is determined by attitude (positive or negative cognitive or affective evaluations of engaging in the behavior), subjective norm (perceived social pressure to engage in the behavior) and perceived behavioral control (PBC; perceived control over performing the behavior) and/or self-efficacy (perceived confidence in performing the behavior; (see Figure 1; 14, 15)

Veldhuizen and van Dongen (2013, (11) asked donors who had registered to donate but who had yet to make their first WB donation to complete a survey. In this survey donors' intentions to donate regularly over the next two years, cognitive and affective attitudes, subjective norm and self efficacy with regard to donating were assessed. In this analysis, the TPB framework was extended by assessing participants' moral norms (personal values or sense of moral obligation) with regard to donation, anxiety about blood donation and their level of conscientiousness. For those who subsequently made a donation (83% of the sample) the type of donation made – plasma or whole blood – was recorded. Those who had converted to plasma from whole blood (7.4%) during the behavioral observation period had higher intentions, stronger self-efficacy, more positive attitudes, higher levels of conscientiousness and lower anxiety at recruitment than those who remained whole blood

donors. This led the authors to conclude that differences existed between WB and plasmapheresis donors prior to any donation being made. In regression analyses predicting intention to donate, self-efficacy and cognitive attitudes emerged as the only significant predictors of intention in the plasma sample, with the predictors accounting for 50% of the variance in intention to convert.

The factors that facilitate conversion of WB donors to plasmapheresis were not specifically targeted in the analysis by Veldhuizen and van Dongen ((11) and a model of conversion not tested. Godin and Germain (2013, 9) provided eligible current WB donors, the majority of whom (86%) were repeat donors, with information about plasmapheresis and gave them the opportunity to ask questions. These donors then completed a TPB survey assessing intention, attitude, subjective norm and PBC (operationalized as donors feeling confident and capable of overcoming obstacles) with regard to donating plasma within the next 6 months. Subsequent plasma donation behavior was tracked six months later. Analyses showed that 22.6% of participants made one or more plasma donations in the follow up period. Intention to donate and age positively predicted behavior, while attitudes and PBC were significantly positively associated with intention to donate, accounting for 77% variance in this variable. Subjective norm, gender, donor status (i.e., first or repeat WB donor) and age were not significantly associated with intention to convert.

Although both of the quantitative analyses published to date (11, 12) have used a TPB framework and assessed intentions and behavior, neither analysis comprized a predictive model incorporating the TPB constructs, intention and behavior simultaneously. To date, there are no studies using an extended TPB with current WB donors to predict their first plasmapheresis donation and the aim of the current study is to address this gap. Extending

the base TPB with variables that explain unique variance and that are theoretically congruent has been done in numerous studies across a range of behavioral domains (16-19) and in one (12) of the two published quantitative plasmapheresis analyses . In the context of WB donation, the unique contribution of a number of constructs has been evaluated (e.g., 20, 21-23) and three constructs consistently emerge as explaining additional variance to that accounted for by the standard TPB predictors (for a review, see 24). These are moral norm, anticipatory regret, and role identity.

As noted, moral norm refers to an individual's view of whether engaging or not in a particular behavior is the right or wrong thing to do (25, 26) and can guide behavioral decisions. Consistent with Schwartz's norm activation model within a prosocial context (27), moral norm has been positively associated with intentions to donate WB (20, 28) and this relationship may extend to plasmapheresis donation. In a meta-analysis of motivators to donate, 81% of apheresis donors from two separate samples endorsed personal moral norm as a motivator (8) while a recent qualitative analysis identified an obligation to donate plasma as a trigger for commencing plasmapheresis within a non-remunerated context (10). Although in a preliminary analysis moral norm did not play a significant role predicting prospective plasmapheresis panel membership (11), theoretically moral norms could predict plasmapheresis donation. An examination of moral norm in closer proximity to donation behavior is warranted.

Anticipated regret motivates behavior through a want to avoid the negative feelings individuals believe they will experience if they do not perform the behavior (e.g., 29). Anticipated regret has been suggested as a construct that may account for the affective nature of blood donation, typically absent in cognitive, rational accounts of donation

behavior (24). Consistent with this, anticipated regret has been previously positively associated with intentions to donate WB (22, 30), more strongly for donors early in their WB donation career than more experienced donors (28). This may suggest that anticipatory regret is likely to influence intentions to donate plasmapheresis for the first time. Retrospective qualitative work has identified that, for some plasmapheresis donors, the belief that plasma is more helpful or useful than WB was a trigger to commence plasmapheresis donation (10). Such a belief among WB donors may result in them anticipating regret if they do not convert to plasmapheresis and this may, in turn, facilitate conversion. However, the role of anticipated regret in commencing plasmapheresis donation has yet to be systematically examined.

Finally, self or role identity reflects an individual's perception of themself within society, which, based on Identity Theory, influences behavior to be consistent with that identity (e.g., 31). In a recent meta-analysis, identity emerged as a significant predictor of behavioral intentions in addition to TPB constructs, for a range of behaviors including health and altruistic behaviors (18). It has been suggested to be a useful addition to the TPB to account for internal motivations for donation (24). Indeed, identifying as a donor has been associated with intentions to donate and WB donation (20, 32-34). Such motivations are proposed to be more strongly associated with donation behavior once the donor moves from being a novice to a more experienced donor (34). When such an identity forms is unclear however, with recent work suggesting it may be as early as after the first (33) or as late as after 10 donations (35). As plasmapheresis donors are recruited from the WB donor panel, the strength of donors' role identity is likely to vary as a function of donors' prior WB donation history. Drawing on this, it is expected that a stronger donor identity, stemming

from a larger number of prior WB donations, may facilitate conversion to plasmapheresis so that donors can meet behavioral expectations consistent with their identity as a donor. However, how donor identity influences people's intentions to donate plasmapheresis has not yet been explored.

The present study

This study will identify key psycho-social factors which predict WB donors making their first plasmapheresis donation. Based on the WB donation literature and preliminary apheresis donor research, it is anticipated that an extended Theory of Planned Behavior will be a useful framework through which to predict WB donors' first plasmapheresis donation (see Figure 2). More specifically, and consistent with TPB, it is hypothesized that intention to make a first plasmapheresis donation will be determined by attitude, subjective norm, and self efficacy. In addition, we predict that WB donors' moral norms, anticipatory regret, and donor identity will also significantly positively relate to intention to make a first plasmapheresis donation. This model will be examined with two samples of WB donors; donors who are asked to consider plasmapheresis donation at the time of a WB donation (i.e., recent sample), and those who are contacted by phone between three and twelve months since their last WB donation (i.e., distant sample). This will allow an examination of the replication of the proposed explanatory theoretical model with two samples relevant to BCA operational practices.

Method

Participants

After screening (see Figure 1), there were 527 (55% male, *M*=40.74, *SD*=12.73 years, 53% with ≤ 4 WB donations) recent donors' surveys and 166 (53% male, *M*=40.10, *SD*=12.88 years, 55% with ≤ 4 WB donations) distant donors' surveys eligible for analysis. Both samples were representative of the WB panel in terms of age (*M*=40.78, *SD*=16.43 years in WB panel with no plasmapheresis donations), donor career (53% with ≤ 4 WB donations), and average bleed times (*M*=8.34, *SD*=1.88 minutes). Men were overrepresented in our samples compared to the total WB panel (47% male).

Application of a strict screening procedure ensured that all participants retained for analyses were eligible to make their first plasmapheresis donation (e.g., weight, age, prior successful WB donation, no medical reason or advice to exclude). In addition, application of these strict criteria excluded any participant who reported an issue at their most recent WB donation and/or during the behavior observation period (e.g., adverse event, deferral).

Procedure

Two separate samples were recruited during an eight week period between February and April 2012, with the behavior follow up period concluding on 22 August 2012. All participants experienced the usual business practice of the BCA of recruiting a WB donor to make a plasmapheresis donation; that is, WB donors were engaged in conversations with donor centre staff while attending donor centres for WB donation or were telephoned specifically to ask to make their first plasmapheresis donation. Typical conversation content included ascertaining if donors were aware of plasmapheresis donation, discussion of how plasma was used and a statement of eligibility criteria (such as vein size). Donors in each sample were sent the same questionnaire package that included a personalized letter asking donors to complete the enclosed questionnaire, along with survey completion facilitators of

a pen and two teabags. Reminder postcards were sent to those who had not returned their survey within two weeks.

For the recent sample, the conversion communication occurred face-to-face at the Donor Center (*n*=18) the donor was attending for a WB donation. Surveys were sent to these donors (*n*=1,957) on average two days (*M*=2.13, *SD*=1.49 days) after the conversation. A response rate of 51% (993 returned) was achieved, excluding 19 that were unable to be delivered. The distant sample (from *n*=60 Donor Centers) received a telephone call from the national BCA Call Centre. Surveys were sent to these donors (*n* = 1,012) between 4-11 days (*M*=7.24, *SD*=2.74 days) of the conversion conversation by the Call Centre and a response rate of 32% (1012 sent, 328 returned) was achieved. The difference in survey administration period was due to BCA reporting practices and logistical issues while the lower response rate of the distant sample (32%) when compared to the recent sample (51%) may reflect the recency of donor engagement with the BCA. The recent sample had been actively engaged in blood donation, on average, approximately 2 days prior to the survey being administered. The distant sample, however, had received a phone call from the BCA and although had donated WB in the prior 12 month period, had not attended a donor centre and donated WB for, on average, approximately 5.6 months.

Measures

Participants in both samples completed an extensive survey from a larger study examining donors' experience with the BCA; only questions relating to the extended TPB are reported here. All items were previously used in the context of WB donation (20, 21, 30, 36), were adapted to the target behavior to "make a plasma donation" (for items see Table 1) and had a Flesch-Kincaid grade level reading score of 6.6. Responses were made on a 7 point Likert

scale (1= *strongly disagree*, 7= *strongly agree*) while attitude was assessed on a series of 7 point semantic differential scales. Higher scores reflected stronger endorsement of each variable. Reliability co-efficients are reported in Table 1, with good to excellent results for all measures.

Demographics (age and sex) were requested. The number of WB donations for the previous 5 years (determined by national record availability) was provided by the BCA and subsequent behavior was determined via donor records provided by the BCA for each participant. Plasmapheresis donation behavior was coded as 1 (*yes, made a first plasmapheresis donation*) or 0 (*no, did not make a first plasmapheresis donation*).

Statistical Analyses

Analyses were conducted using Mplus 7.11 (37). A multi-group measurement model was conducted to assess the compilation of constructs. A series of confirmatory factor analyses (CFA) using the maximum likelihood estimator with robust standard errors (MLR) was used. The aims of these analyses were to test the expected factor structure of our measures, ensure discriminant validity among the factors, and to test for measurement invariance between the two groups. We then tested a structural model based on our hypotheses about the factors leading to plasma conversion. Preliminary analyses indicated no effect of sex and age on intention and these were excluded from further analyses. As the dependent variable (plasma conversion) was dichotomous, we tested these models using the robust weighted least squares estimator (WLSMV) (38). The varying length of the observation behavior period was controlled for within structural analyses to account for the staggered recruitment over an eight-week period. Model fit was examined using three indices: a non-significant chi-square (χ^2), a comparative fix index (CFI) above 0.95, a root mean square

error of approximation (RMSEA) below 0.08 and for the CFAs a standardized root mean square residual (SRMR) below 0.05 (38). A significant χ^2, however, is acceptable due to issues with sample size (38).

Results

Measurement model

We tested an initial measurement model using the combined dataset from the two groups in order to test a seven-factor model. The factors included attitudes towards plasma donation, self-efficacy, subjective norm, moral norm, anticipated regret, donor role identity, and intention to donate. We removed items if they appeared to be redundant (i.e., if two items were similarly worded and the residual correlation matrix suggested a covariance between them not explained by the common factor), were cross-loading with other factors, or if the standardized factor loadings were very low (i.e., below .5). Based on these criteria, three items were removed (2 from attitudes towards plasma donation – *Unsatisfying/Satisfying, Unrewarding/Rewarding*, and 1 from role identity – *Being a donor is something I rarely think about*).

After the final set of items had been determined, we tested a full measurement model with all seven scales. This model yielded the following fit statistics: $\chi^2(117) = 310.691$, CFI = 0.971, RMSEA = 0.049, SRMR = 0.042. Although the approximate indices of fit suggested a close fit to the data, the chi-square was significant. In order to diagnose possible sources of misfit, we examined the modification indices and the residual correlation matrix. Inspection of both revealed a small number of residual correlations that were not explained by the model. These correlations appeared to be small and unsystematic, and as there were no strong

theoretical grounds on which to respecify the model, we opted to retain the original measurement model.

In the next step, we employed two methods to test the discriminant validity of each of the factors. The first method involved inspecting the 99% confidence intervals of the correlation between each of the factors to see whether it included 1. The largest correlation was between anticipated regret and moral norm (r = .80), but the upper limit of the 99% confidence interval (0.73, 0.86) did not include 1. The second method involved using Satorra and Bentler's (39) scaled chi-square difference test (χ_D^2). Specifically, we scaled the latent variables so that each had a variance of 1, and then examined the change in model fit after fixing the correlation between each pair of factors to 1. This constraint produced significantly worse model fit for all pairs of variables, smallest $\chi_D^2(1) = 343.464$, $p < .001$. Collectively, these tests provide evidence of the discriminant validity of each measure.

We then proceeded to test the measurement equivalence of the two groups using a multi-group CFA. We first tested a configural invariance model, in which the factor structure was the same between the two groups, but the factor loadings, observed variable intercepts and residual variances were freely estimated. The configural model produced favorable fit statistics: $\chi^2(234) = 435.404$, CFI = 0.971, RMSEA = 0.050, SRMR = 0.046. We next tested a metric equivalent model, in which the factor loadings were constrained to be equal between the two groups. This model also produced favorable fit statistics, $\chi^2(238) = 438.448$, CFI = 0.971, RMSEA = 0.049, SRMR = 0.046, and did not worsen model fit compared to the configural model $\chi_D^2(4) = 3.309$, p = .508. Next, we tested a scalar invariance model, in which both the factor loadings and intercepts were constrained to be equal. The latent variable means of the recent group were freely estimated, whereas the

means of the distant group remained fixed at zero. This model also produced favorable fit, $\chi^2(249) = 458.609$, CFI = 0.970, RMSEA = 0.049, SRMR = 0.047, and did not worsen model fit compared to the configural model, $\chi_D^2(15) = 23.109$, $p = .082$. Finally, we tested a strict invariance model, in which the factor loadings, intercepts and residual variances were constrained to be equal. This model was a close fit to the data, $\chi^2(267) = 461.524$, CFI = 0.972, RMSEA = 0.046, SRMR = 0.049, and did not worsen fit compared to the configural model, $\chi_D^2(33) = 38.027$, $p = .251$. As a result, we used the strict invariance model in the subsequent analyses. This model is presented in Table 1.

Structural model

Examination of the mean, standard deviations and correlations of variables (see Table 2) show that respondents' scores on constructs were above the scale mid-point except for anticipatory regret. Self efficacy [$t(690)=2.61$, $p<.01$] and moral norm [$t(691)=2.31$, $p<.05$] were significantly higher in the recent than the distant sample. Significant correlations were observed between all variables and intention for both groups.

We then tested an initial structural model in which the path coefficients were freely estimated between groups, which produced a close fit to the data, $\chi^2(337) = 421.422$, CFI = 0.964, RMSEA = 0.027. We then tested a more stringent model, in which the structural path coefficients were constrained to be equal between the two groups. This model also provided a close fit to the data, $\chi^2(345) = 435.827$, CFI = 0.962, RMSEA = 0.028, and did not produce significantly worse model fit, $\chi_D^2(8) = 13.789$, $p = .0874$. We used the parameter estimates from this latter model in order to evaluate our hypotheses. Figure 2 presents this structural model, as well as the factor mean differences between groups and latent factor standard deviations.

As can be seen from Figure 2, intention to convert to plasma was predicted by self-efficacy and moral norm. The relationship between positive attitude toward plasma donation and intentions approached significance. Contrary to expectations, donor role identity was significantly negatively associated with intentions. The effects of the other variables in the model were non-significant.

While the structural paths were not found to differ between the two groups, differences were observed between the factor means. Specifically, moral norm was significantly higher in the recent group compared to the distant group. The recent group also showed a greater proportion of conversions (17.5% vs. 7.8%) and this difference was significant, $\chi^2(1) = 12.886$, $p < .001$. The intercept of the intentions measure (i.e., the estimated intentions score when the value of each predictor is assumed to be zero) did not differ significantly across groups, $\alpha = -0.06$, $p = .66$. While similar levels of variance in intention were accounted for with both groups (recent 55.3% and distant 53.4%), intention accounted for a higher percentage of behavior in the recent sample (45.2%) than in the distant sample (35.1%).

Although the correlation between role identity and intention was positive for both samples (see Table 2) as expected, a negative beta weight was recorded, indicating that a variable was removing irrelevant variance from the outcome variable from the predictor variable; that is, negative (40, 41) or cross-over (42) suppression. As recommended (40, 42), the suppressor structure revealed was retained within the model results, not deleted or ignored and, so, further exploration of this finding took place. A series of exploratory regressions (see Table 3) indicated that, on its own, role identity was positively associated with intention (β=.15, p <.001, β=.16, p <.05) for both recent and distant samples respectively; however,

the inclusion of additional variables affected the relationship (43). In particular, the inclusion of the extended TPB predictors (i.e., attitude, subjective norm, self efficacy, anticipatory regret, and moral norm) resulted in role identity becoming a significant negative predictor (β=-.10, p <.01, β=–.14, p <.001) of intention for both recent and distant samples respectively. Additional analyses revealed that moral norm was the key suppressor variable and suppressing (or removing) the irrelevant variance of intention to make a plasmapheresis donation from role identity.

Discussion

This study employed an extended TPB framework to examine the psychological factors which impact on whether WB donors will engage in plasmapheresis donation. Two samples were employed which differed in the proximity of participants' prior WB donation behavior to the request to make a plasmapheresis donation. Model invariance was achieved with both groups and in line with prior WB (28, 30, 33) and plasma (11, 12) research, intention to become a plasmapheresis donor was positively associated with conversion.

Consistent with prior WB (30, 33, 44) and preliminary plasmapheresis research (11, 12), subjective norm was not associated with intentions for either sample. However, inconsistent with prior donation research, attitude was not a predictor of intention. This finding may reflect the 'experienced' nature of our sample (albeit with WB), suggesting a development in the motivation of donors away from intention being the product of rational decision-making (24) or, alternatively that the inclusion of other predictors in our extended TPB decreased the unique variance accounted for by attitudes. Anticipated regret was also not a significant predictor of donors' intention to make a first plasmapheresis donation. This study provides the first exploration of the role of anticipatory regret with plasmapheresis

donations and the results are inconsistent with prior WB work (22, 28, 30, 45). One possible explanation is that the potential benefits (e.g., helping more) did not outweigh the costs associated with donating plasmapheresis (e.g., extended period of time required, return of fluids) and thus low to moderate levels of anticipated regret could be countered by deciding to continue with WB donation. To increase the potential benefits, the value of plasma-derived products may be highlighted for conditions that are well known within the general public, such as immunisations for measles, chicken pox or tetanus or to prevent infections or treat severe burns. However, as indicated below, caution is warranted as not all donors can, nor should engage in plasmapheresis.

The strong association of self efficacy with intention is consistent with the findings of prior WB (20, 30) and plasmapheresis (11, 12) donation research. This result suggests that increasing donors' perceived ability or capability to perform plasmapheresis donation will facilitate WB donor conversion to plasmapheresis. Research indicates that approximately one-third of donors do not understand the plasmapheresis process, are uncomfortable about the idea of blood replacement, and/or fear of contamination of returned fluid (9). Research by France and colleagues (44, 46, 47) into interventions to bolster self efficacy for WB donation suggests that addressing these specific critical control beliefs could bolster donors' perceptions of their capability to engage in plasmapheresis donation.

Moral norm was also strongly associated with intention to make a plasmapheresis donation. This finding is in stark contrast to prior plasmapheresis research where pre-donors' moral norm was not associated with subsequent plasmapheresis donors' intention to regularly donate blood (11). Although the samples across both studies report moderate levels of moral norm, distinct differences in the methodology may account for the different

relationships observed. Veldhuizen and van Dongen (11) examined behavior two years after survey completion and assessed their predictor constructs in relation to the general behavior of 'donating blood' or 'being a blood donor'. In the current analysis, participants were specifically asked to consider plasmapheresis donation and the likely content of this conversation would have included the specific suitability of that individual donor for plasma donation: 'your veins are ideal for apheresis', 'plasmapheresis is the best donation type for your blood type' and 'plasma can be made into multiple products'. Further, in the current analysis the behavioral assessment took place within 4-6 months of survey completion and participants responded to items tailored specifically to plasmapheresis donation. Further, Veldhuizen and van Dongen's (11) measure of moral norm included items which appear to be theoretically closer to anticipatory regret as their focus is on guilt, another self-conscious emotion (45). This low face validity may account for the relatively low reliability coefficient (α=.65) reported (11).

Although the causal effect of moral norms has been established (48) and moral norm was identified in the current analysis as a potential target for interventions to induce stronger intentions to make a first plasmapheresis donation, moral norms are potentially difficult to intervene on (27, 49). Attempts to induce moral norms in individuals by external sources rather than internal factors can lead individuals to attempt to correct for their perceived influence (49), even to decreasing the desired behavior (50). Further, the strong positive correlation observed between anticipatory regret and moral norm in both samples suggests that, for those donors who feel a strong sense of responsibility to donate, they will also anticipate feeling regret if they do not follow through behaviorally. Although only correlational in nature, these results suggest that it may be critical that BCAs exercise

caution when considering emphasising a sense of responsibility or obligation to donate plasmapheresis in their communications as not all WB donors are eligible (e.g., vein suitability) nor is it desirable to the BCA for them to convert (e.g., the universal blood donor with O negative). Being unable to follow a strong internalized motivation to make a plasmapheresis donation may yield negative emotions that may decrease a donor's intention to donate WB. Ensuring all donors receive positive messages regarding the donation types they are eligible for, including the structure of reward systems, could facilitate donor retention across donation panels.

Adding to the difficulty of initiating interventions targeting moral norms is the complex interplay of this construct with role identity observed in the current analysis. In the context of blood donation behavior, assuming a donor identity is generally considered as desirable (24, 33, 34, 51). A donor with a strong role identity is theorized to be self-motivating and resilient in their donation behavior (24). However, the relationship of role identity to intention to become a plasmapheresis donor was negative, with suppression via moral norm occurring. While previous analyses in other behavioral domains (e.g., diet; 52) and in whole blood donation (e.g., 20) have not observed such an interplay between these constructs, it is notable that the suppression effect was constant across both samples and so less likely to be a chance finding (42). Although unexpected and contrary to initial theoretical proposals, this finding may provide a critical insight to the role of identity in influencing a change in donation intentions and subsequent behavior. As the intention of a WB donor to make a plasmapheresis donation is influenced by a myriad of constructs (including, but not limited to, those constructs assessed in this analysis), determining the circumstances that identity has a positive or negative influence on donation intentions is key to ensure BCA

interventions are appropriately targeted.

The role identity assessed in the current studies was a general 'donor' one. Based on broad (18, 31) and WB donor-specific (20, 32, 33) identity literature, it was expected that donors would not form a plasma specific identity before completing a plasmapheresis donation (24). Donors sampled in the current analysis had only experienced WB donation, and therefore it is likely that their role identity was specific to WB (i.e., the participants would identify as WB donors making WB donations rather than general donors making any type of donation). While engaging in plasmapheresis is still clearly a donation behavior, it is possible that making a plasmapheresis donation would be viewed by donors as being incongruent and potentially threatening to their WB donor identity (53, 54); that is, they consider themselves WB donors, not plasma donors. In turn, donors with a strong WB role identity would be unlikely to intend to engage in identity incongruent behavior. A somewhat similar pattern of results has been previously observed in the analysis of Grube and Piliavin (2000) (55). In this analysis, focused on volunteers sampled from the American Cancer Society, they assessed a behavior specific role identity (that is, volunteering for the American Cancer Society) in relation to a number of outcome variables, including hours spent volunteering for organisations other than the American Cancer Society. Consistent with the results of the current analysis, Grube and Piliavin (2000) reported a significant negative association between the behavior specific role identity and volunteering for other organisations (55). Despite the behavior being requested (i.e., volunteering) being consistent at a meta-level with the specific role identity developed (i.e., volunteering for the American Cancer Society), the behavior specific nature of the developed role identity seemed to deter this broader volunteering.

Although we cannot be sure whether WB donors responded to our general items with their current WB donation behavior solely in mind, recent qualitative work examining deterrents to plasmapheresis provides some evidence to suggest that donors do distinguish between WB and plasmapheresis donation: “I thought you could only opt to do one or the other—you couldn’t be both”; “I donate full blood. I don’t know what is the plasma?” (9). Without understanding or experience in plasmapheresis, it is likely that WB only donors have not incorporated plasmapheresis into their role identity as a donor. In turn, our results indicate that, for WB donors with a strong moral norm for plasmapheresis donation, having a donor identity that has emerged from their WB donation behavior (32) may not be conducive to behavior change.

For BCAs to facilitate WB donors’ conversion to plasmapheresis, the solution may involve broadening the inclusivity of the term ‘donor’ to extend the sense of responsibility to donate all donation types, similar to a common in-group identity (56, 57). BCAs should consider the way they present donation to new donors and ensure that the range and equal value of all donations is a consistent message in cues including campaign collateral at donation sites or direct marketing. Currently, cues may be interpreted as supportive of WB donation to the exclusion of plasmapheresis donation. Clearly, one of the key tasks of BCAs is to recruit WB donors. However, the linguistic emphasis on ‘blood’, ‘blood donation’, ‘blood service’, ‘blood collection’, and the color red as a prime cue for BCAs’ suggests that the general public and donors may interpret ‘blood’ as specifically WB without being aware of the various components of blood (i.e., WB, plasma, platelets) and the subsequent distinction across donation types.

Combined with the main donation behavior of WB donation, the results of the current study

suggest that the 'whole blood' emphasis may come to be restrictive for donors. Their identity is developed to be one of a WB donor rather than a potential donor of all or any blood and blood products. By facilitating a superordinate identity of donor to which WB, plasma and platelet donations equally contribute, movement between the respective panels as required by the BCAs may be facilitated (56, 57). Clearly, however, these proposals require empirical examination.

Despite the model invariance across both samples, a comparatively lower rate of plasmapheresis donation and the lower percentage of variance accounted for in behavior was observed in the distant sample. Given these donors comparative disengagement with donation – in that they had not presented to donate for between 3 and 12 months – it is perhaps surprising that conversion occurred at all. One possibility is that these 'distant donor' convertors may have a stronger involvement or prior connection with donation (58). However, while the small number of 'distant donor' converters limits the analyses in the current data, these donors did not differ significantly in terms of number of prior donations or levels of donor identity (analyses available). An alternative possibility is that conversion in this study was facilitated by the question-behavior effect (59). Although survey administration alone is not documented to have a consistently positive effect on subsequent donor behavior (60), future research could carefully explore survey completion as a possible way of reactivating at least some lapsing WB donors to become plasmapheresis donors (59, 61, 62). An operational consideration is that the distant sample was contacted by phone, and a physical assessment of vein suitability could not be immediately conducted. As such, a portion of this sample may not have been eligible to convert, despite intentions to do so.

This study provides a number of unique contributions to the donation literature; however, a number of limitations must be considered. First, both samples only included WB donors who had made a successful WB donation. Those donors who may have experienced difficulty in their donation were excluded. How the model predicts conversion of WB donors who have experienced a less than optimal donation experience is unknown, but could provide an interesting avenue for future research. For those with a strong want to donate, but with a less than optimal whole blood experience behind them, trying 'something different' may be enough of an incentive to try to donate again. Further, our research sought to predict the first plasmapheresis donation only. How the extended TPB variables, in particular role identity as a donor or plasmapheresis donor specifically, may change after engaging in plasmapheresis is not known as is how the model performs for predicting the continuation of plasmapheresis donation. Indeed, how this model performs for other forms of apheresis donation (e.g., plateletpheresis) requires examination. Further, how a plasmapheresis donor identity is developed also awaits future research. In developing and implementing behavior change interventions, BCAs must exercise caution during plasmapheresis recruitment to ensure that WB donations continue to be perceived as valuable to BCAs. Building on prior research indicating broad conversation factors can influence conversion success (13) and the implication of phlebotomists' social skills in mitigating vasovagal reactions (63) , an additional consideration for future research could also be on the influence of staff skills in the specific content and subsequent effect of conversion conversations on donor behaviour. Theoretically, to the degree that the staff member who is interpersonally skilled is seen as a trusted (64) expert (65), their conversion success may be heightened (65, 66). Finally, and noting the limit of our analysis to the

voluntary non-remunerated context, identifying the key factors in conversion conversations within current remunerated systems would be beneficial.

The results suggest that the extended Theory of Planned Behavior may be a useful framework to understand and predict first time plasmapheresis donation. The model invariance across both samples indicates that intentions to donate are associated with plasmapheresis donation. Moral norm and self efficacy were the most strongly associated with intention to make a first plasmapheresis donation for donors, regardless of proximity of prior WB donation behavior. The proposed explanation of the negative impact of role identity attributed to the development of a specific WB donor identity warrants further theoretical and practical exploration. The replication of the model in two samples differing in their proximity to recent WB donation indicates that similar interventions may be effective for recruiting to plasmapheresis panels those WB donors who have, and have not, recently donated. As such this finding supports both in-centre and telephone-based conversion practices.

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Table 1

Standardized factor loadings and composite reliability coefficients for the distant / recent groups.

Survey Items	1. Plasma attitudes	2. Subjective norm	3. Self-efficacy	4. Moral norm	5. Anticipated regret	6. Role identity	7. Intentions
Donating plasma would be: Stressful/Relaxing	.88 / .90						
Donating plasma would be: Unpleasant/Pleasant	.94 / .94						
Donating plasma would be: Bad/Good	.82 / .82						
Most people who are important to me think I should donate plasma		.57 / .61					
If I were to donate plasma regularly most people important to me would approve		.53 / .57					
If it were entirely up to me, I am confident I could donate plasma			.84 / .81				
I believe I have the ability to make a plasma donation			.88 / .88				
If I wanted to, it would be easy for me to make a plasma donation			.72 / .76				
I believe I have a moral obligation to make a plasma donation				.85 / .87			
I feel a personal responsibility to make a plasma donation				.92 / .93			
My personal values encourage me to make a plasma donation				.73 / 76			
If I did not make a plasma donation, I think I would regret it					.90 / .91		
If I did not make a plasma donation, I think I would be disappointed					.93 / .94		
Donation is important to me						.68 / .68	
I am the kind of person who is a donor						.64 / .65	
I intend to make a plasma donation							.96 / .97
I will try to make a plasma donation							.91 / .92
I will make a plasma donation							.95 / .96
Average variance extracted	.78 / .79	.30 / .35	.66 / .65	.70 / .73	.83 / .85	.44 / .41	.88 / .90
Composite reliability	.91 / .91	.46 / .51	.85 / .86	.88 / .89	.91 / .92	.61 / .61	.96 / .96

Note. All factor loadings are significant, $p < .001$. Although the unstandardized factor loadings were constrained to be equal between groups, the standardized factor loadings differ between groups as the observed variances of individual items are not equal. Average variance extracted was calculated using the formula of Fornell and Larcker (67), and composite reliability using the formula for Raykov's rho (68).

Table 2

Descriptives (M, SD), correlations between and reliability for variables for recent (lower) and distant (upper) sample

										Distant Sample	
	Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	*M*	*SD*
1	Plasma Attitude	-	.29***	.58***	.25***	.27***	.29***	.44***	.14	4.85	1.26
2	Subjective Norm	.31***	-	.34***	.54***	.52***	.29***	.45***	.06	4.22	1.25
3	Self efficacy	.55***	.37***	-	.27***	.37***	.32***	.55***	.22**	5.07	1.42
4	Moral Norm	.39***	.48***	.49***	-	.72***	.26***	.54***	-.00	3.68	1.54
5	Anticipatory Regret	.33***	.38***	.39***	.73***	-	.24**	.54***	.06	3.29	1.62
6	Role Identity	.16***	.28***	.19***	.34***	.24***	-	.16*	.13	5.50	1.02
7	Intention	.43***	.39***	.56***	.64***	.56***	.15***	-	.28**	4.05	1.88
8	Plasma Donation	.21***	.15***	.24***	.28***	.24***	.05	.44***	-	N/A	N/A
	(Behavior 1=Yes, 0=No)										
	Recent Sample *M*	4.96	4.29	5.39	4.02	3.57	5.59	4.35	N/A		
	SD	1.29	1.30	1.39	1.68	1.74	1.02	2.06	N/A		

Note: N/A as dichotomous variable. * p=.05, **p<.01, ***$p\leq$.001

Table 3

Models predicting intention to make a first plasmapheresis donation for the recent (upper row) and distant (lower row) samples

	Model 1			**Model 2**		
	Role Identity Alone			**Extended TPB**		
	Recent: R^2=.02***			**including moral norm**		
	Distant: R^2=.02*			**Recent: Adj R^2=.51*****		
				Distant: Adj R^2=.49***		
Predictor Variables	**B**	**SE**	**β**	**B**	**SE**	**β**
Role identity	.30	.09	.15***	-.20	.07	-.10**
	.29	.14	.16*	-.26	.11	-.14*
Attitude				.14	.07	.08*
				.21	.12	.12ns
Subjective Norm				.08	.06	.05ns
				.14	.11	.09ns
Self efficacy				.40	.06	.27***
				.47	.10	.36***
Anticipatory Regret				.19	.05	.16***
				.18	.10	.16ns
Moral Norm				.45	.06	.37***
				.35	.10	.29***

Note: ns = non significant, * $p < .05$, ** $p<.01$, *** $p<.001$.

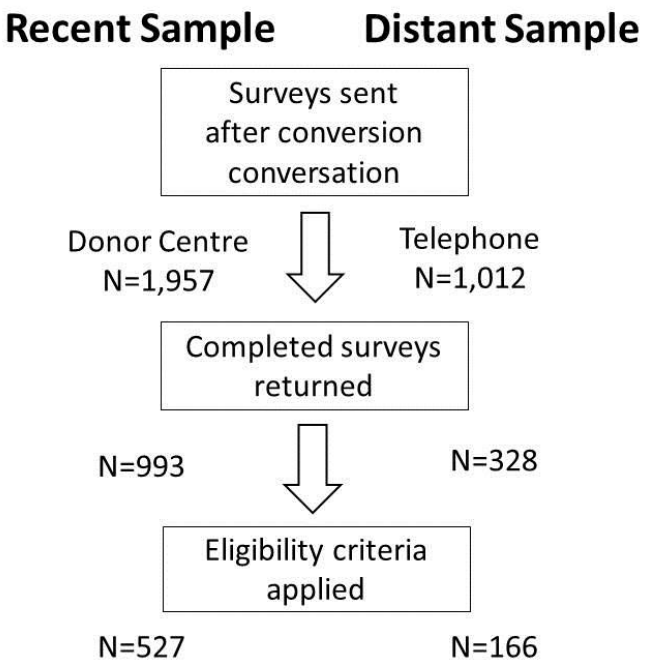

Figure 1: Participant recruitment process

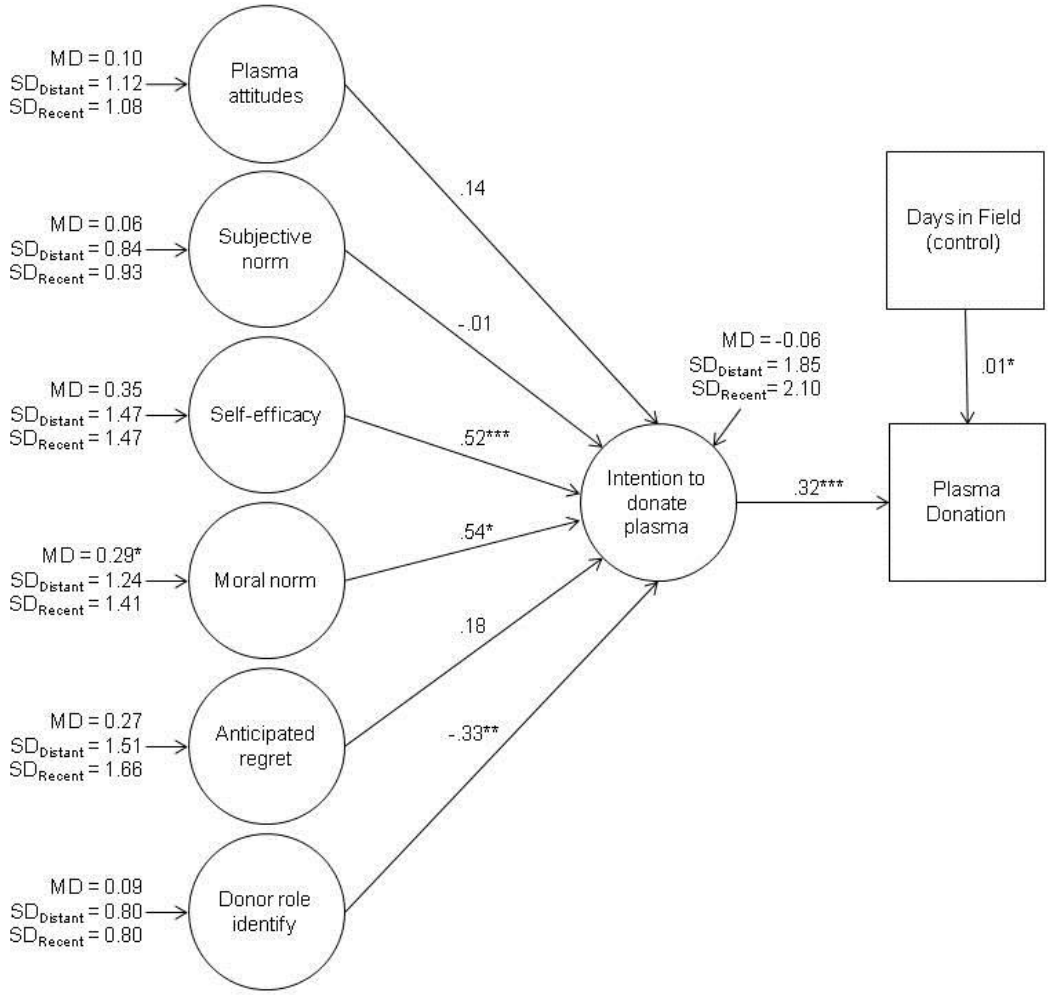

Figure 2: Extended TPB model depicting antecedents of intention to donate plasma and plasma donation behavior. MD = difference in factor means between the distant and recent groups (a positive score indicates a greater mean for the recent group). SD = standard deviation of the latent factors for each group. * $p < .05$, ** $p<.01$, *** $p<.001$.