THE INTENTIONS OF GRADUATE STUDENT RESEARCHERS TO PARTICIPATE IN KNOWLEDGE TRANSLATION: A MIXED METHODS INVESTIGATION

by

Nicolle Vincent

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DEDICATION PAGE

This dissertation is dedicated to my husband Ryan and our children Adella and Lucas. Ryan, you are my rock and your endless support was what encouraged me along this journey. Adella and Lucas, you taught me to embrace the small joys in life; a skill essential for long journeys. I am indebted to your patience and understanding while "mommy writes her book". Love you all "more than anything you say"!

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ABSTRACT

There is a well-established disconnect between research evidence and health practice. This has prompted efforts to improve knowledge translation (KT) between knowledge producers and knowledge users. Little is known about what motivates health researchers to engage in KT activities. Focusing attention on graduate student researchers can inform early interventions in order to shape future KT practices. The overall objective of this dissertation was to investigate the correlates that help explain graduate students' intentions to participate in KT; specifically, research dissemination to audiences outside of the academic community. This form of KT activity was labelled as non-traditional research dissemination (NTD), to contrast it with the more familiar form of traditional research dissemination (TD) to academic audiences (e.g., peer-reviewed publications). This dissertation involved a mixed-methods approach with four phases that generated three papers addressing the study objectives. Using the theory of planned behaviour (TPB) as the framework, results from a focus group (n = 30) and pilot work led to the development of an online survey. Data from the online survey (n = 419) assessed the utility of the TPB global constructs (Paper 1) and specific beliefs (Paper 2) in predicting NTD and TD intentions among graduate students in health disciplines. A sub-sample (n = 16) participated in interviews further exploring perceptions of NTD (Paper 3). The integrated results provide evidence that the proposed augmented TPB model is a reasonable framework for understanding the influences of both TD and NTD intention. The findings point to four principal observations. First, most graduate students have a favorable attitude towards the benefits of NTD as a means to contribute and make a difference with their work. Second, low self-efficacy, minimal support from the research supervisor, and believing that other graduate students do not do this work, all serve as barriers to intention formations. Third, moral responsibility influences NTD intentions but not TD intentions. Finally, past experience and future career dissemination plans strongly influence intentions to participate during graduate school. Overall, this work highlights how these modifiable variables could be useful for guiding interventions and resources to promote KT participation.

LIST OF ABBREVIATIONS & SYMBOLS USED

CIHR	Canadian Institutes of Health Research
CI	Confidence Intervals
df	Degrees of Freedom
EBP	Evidence-Based Practice
F	F-test
KT	Knowledge Translation
M	Mean
n	Number of Participants
η_{p2}	Partial Eta Squared (Estimate of Effect Size)
ns	Not Statistically Significant or p-value > .05
NTD	Non-Traditional Research Dissemination
OR	Odds Ratio
p	p-value for Significance Testing
PBC	Perceived Behavioral Control
r	Correlation Coefficient
R^2	Squared Multiple Correlation Coefficient
SD	Standard Deviation
SE	Standard Error
SPSS	Statistical Package for the Social Sciences
t	Student's *t* Value of the *t* Test for Testing Mean Differences
TACT	Target, Action, Context, Time
TD	Traditional Research Dissemination
TPB	Theory of Planned Behavior
UK	United Kingdom
Wald	Wald Statistic
z	z score
Δ	Change
α	Alpha
β	Standardized Beta Weight
b	Unstandardized Beta weight

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CHAPTER 1: INTRODUCTION

1.1 SIGNIFICANCE OF THE PROBLEM

Research evidence is important for the provision of health care. It can help inform health providers, managers, and policy decision-making (Wilson, Lavis, & Grimshaw, 2012). The regular application of evidence-based practice (EBP) has been shown to have a direct impact on improving patient outcomes (e.g., Duncan et al., 2002). Despite the ongoing scholarly production of evidence for best practices, the literature suggests that the mobilization of this evidence into practice is slow, unpredictable and inefficient. The assumption was that new knowledge and scientific evidence would be readily integrated into daily practice and decision-making; however, this assumption has been challenged by the many examples of research evidence not being used (Davis, Evans, Jadad, & Perrier, 2003). The consequence of a haphazard research-to-practice translation process is the delivery of unreliable and possibly inappropriate health care.

In health care practice, it is estimated that approximately 30-40% of patients are not getting treatments of proven effectiveness and that 20–25% of patients are getting care that is not needed or potentially harmful (Grol, 2001; McGlynn et al., 2003; Schuster, McGlynn, & Brook, 1998). Studies have found significant deficits in adherence to recommended care processes (McGlynn et al., 2003; Schuster et al., 1998) as well as prescribing practices (Shrank, Hoang, Ettner, & Glassman, 2006; Woods et al., 1998). Medication prescribing practices are highlighted by examples of medication underuse (e.g., Larosa, He, & Vupputuri, 1999), misuse, and overuse (e.g., Arnold & Straus, 2005), even when best practice guidelines are available (Chassin & Galvin, 1998). This prompts concerns about patient safety in health care (Institute of Medicine, 2001). Low adherence

to current guidelines or evidence of contraindicated practice are not limited to prescribing practices, but have been demonstrated in a range of disciplines, such as: diabetes self-management counselling (Glasgow, Boles, McKay, Feil, & Barrera, 2003), pain assessment in hospitalized children (Stevens et al., 2012), bladder cancer care (M. Walker et al., 2015), psychotherapy practices in mental health (Drapeau & Hunsley, 2014), to name a few. In stroke rehabilitation, for example, studies have found that, despite available best-practice assessment and treatment guidelines for unilateral spatial neglect (which is a serious sequelae of stroke), less than 30% of occupational therapists employed best practice assessment and only 58% offered the recommended intervention (Menon-Nair, Korner-Bitensky, & Ogourtsova, 2007).

This failure to incorporate research evidence into decision making is not isolated to the health provider, but is also apparent across all key decision-maker groups, including patients, informal carers, managers, and policy makers. Examples include studies that indicate 75% of patients do not get the information they need for decision-making (Kiesler & Auerbach, 2006) and, at the policy level, recommendations from organizations like the World Health Organization (WHO) rarely and unreliably draw on findings from high quality systematic reviews and summaries (Oxman, Lavis, & Fretheim, 2007). It has become apparent that simply providing evidence from clinical research through traditional routes (such as publication in journals or presentation at scientific meetings) is necessary, but not sufficient, for the provision of optimal care or decision making (Straus, Tetroe, & Graham, 2013). This growing recognition that research evidence is not reaching appropriate audiences has highlighted a need to narrow

the gap between what is known from health research and what is practiced (Wilson, Petticrew, Calnan, & Nazareth, 2010).

1.2 KNOWLEDGE TRANSLATION

This recognized gap has led to an interest in the science of knowledge translation (KT); the study of optimal strategies or interventions to close this gap. The study of KT attempts to support the use of research evidence to inform practice, management, and policy and encompasses all the activities involved in closing the gap between what we know and how we use that knowledge in order to facilitate the provision of EBP (Graham & Tetroe, 2007). Sackett, Rosenberg, Gray et al. (1996) define EBP as a process that involves "the conscientious, explicit, judicious use of current best evidence in making decisions about the care of individual patients" (p. 71). According to these authors, basing practice on evidence is intended to promote clinical decision making that follows a rational process, rather than one that is based on intuition. Yet, as attention to this practice to evidence gap has increased, so too has the terminology used to describe it. A cross-sectional study of 12 healthcare journals in 2006 found 100 different terms (across 581 articles) used to describe KT (McKibbon et al., 2010). Furthermore, in a review of terminology used by 33 applied health research funding agencies, 29 different terms were used (Graham et al., 2006). Some of the more common terms applied to this process are knowledge translation, knowledge transfer, knowledge exchange, knowledge mobilization, research utilization, implementation science, dissemination, diffusion, linkage and exchange. These terms have all been used to describe overlapping and interrelated concepts and practices. Kerner, Rimer, and Emmons (2005) argue that this

lack of standardized terminology makes it difficult to compare studies with one another and even to communicate findings and their implications.

Of all the terms, knowledge translation (KT) is the most prominently used term in Canada (Graham et al., 2006). The Canadian Institutes of Health Research (CIHR), the national funding agency for health research in Canada, has a definition of KT that has gained traction nationally and internationally. It defines KT as "…the exchange, synthesis and ethically-sound application of knowledge - within a complex system of interactions among researchers and users – to accelerate the capture of the benefits of research for Canadians through improved health, more effective services and products, and a strengthened health care system" (Canadian Institutes of Health Research, 2015). Implicit in this definition is that the term knowledge is meant to represent scientific knowledge, as it points to the interaction between researcher and user. Users are considered to be any individual who is likely to use research results to make informed decisions about health policies, programs and/or practices. Examples include a practitioner, a policy maker, an educator, a decision maker, a health care administrator, a community leader or an individual in a health charity, a patient group, a private sector organization or a media outlet.

The CIHR recognizes two forms of KT: (1) integrated KT, where research is designed to be a collaborative venture between researchers and knowledge users, and; (2) end-of-grant KT, which can be categorized as diffusion, dissemination, or implementation activities (Canadian Institutes of Health Research, 2015; Lomas, 1993). In integrated KT, research engages stakeholders, usually the knowledge users, at the beginning and throughout the project. Knowledge users, such as the public, patient

groups, health providers or decision makers, assist in guiding the research priorities and applicability of the data, while also shaping study methodology, data interpretation, and moving the results into practice, for example (Graham, Grimshaw, Tetroe, & Robinson, 2005). Integrated KT is increasingly being recognized as the gold-standard approach to best promote knowledge use (Bowen & Graham, 2013); however, it is also recognized that integrated KT is not appropriate for all research, such as research that is not intended to produce results for direct use in policy, clinical care or public health (Tetroe, 2007).

End of grant KT involves researcher-initiated work to transfer knowledge, typically with the aim of raising awareness and/or promoting action (Canadian Institutes of Health Research, 2012). End of grant KT also requires a solid understanding of who the knowledge-user audience is and appropriately communicating tailored messages to this audience. Lomas (1993) further differentiated this knowledge transfer work into three classifications: diffusion (let it happen), dissemination (help it happen), application/implementation (make it happen). The CIHR has adopted this classification and describes diffusion as a mode of delivery that involves minimal customization to the receiving audience, such as traditional scholarly methods of peer-reviewed publications and conferences. Dissemination involves more active tailoring of the message and consideration of the context/method to which the message will be delivered to a target audience. As the CIHR outlines, this type of dissemination could take many forms, such as: patient decision-support aids, the development of new educational materials/sessions, interactive small group meeting/workshop, plain-language summaries, summary briefings to stakeholders, social marketing (e.g., Facebook, Twitter), communities of practice (e.g., communication of evidence with a group of practitioners that meets to share work

practices), and media release/outreach campaign. The final classification, implementation, involves more systematic efforts to encourage adoption. This is where knowledge is moved into use by working with knowledge users to do any of the following: adapt knowledge for use, commercialize it, identify barriers/supports to the use of findings, tailor messages and interventions to promote use, monitor knowledge use, and ensure sustainability. Despite increasing acceptance of Lomas' classification of knowledge transfer activities, the term "dissemination" continues to be used more universally to refer to any form of spreading of knowledge or research; including both the passive diffusion (i.e., scientific journal publications) and active dissemination types defined by Lomas (Graham et al., 2006). In keeping with the familiar dissemination term, Fernández-Peña et al. (2008) differentiate dissemination methods based on their frequency of use in the academic culture, and subsequently label them as traditional (scholarly work created for academic audience) and non-traditional (transfer of knowledge to predominantly non-academic audiences) dissemination practices.

1.3 KNOWLEDGE TRANSLATION AND RESEARCHERS

With increased attention focused on KT practices, researchers have encountered more demands to participate in collaborative KT projects or knowledge dissemination efforts. This demand is particularly evident in the realm of research funding. In the interest of bridging the research-to-practice gap and the pressures on funding agencies to be accountable to their funding sources, many funding bodies have begun to emphasize the role of the knowledge producer in the KT process (Palmer & Schibeci, 2014). One study revealed that, in an international sample of funding agencies, 73% expected researchers to outline a KT plan (Tetroe et al., 2008); yet, minimal to no guidance was

offered in what dissemination entails or how to do it (Wilson et al., 2010). In a survey of 1,554 Canadian researchers in the natural science and engineering fields, 45% reported rarely (to never) disseminating knowledge to audiences outside of academia (Landry, Amara, Ouimet, 2007). It has also become more widely recognized that sharing research knowledge requires specific skills that are not an inherently possessed ability by all researchers (Jacobson, Butterill, & Goering, 2004; Lavis, Robertson, Woodside, Mcleod, & Abelson, 2003). So it is not surprising that, in a survey of applied health researchers, the majority of researchers expressed a lack of confidence in disseminating research results to target audiences outside of their academic colleagues (even when they perceived their results to be of considerable importance to both the public and decision makers; Graham et al., 2005).

Benefits of knowledge translation. The study of KT has generated substantial interest in the uptake of research knowledge, but the dissemination of knowledge produced by health researchers has received relatively less attention (Tetroe et al., 2008). What is apparent from the literature, however, is that less than half of health researchers participate in knowledge dissemination outside the academic community and that publication in refereed academic journals and conferences continue to be the most highly regarded scholarly practice for academic promotion and tenure decisions (Avgerou & Siemer, 1999; Graham et al., 2005). With academic publications being the principal channel of disseminating findings, a communication problem arises. The non-academic knowledge users are isolated from these knowledge sharing efforts, thus further accentuating the research-to-practice divide. In a systematic review of 102 controlled trials, the passive approach of employing only traditional dissemination methods was

ineffective in changing health practices (Oxman, 1995). When preference is given solely to traditional dissemination methods, Lang (2003) believes that the accessibility of research findings are further disadvantaged by, (1) scholarly atrophy resulting from low acceptance rates of journals (Straub et al., 1994) and, (2) the unenviable prospect of research findings being rendered obsolete before they are published within the four to five year production cycle typical of academic journals (Lee, 1999; Morris, Wooding, & Grant, 2011). Also, the factors that have been identified as being important in communicating research to policy-makers, namely timely communication and personal contact between researcher and policy maker, are not achieved by traditional dissemination methods (Hanney, Gonzalez-Block, Buxton, & Kogan, 2003; Innvaer, Vist, Trommaled, & Oxman, 2002).

Kuehne (2014) contends that researchers who build relationships with their knowledge users create far reaching societal benefits by fostering public trust in and better access to the sciences. Engaging with knowledge users can make scientific knowledge more compelling (Nisbet & Scheufele, 2009), thus attracting users to the science and ultimately narrowing the gap between research knowledge and implementation (Arlettaz et al., 2010). In addition to reducing the knowledge to action divide, Jensen et al. (2008) suggest that non-traditional dissemination activities can have benefits to the researcher and the knowledge creation process. For example, dissemination with knowledge users compels scientists to discuss with others who might have different views on the research, thus forcing researchers to consider other perspectives, open up their horizons, and gain new insights into their research. Similarly, Gagliardi, Berta, Kothari, Boyko, and Urquhart (2016) point to the positive impact

collaborative efforts can create for researchers, "researchers gain a nuanced understanding of the policy or practice environment, develop and pursue research questions that have real-world applicability, and, through ongoing conversations with decision-makers, interpret results with a deeper understanding of contextual circumstances that, in turn, enhances the usefulness of the research findings." (p. 2). Some researchers believe that time invested in non-traditional forms of dissemination will disadvantage progress in the necessary traditional forms of dissemination (Royal Society, 2006). Although this seems a reasonable speculation, preliminary evidence suggests that researchers who have participated in non-traditional dissemination activities (such as actions aimed at the non-specialized public: interviews to the media, school or public talks, collaboration with the media), have higher levels of scholarly publications and academic ranks (Bentley & Kyvik, 2011; Jensen, 2011). However, it is unclear how this connection emerges.

Barriers and motivators to knowledge translation. Despite these correlational findings between non-traditional dissemination and academic success, researchers typically believe that KT activities are not widely accepted as legitimate forms of scholarship (Jacobson et al., 2004). Jacobson et al. found that when compensation and career advancement are based mainly or solely on traditional dissemination activities, scholars are not likely to make major commitments to KT. The authors proposed that findings from their focus group of academic participants suggest there are five interrelated organizational domains that influence researchers' engagement in knowledge dissemination: (1) promotion and tenure guidelines (compensation and career advancement based on traditional scholarly activities); (2) resources and funding (money,

training); (3) structures (development of internal structures to promote KT); (4) KT orientation (organizational priorities and attitudes); and (5) documentation (of KT activities for organizational planning and evaluation related to promotion and tenure decisions). The authors recommend that organizations take responsibility for emphasizing and making a commitment to prioritizing KT in order to remove these environmental/organizational barriers to KT practice. They suggest that, in order to address the five abovementioned domains, organizations consider recruiting staff that have KT skills, offering training opportunities for students, and including KT in operational plans and mission statements. Kerner (2005) echoed these sentiments by suggesting that in order for a KT agenda to be actualized, "universities must recognize, support and reward the importance of dissemination as a fundamental part of the research process and as a legitimate area of study" (p.3). It is apparent that researchers perceive there to be inadequate infrastructure and systems organization to support KT efforts, thus creating a barrier to KT involvement. Supporting these findings, Andrews et al. (2005) identified three main barriers to outreach participation (a particular form of science communication and KT). Participants were a small sample of graduate students and basic science researchers (i.e., biology, chemistry, and physics) at one university. Participants highlighted three environmental constraints to participation: inadequate value placed on outreach efforts by their advisors, colleagues, and departments; time limitations due to other priority responsibilities, and lack of apparent opportunities or information clarifying the expected commitment. Moreover, Landry, Amara, and Ouimet (2007) identified two common predictors to knowledge transfer among natural science researchers: having established links with research users and focusing research projects on the users' needs.

Research that coincides with the needs and expectations of target audiences was also found to be a correlate of knowledge transfer activities among health researchers in low-income countries (Lavis et al., 2010).

Conversely, Andrews et al. (2005) discovered three main motivators for researcher participation in outreach that were not organizational. The first was a desire to contribute. This was seen as an interest in contributing to the public's science literacy, playing a part in correcting misconceptions about science and increasing awareness of the value in funding science (also supported by findings from Besley, Oh, & Nisbet, 2011). Involvement was seen as social responsibility to share knowledge for the betterment of society. The second motivator was the view that outreach was fun and enjoyable. The third was the belief that outreach participation would improve their teaching and communication skills, assisting with their academic endeavors and professional development.

Although the findings from Andrews et al. (2005) and Jacobson et al. (2004) offer insightful descriptive details about scientists' views, they are difficult to replicate or generalize given the small sample size and lack of clarity about measurement development. In the only theoretically informed investigation of researchers' motivation to participate in KT, Poliakoff and Webb (2007) surveyed graduate students and researchers in the medical, life, and physical sciences at one university in the UK. Results revealed that scientists decided not to participate in KT activities for the following reasons: they had not participated in the past (consistent with Croissant & Jensen, 2007), they had a negative attitude toward participation (such as, it is 'pointless' or 'unenjoyable'), they felt they lacked the skills (consistent with Besley, 2013) and finally

that they did not believe that their colleagues participated in such activities, which is interpreted as an indicator of the relative irrelevance of this activity. As is evident, Poliakoff and Webb's theoretically-informed study supported past descriptive findings on researchers' views (i.e., those who feel more skilled at KT are also more likely to participate in KT) and contributed new insight (i.e., being influenced by others' behaviour). Interestingly, none of the studies on researchers to date have exclusively targeted health researchers. This is notable given the attention devoted to KT science in the health sector in order to improve the knowledge-to-practice disparity.

Graduate students. It is also worth noting that many of the already discussed studies included graduate students and researchers as participants and aggregated the results. It is true that graduate students and academic researchers would be exposed to similar context-specific variables (e.g., an organization's attitude toward KT), but it is reasonable to assume that graduate students could have different personal motivators (e.g., complying with a supervisor's requests) or barriers (e.g., less autonomy, more priority demands) to KT participation. For a number of reasons, there is value in investigating graduate students' perceptions about KT and subsequently supporting KT participation during graduate training. First, graduate students are the future generation of researchers. If the objective is to encourage more researcher KT participation, it would seem logical that KT participation during graduate school could be considered a training tool for a later career involving KT (Newing, 2010). KT experience could offer the professional benefits associated with learning how to communicate broadly one's own and others' research to non-academic audience (Baron, 2010; Jensen et al., 2008);

compared to the limited reach of the traditional forms of scholarly dissemination that most graduate students are expected to deliver (Suleski & Ibaraki, 2010).

Second, there is evidence that researcher motivation for KT involvement is influenced by feelings of self-efficacy (Besley, 2013; Poliakoff & Webb, 2007). According to Bandura's (1977) conceptualization of self-efficacy, performance and vicarious experience are believed to the most influential factors in generating the belief that one is capable of performing an action. Given this understanding, gaining experience in KT activities would be considered vital for KT self-efficacy. Indeed, studies on scholarly research productivity and self-efficacy among graduate students found that programs involving students early in the training process generated more research productivity with more favorable attitudes about research (Phillips & Russell, 1994). In other words, the program environment and culture (i.e., early or late research training) appears to influence research productivity. Although these findings are specific to traditional forms of research involvement, it would be reasonable to believe these early experience benefits could apply to KT as well (such as non-traditional dissemination activities). Third, Kuehne (2014) argues that when graduate students do not engage in KT due to time constraints, lack of training or institutional support, the known societal benefits of KT go unrealized. They maintain that by making science knowledge more accessible to knowledge users, science as a whole benefits by promoting conversations about research with diverse stakeholders. The authors further suggest that graduate students are perhaps more suited to appeal to and inspire younger audiences (Messinger, Schuette, Hodder, & Shanks, 2009), thus broadening the scope of possible non-academic networks.

Considering the societal benefits and the long-term professional advantages in training competent researchers, supporting graduate students' KT involvement seems warranted. In order to encourage participation, however, programs and institutions would benefit from understanding graduate students' views on KT and how students can best be supported in such endeavors. This dissertation focused on the graduate student population; specifically, those involved in health research. The KT activity of particular interest in this dissertation is non-traditional research dissemination. Although it is recognized that dissemination is only one component of the research-to-practice (KT) continuum, dissemination was expected to be the most feasible KT activity for graduate students. This is in keeping with findings from a study of university-based researchers that identified knowledge sharing as the most achievable of all KT activities (Arrington et al., 2008). This dissertation also aimed to improve on past research by being theoretically oriented.

1.4 USING THEORY TO INFORM INVESTIGATION

Many argue that a systematic and deliberate approach in the use of theory is essential for advancing the science of KT and for increasing the likely success of KT in reducing these practice gaps (Eccles et al., 2012; Eccles, Grimshaw, Walker, Johnston, & Pitts, 2005; Thomas, Menon, Boruff, Rodriguez, & Ahmed, 2014). As Besley et al. (2013) highlight, the existing findings on scientists' views regarding KT (e.g., Royal Society, 2006) are difficult to interpret because the measures do not readily fit with any theoretical framework aimed at predicting behaviour. They propose that a more strategic selection of variables would enhance integration of findings into a framework that can be applied more generally. Applying theory to research can offer a better appreciation for

the barriers and enablers of behaviour change, it can help inform the design of KT intervention, and ultimately allow for investigation of the potential causal pathways and moderators (ICEBERG, 2005). For example, theory-based interventions facilitate an understanding of what works and therefore are a basis for developing better interventions across different contexts, populations, and behaviors (Michie, Johnston, Francis, Hardeman, & Eccles, 2008). Without theory, it is difficult to understand the underlying mechanisms behind interventions, understand the impact that various interventions have on behaviour change, and to compare across studies (Thomas et al., 2014).

Theory can be defined as "a coherent and non-contradictory set of statements, concepts, or ideas that organizes, predicts, and explains phenomena, events, behaviors, etc." (as cited by Eccles, Grimshaw, Walker, Johnston, & Pitts, 2005, p. 108). When designing KT interventions intended to improve adoption of a desired behaviour, Eccles et al. (2005) emphasize two ways to use theory that are inter-related and build on each other. The first is identifying the process and theoretical constructs important in current behaviour (such as research dissemination behaviour) that might inform the appropriate targets of intervention. The second follows from this knowledge, and uses the theoretical constructs to design and test interventions to enhance the processes supporting change in the constructs. Yet, despite recognition and recommendations for theory-informed research in KT, theory use is rare in the design and evaluation of KT interventions (Grimshaw et al., 2004). In a review of theory use in guideline dissemination and implementation research, results revealed that only 6% of the included studies explicitly used theory to inform the design or the implementation of KT interventions (Davies, Walker, & Grimshaw, 2010). As the authors point out, this is problematic because the

lack of theory precludes a systematic exploration of the barriers to implementation, hinders intervention design, and prohibits investigation of mediating mechanisms and potential moderators of an intervention.

Ferlie and Shortell (2001) contend that different theories will be relevant to interventions that have different target recipients. In their example, they identify four different levels that can be targeted for interventions to improve health care: the individual health professional, the health care group or team, health care institutions/organizations (i.e., hospitals), and the larger health care system in which the individual organizations are embedded. Walker et al. (2003) suggest that psychological theories are more relevant to interventions directed at individuals and teams, and theories of organizational change will be more relevant to interventions directed at hospitals or trusts, and so on. Using the same conceptualization, psychological theories would be most appropriate to investigate graduate student behaviour, while organizational theory would be best applied to studying the academic institution to which graduate students are enrolled.

Undoubtedly, a full scientific inquiry of KT practices related to knowledge producers (i.e., researchers), would best be explored at all the levels relevant to researcher decision-making; this includes their department, institution, and funding agencies. However, given the paucity of research on the topic of KT and knowledge producers, it can be helpful to first start at the individual level. For example, Walker et al. (2003) draw attention to the multitude of organizational change theories that purport that change effects are mediated through the actions of the individual, suggesting that, ultimately, it is the individual clinician (or researcher) who decides whether or not to

participate in the target behaviour. In other words, individual, social, economic, political, and organizational factors coalesce to influence individual behaviors. Consequently, this dissertation focuses at the individual level of the graduate student, and is thus most appropriately investigated with psychological theory. Given the importance of organizational limitations to individual behaviour, it is recognized that a professional's perception of the environmental context, such as resource constraints or organizational policy, will be an important key determinant of action and will need to be included in the selected theory.

Theoretical approaches in knowledge translation. Viewed as an individual human behavior, the problem of understanding why researchers do or do not participate in KT activities is similar to investigating why individuals do or do not implement healthy lifestyle choices. The latter area has been extensively investigated regarding a variety of lifestyle activities (e.g., smoking cessation, exercise) and the applicability of psychological theories has been demonstrated (see Glanz et al., 2008; Noar & Zimmerman, 2005 for a review). Turning to the theoretical literature regarding individual health behavior change provides a strong and well validated starting point. The theories reviewed for selection for this dissertation were based upon three criteria outlined by Walker et al. (2003), who investigated behaviour change interventions for clinical providers. The following criteria were used for theory selection:

(1) the theory has been rigorously evaluated in other settings, such as lifestyle change.

(2) the theory explains behavior in terms of factors that are amenable to change, (e.g., beliefs, attitudes, self-confidence and actual or perceived external

constraints). Consequently, psychological theories that include factors that are relatively stable (e.g., intelligence or personality characteristics) and not modifiable have less practical applicability and were therefore deliberately excluded.

(3) The theory assumes that individuals working within a system do not always have complete control over their actions. The theories permit examination of an individual's perception of external factors such as patient preferences or organizational barriers or facilitators.

Using these criteria for individual behaviour, Eccles et al. (2005) revealed that relevant psychological theories can be categorized in groupings such as *motivational theories* (which explain how individuals come to wish/intend/decide to change behavior), *action theories* (which explain how individuals move from intention to actual behavior change), and *stage theories* (which propose an orderly progression through discrete stages toward behavior change). These are discussed here in more detail.

Motivational theories propose that motivation determines behaviour, and therefore the best predictors of behaviour are factors that predict or determine motivation (or intention). Well-studied motivational theories include the theory of planned behavior (Ajzen, 1991) and its predecessors the theory of reasoned action (Ajzen & Fishbein, 1980), the social cognitive theory (Bandura, 1977), the health belief model (Becker, 1974), and the theory of interpersonal behaviour (Triandis, 1977). *The Theory of Planned Behaviour* (TPB) proposes that the strength of an individual's intention (or motivation) to engage in a behaviour, and the degree of control they feel they have over that behaviour (perceived behavioural control) are the proximal determinants of engaging

in it. Intentions are determined by attitude toward the behaviour (e.g., an individual's positive or negative evaluation of performing the behaviour), feeling social pressure to engage in the behaviour, and the degree of perceived control and confidence in performing the behaviour. A discussion of the empirical evidence for the TPB is presented later in this dissertation. According to the S*ocial Cognitive Theory*, behaviour is determined by self-efficacy expectations, response-outcome expectations, goals, impediments and facilitators to behavior. Self-efficacy is the degree to which individuals perceive themselves capable of performing a given behavior (e.g., I can stop smoking if I want to). Empirical studies have found it to be the most important construct in the model (Luszczynska & Schwarzer, 2005)) and has consequently been adopted by many of the commonly used theories of behavior change, including the TPB (Conner & Norman, 2005). To date, empirical reviews and meta-analyses of the social cognitive theory have largely addressed its utility in explaining physical activity. In a recent meta-analysis, the model accounted for 31% of the variance in physical activity behaviour, with self-efficacy and goals identified as the strongest predictors of the model constructs (Young, Plotnikoff, Collins, Callister, & Morgan, 2014). As a framework, there are inconsistencies in the measurement and inclusion of sub-components, and often SCT-based studies focus largely on the strongest predictor of the model, self-efficacy (Rhodes & Nigg, 2011).

The *Health Belief Model* proposes that for people to adopt recommended health behaviors, their perceived threat of disease (and its severity) and benefits of action must outweigh their perceived barriers to action. A meta-analysis reported that perceived susceptibility (perceived risk for contracting the health condition of concern) and barriers

(perception of the difficulties and cost of performing behaviors) were the strongest predictors of behavior (Harris, Mullen, & Grenn, 1992). This meta-analysis also indicated, however, that while the health behaviour model was capable of predicting 10% of variance, results from the included studies were heterogeneous and were unable to support conclusions as to the validity of the model (Harris et al, 1992). More recent additions of the model have included self-efficacy, which has improved the predictive power of the model to approximately 20% (e.g., Abraham & Sheeran, 2005; Orji, Vassileva, & Mandryk, 2012). With its emphasis on perceived severity and susceptibility to illness as motivation, this theory was deemed less applicable for this dissertation's focus on research dissemination behaviour. In the *Theory of Interpersonal Behaviour,* behaviour is explained by the following constructs: (a) intentions, (b) habits, (c) facilitating conditions, (d) social and moral influences, (e) perceived consequences of performing a behaviour, and (f) affective responses. The model has been successfully applied to a number of health behaviours, explaining as much as 75% of the variance in some of the behaviours studied (e.g., Apostolopoulos, Sönmez, & Yu, 2002). Many of the model's constructs parallel those of TPB, but the model is considered more inclusive with its proposed constructs of habit, emotion and moral influences. However, the model has not received the same empirical attention as TPB, for example, it lacks systematic reviews, and its applicability to intervention and behaviour change has not been thoroughly investigated. Moreover, the model has also been observed to be inconsistently applied with studies using different constructs, applying different labels to similar constructs, and operationalizing variables in different ways (see Conner & Norman, 2005 for a review).

***Action theories*.** Theories in this category may include motivational elements, but postulate that other factors are necessary to predict behaviour. Operant Conditioning (Blackman, 1974) and Implementation Intentions (Gollwitzer, 1993) are relevant theories to this category. *Operant Conditioning* proposes two main constructs to explain behaviour. First, behaviours that have perceived positive consequences for the individual (such as remuneration) are likely to be repeated, whereas those that have perceived unpleasant consequences will become less frequent. The principle that perceived positive consequences promote behaviour is considered well established and has been widely and successfully used to understand behaviour and behaviour change (Knafer & Goldstein, 1986). Second, the operant conditioning theory posits that as behaviours are repeated, and may become 'habitual'. The frequency of past behaviour has been demonstrated to be a powerful predictor of future behaviour (Ouellette & Wood, 1998).

With *Implementation Intention Theory,* a distinction is made between 'goal intentions' and 'implementation intentions'. A goal intention is an intention to perform a behaviour or achieve a goal. This is conceptually close to the behavioural intention construct in the TPB. By contrast, 'implementation intentions' are explicit plans about when and where a goal intention will be achieved. Implementation intentions have demonstrated promising predictive power to behaviour and can offer an index of the strength of commitment to a target behaviour (Sheeran, Webb, & Gollwitzer, 2005). A meta-analysis on the impact of implementation intentions on behaviour (Sheeran, 2002) showed that implementation intentions had a highly significant effect of medium size, d = .70. However, assessing implementation intentions alone does not provide a comprehensive theory in explaining behaviour. The model emphasizes factors that are

necessary to predict behaviour in people who are already motivated to change. Consequently, it was considered less applicable to this dissertation's objectives.

Stage theories. Stage theories propose that individuals are at different stages in the progress toward behaviour change (for example, a motivated stage is likely to occur before an action stage), and that predictors of behaviour may be different for individuals at different stages (Walker et al., 2003). The most commonly investigated stage theory, the *Transtheoretical Model of Change* (Prochaska & DiClemente, 1984), maintains that in adopting behaviors (e.g., regular physical activity) or eliminating unhealthy ones (e.g., watching television), people progress through five levels related to their readiness to change. According to the model, perceived advantages and disadvantages of behaviour are considered crucial to behaviour change. At each stage, different intervention strategies will help people progress to the next stage. Although widely applied (Glanz & Bishop, 2010), systematic reviews conclude that there is little evidence that interventions based on stage theories are more effective than other non-stage theory interventions (Reimsma et al., 2002; Munro, Lewin, Swart, & Volmink, 2007). Moreover, it does not offer explanation as to how people change or why only some individuals succeed. Consequently, stage models theories were not considered for application in this dissertation.

Selection of the theoretical model. After reviewing available theoretical frameworks, the TPB, a leading social-cognitive theory, was selected for application to the graduate student population for the prediction of a subtype of KT behaviour, dissemination. The reasons for selecting the TPB follow from the selection considerations just described. In brief, the TPB's inclusion of numerous key social-cognitive predictors

relevant to KT render the TPB a promising theoretical framework from which to understand researcher behaviour with varying degrees of motivation (e.g., self-efficacy, perceived behavioural control). TPB is a well-established theory and has received strong empirical support for its prediction of numerous behaviours (Armitage & Conner, 2001), including KT behaviours among policy-makers (Boyko, Lavis, Dobbins, & Souza, 2011) and it appears to have predictive utility in the academic researcher population (Poliakoff & Webb, 2007). According to a review by Webb and Sheeran (2006), the effect sizes obtained from studies using the TPB for designing interventions were superior to other theoretical models (e.g., Health Belief Model and Social Cognitive Theory), validating its utility in identifying process and outcome variables.

Many of the theoretical constructs in other respective theories that are considered strong predictors of behaviour overlap with TPB constructs. This overlap is illustrated in Table 1.1. As an example, the strongest behavioural predictors arising from the predecessor Health Belief Model (perceived barriers), Social Cognitive Theory (self-efficacy), and Operant Conditioning (anticipated consequences of the behaviour) are represented in the TPB model. The following table illustrates the substantial overlap in the reviewed theoretical models. Further, the TPB offers assessment of multiple levels of motivation, which is likely to be particularly informative for the current dissertation. That is, the TPB predicts intention and behaviour by examining both global and specific beliefs, rendering it more informative for the prediction of complex KT behaviours, compared to the Transtheoretical Model of Change for example.

Table 1.1

An outline of the major constructs from the Theory of Planned Behaviour (TPB), Social Cognitive Theory (SCT), Theory of Interpersonal Behaviour (TIB), Health Belief Model (HBM); Transtheoretical Model of Change (TTM), Operant Conditioning (Operant), and Implementation Intention Theory (IIT).

	Behaviour Theory						
Construct	TPB	SCT	TIB	HBM	TTM	Operant	IIT
Attitudes	**X**	X			X		
Perceived Control/barriers	**X**		X	**X**			
Self-Efficacy	X	**X**		**X**	X		
Social Influences	X	X	X		X		
Descriptive Norm	X	X					
Moral Norm			X				
Perceived Consequences	X	X	X	**X**		**X**	
Readiness to Take Action					X		
Affective Reaction		X	X				
Intentions/Goals	**X**	**X**	X		X		X
Habit/Past Experience			X			**X**	

Note. B**olded X** denotes a construct that has been identified empirically as having consistently strong explanatory power for its relevant theory.

As well, the TPB provides an important advantage over all other models reviewed in that the TPB constructs are consistently used and clearly sequentially and operationally defined, thus increasing the clarity and face validity of the model for multiple users of the model. As Brehaut and Eva (2012) point out, the constructs that comprise the TPB can be reasonably understood without an extensive disciplinary background. This is particularly important in an inter-professional field, such as KT. It follows, that a theory with established methodologies for measuring the relevant constructs will be more apt to be adopted and consistently implemented in an interprofessional field. The TPB offers this criterion (Francis et al., 2004) and consequently offers more opportunity for research replicability, comparison, and interpretation. Overall, the TPB appears to offer an empirically-based collection of the strongest behavioural models while also demonstrating theoretical and clinical promise in understanding KT motivation among graduate students.

Overall, many contend that the theory of planned behavior is perhaps the dominant social cognition model used to predict human behaviour, with as many as 490 studies directed at applying and refining the framework (Conner & Sparks, 2005). The research supports the utility of the main constructs of the TPB model and has demonstrated applicability in understanding provider and professional behaviour (Armitage & Conner, 2001; Perkins et al., 2007). There is agreement that many of the common factors of behaviour change are represented in the TPB (Ajzen, Albarracin, and Hornik, 2007; Fishbein & Cappella, 2006). The TPB is appealing to the application of KT research because of its broad scope. It is explicitly intended to be applicable to all voluntary human behaviors and has reliably demonstrated its applicability to a wide range

of behaviors. A description of the TPB model constructs, empirical support, and the applicability of the theory in the context of this dissertation, are described below.

The theory of planned behaviour. The TPB (Ajzen, 1991) is a framework that incorporates a set of factors shown to influence actual behaviour and intention to engage in the behaviour. The TPB describes changes in behaviors (e.g., changes in antibiotics prescribing habits) as being primarily determined by individuals' intentions to engage in the behavior. Intention, in turn, is primarily determined by three direct factors: attitude towards the behavior, subjective norm, and perceived behavioral control. Attitude toward the behaviour reflects an individual's positive or negative evaluation of behaving a particular way. Subjective norm refers to an individual's perception of social pressure to behave a certain way. If people perceive that important others endorse or disapprove of a behaviour, then it is believed they are more or less likely to engage in that behaviour, respectively. Perceived behavioural control refers to one's own self-efficacy and sense of control over engaging in the behaviour. These intentions together with the perceptions of behavioural control, account for considerable variance in actual behaviour. Meta-analyses have revealed the strong predictive ability of the TPB framework to predict behaviour, with R^2 values ranging between 26.5% and 34% (Armitage & Conner, 2001; Conner & Sparks, 2005; Godin & Kok, 1996; Godin, Conner, & Sheeran, 2005).

The TPB also proposes that each of the three direct variables (attitude, subjective norm, and PBC) is informed by a set of underlying accessible beliefs. The direct variables represent global constructs that offer *what* is relevant to intention, while the beliefs are said to be the cognitive foundation (i.e., the antecedents) of the global constructs and specify *why* people hold certain attitudes, subjective norm, and perceptions of behavioral

control (Ajzen, 1991). Attitude is reflected by behavioural beliefs (costs and benefits of performing a behaviour), subjective norm is reflected by normative beliefs (perception of important others' approval/disapproval), and PBC is reflected by control beliefs (barriers and facilitators). These accessible beliefs are proposed to be weighted by the value or importance that an individual places on a belief. For example, if one has the belief, 'walking on a treadmill will lower my blood pressure', the value item would measure how important this belief is to the individual. Together, the belief strength weighted by the value would form a belief composite (Ajzen, 2006). However, the value component of the belief composite has not been universally endorsed, and evidence has suggested that the value component does not add to the TPB framework (Gagne & Godin, 2000; Rhodes, Blanchard, Courneya, & Plotnikoff, 2009; Newton et al., 2012). Despite this controversy, there is agreement that being informed about the critical beliefs (the beliefs that significantly influence intention and behaviour) is essential in designing effective and tailored interventions aimed at changing a target behaviour (Fishbein et al., 2001). Studies measuring underlying beliefs have offered improved understanding in areas such as risk taking behaviours (e.g., Hamilton et al., 2013), physical activity among various populations (e.g., Blanchard et al., 2003; Speed-Andrews et al., 2014), and healthy eating (e.g., Bassett-Gunter et al., 2015), to name a few. No previous study has, however, documented a belief-level analysis of the beliefs underlying researchers' intentions to participate in KT activities. To our knowledge, the only study to investigate researchers and KT using a TPB framework is Poliakoff and Webb (2007). However, Poliakoff and Webb predominantly explored TPB global constructs, not the underlying beliefs, and their sample was not exclusively focused on health researchers.

The TPB views intention to perform a behavior as the central predictor of behaviour. According to Sheeran (2002b) "the assumption is that people do what they intend to do and do not do what they do not intend" (p. 1). A behavioural intention is said to be an index of motivation to perform the behaviour; it can "capture the standard of performance that one has set oneself, one's commitment to the performance, and the amount of time and effort that will be expended during action" (Sheeran, Milne, Webb, & Gollwitzer, 2005, p. 276). In TPB, intention and behaviour have been shown to be significantly related, with similar mean correlations ranging from r = .44 - .47 (Armitage & Conner, 2001; Sheeran & Orbell, 1998) and a systematic review of clinician behaviour demonstrating R^2 values between .15 to .40 (Eccles et al., 2006). Sheeran (2002b) conducted a meta-analysis of prospective tests of the intention– behavior relation. Across 422 studies, involving a wide range of behaviors, intentions accounted for 28% of the variance in subsequent behavior. This is considered a large effect size (Cohen, 1992), thus indicating that intentions are good predictors of behavior. The TPB has been predominantly investigated in relation to lifestyle health related behaviours (see review of Conner & Sparks, 1996), but intentions have been successfully used in the prediction of behaviour in other contexts, such as student academic achievement (Manstead, 2000; Sheeran, Orbell, & Trafimow, 1999) and health provider uptake of evidence-based practice (Breslin, Li, Tupker, & Sdao-Jarvie, 2001; Casper, 2007).

With intention regarded as a prominent predictor of behaviour (an assumption that has been supported by meta-analyses), many studies have used intention as a proxy to understand behaviour. For example, KT intentions within the TPB model, have been explored as the outcome variable in studies investigating the knowledge sharing

intentions of physicians in hospitals (e.g., Ryu, Ho, & Han, 2013), teachers' intentions to disseminate science education (e.g., Haney, Czerniak, & Lumpe, 1996), and intention to adopt evidence-based practice behaviours (e.g., Walker, 2001), to name a few. Only one known study has applied the TPB to understand researchers' intentions to participate in KT activities (Poliakoff & Webb, 2007). Poliakoff and Webb used an expanded version of the TPB to measure researchers' intentions to participate in science-related public engagement. As described earlier, four factors were found to influence academic researchers' intentions to participate in public engagement: *past behavior* (extent of previous participation in public engagement activities), *attitude* (whether scientists regard participating in public engagement activities as positive), *perceived behavioral control* (whether scientists feel capable of participating in public engagement activities), and *descriptive norm* (how much scientists perceive that their colleagues are participating in public engagement activities). In contrast, *subjective norm* and *moral norm* did not significantly predict participation intentions.

There is evidence that the three TPB constructs that predict intentions should be considered multicomponent. For example, in support of Poliakoff and Webb's (2007) augmented TPB model, the addition of descriptive norm and moral norm constructs to TPB measures has been supported by the literature. Descriptive norm measure the perceptions of what others do (Cialdini, Kallgren, & Reno, 1991; Rivis & Sheeran, 2003) and have been found to explain additional variance in intentions (Conner & Sparks, 1996). Similarly, moral norm has demonstrated the ability to predict unique variance in intention (Beck & Ajzen, 1991; Conner & Armitage, 1998), and is believed to reflect the individual's perception of the moral correctness or incorrectness of performing a

behavior (Ajzen, 1991). There is reason to believe that graduate students, who are trainees developing their professional identity, would be influenced by perceptions of descriptive norm. Moreover, knowledge sharing with non-academic audiences might be considered a morally relevant situation for training researchers (e.g., feeling a duty to share privileged information to those who could benefit from it), and, therefore, be influenced by feelings of moral norm. Consequently, moral and descriptive norm were considered for inclusion in this dissertation.

Further multicomponent recommendations have surrounded perceived behavioural control and attitude. In an investigation of perceived behavioural control, Trafimow, Sheeran, Conner, and Finlay (2002) identified two distinct item clusters, which Ajzen (2002) has since labelled self-efficacy (e.g., ease/difficulty, confidence) and controllability (e.g., personal control over behaviour). The role of self-efficacy as a component of perceived behavioural control is not universally endorsed (Rhodes, Blanchard, & Matheson, 2006), but nonetheless has received strong support (Ajzen, 2012). There is also support to distinguish attitude as a two factor component, incorporating an affective and an instrumental component (Ajzen & Driver, 1991; Ajzen, 1991; Conner & Armitage, 1998; Trafimow & Sheeran, 1998). Rhodes, Blanchard, and Matheson (2006) found further evidence for this distinction in their study of exercise behaviour, and revealed that affective attitude was a stronger predictor of intention. Hence, the recommended multicomponent structures of both perceived behavioural control and attitude were considered for inclusion in this dissertation.

1.5 OUTLINE OF THE DISSERTATION

The overall rationale for this dissertation was to help address efforts aimed at improving researcher participation in KT by investigating the future generation of researchers (i.e., graduate students). This dissertation was designed to answer the following primary question: What are graduate students' intentions, and the underlying beliefs, related to participating in non-traditional research dissemination during graduate school? Non-traditional research dissemination, a type of KT, was selected as the target KT behaviour as it was believed to be the most familiar and feasible type of KT activity for graduate students (compared to Integrated KT, for example). Intention, rather than actual dissemination behaviour, was the focus of attention as it was proposed that participating in non-traditional research dissemination could be understood by studying the intention as a necessary although, admittedly, not sufficient condition to actual participation. The assumption was that intentions would be particularly salient to dissemination behaviour as it would be unlikely that a graduate student would spontaneously participate in the demanding (and preparation requiring) task of non-traditional research dissemination without having an intention or goal to do so.

The TPB was used as a framework to answer this question, posing the question: can the TPB adequately explain graduate students' intentions? This dissertation was specifically designed to add to and improve on existing literature by, (a) investigating an important population that has received minimal empirical attention in the KT domain, (b) utilizing the recommended mixed-methods approach to exploring intentions and beliefs (Macaulay & Salsberg, 2013), and (c) testing intention and beliefs using a systematic theory-driven approach. To accomplish this, a four-phase mixed methods approach was

used to develop and administer an online questionnaire and conduct telephone interviews. Phase one involved an online discussion forum to elicit readily accessible behavioural, normative and control beliefs in a representative sample of graduate students to generate questionnaire items (Francis et al., 2004). Participants in phase two provided feedback on the readability of the developed questionnaire, in order to refine and ultimately deliver the main online questionnaire for phase three. Phase four involved telephone interviews with a sample of participants from phase three, to further explore graduate students' beliefs about KT. Overall, these phases included three unique samples of graduates students, three different methodological approaches (online focus group, online quantitative survey, and telephone qualitative interviews), and generated three papers that address the major research objectives. Findings from phase three (quantitative data) and four (qualitative data) were designed to answer the primary research question of intentions and beliefs. The four-phase mixed-methods design is illustrated in Figure 1.1 and detailed further here.

In phase one (Chapter 2), 30 graduate students, conducting health research across Canada, participated in online focus groups to offer their views about engaging in non-traditional research dissemination. Incorporating guidelines from Francis et al. (2004), the study was designed as a TPB elicitation study. Participant responses were collated into themes, which were subsequently converted into questionnaire items and considered for inclusion in the main online survey. This elicitation study was exploratory, thus no a priori hypotheses were formed.

Phase two (Chapter 2) involved creating the questionnaire using results from phase one, as well as incorporating guidelines for TPB questionnaire design (Ajzen,

2006; Francis et al., 2004) and findings/recommendations from the relevant literature (e.g., Poliakoff & Webb, 2007). The questionnaire was pilot tested on a small convenience sample of graduate students to assess survey usability and readability. The questionnaire was modified accordingly.

In phase three, a cross-sectional sample of graduate students across Canada participated in the main online survey (approximately 15 minutes in duration). Data derived from this study was used to address two major research objectives, which are presented as two separate papers (i.e., chapters) in this dissertation. The first paper reports on the investigation of the utility of the global TPB constructs in explaining graduate student intentions. In line with the TPB framework, it was expected that a positive attitude, a high subjective norm, and the belief that one has the resources and ability to perform the behavior (perceived behavioural control), should lead to higher intentions to participate in non-traditional research dissemination during graduate school. Based on a review of the literature, additional constructs were included (moral norm, past behaviour, and future career dissemination intentions) and also expected to influence intentions during graduate school. The second paper reports on the investigation of the salient beliefs that are critical to intentions. Beliefs were generated from phase one of this dissertation, and were expected to have influence on intention, but it was not clear what the strength of these beliefs would be. Both papers offer comparison from findings with non-traditional research dissemination to that of traditional research dissemination results. There was no existing research to guide a priori hypotheses about how findings might compare, other than to speculate (based on graduate training models) that intentions to participate in, and past experience with, traditional research dissemination

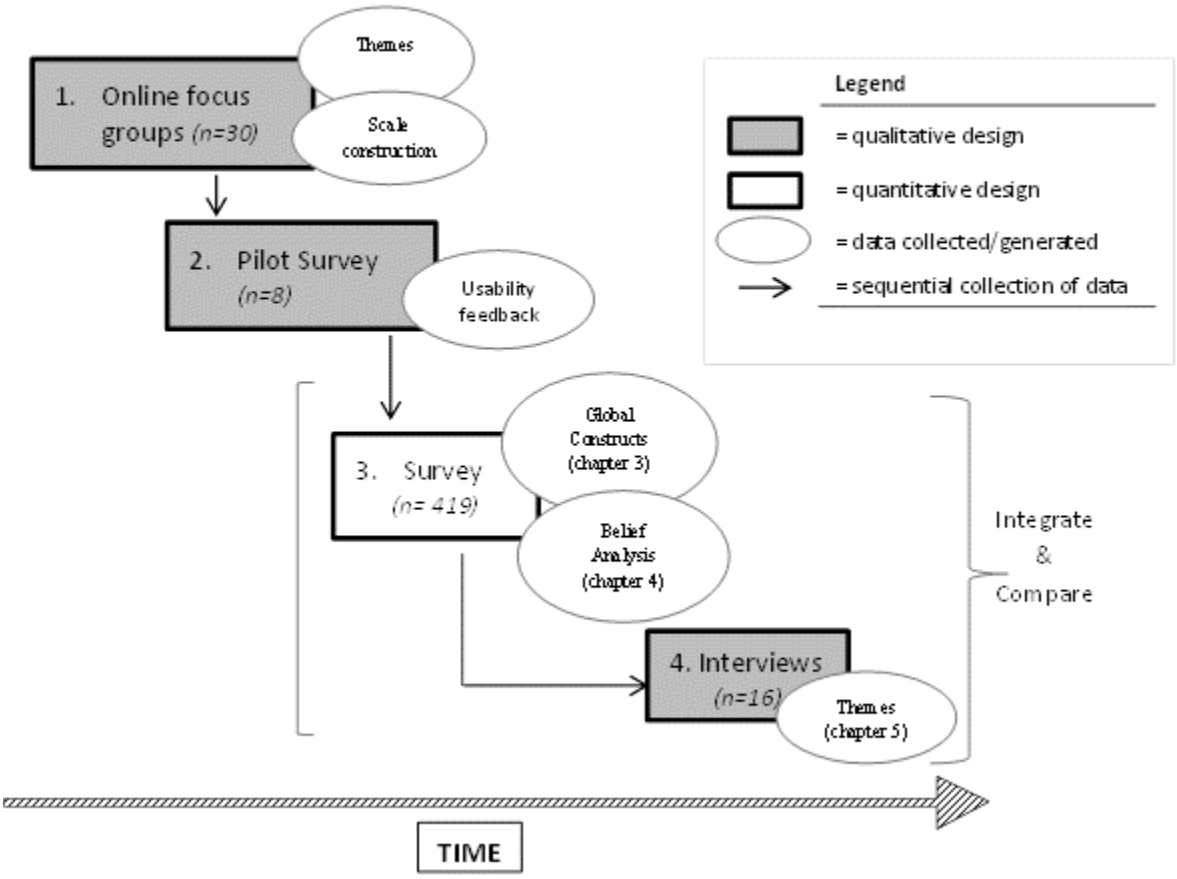

Figure 1.1. The dissertation mixed-methods research design, illustrating the order of phases one to four with the respective generated data type.

would be significantly higher than non-traditional research dissemination. Additional relevant background information is provided within each of those chapters.

Phase four involved telephone interviews (of 30-45 minutes duration) with a subsample of participants from phase three. Interviews were recorded, transcribed and analyzed with thematic analysis. The purpose of the interviews was to investigate perceptions and beliefs with more depth than can be offered by a questionnaire. Phases three (quantitative) and four (qualitative) were analyzed independently and concurrently, and together they form a convergent parallel mixed methods design. This is a methodological approach that focuses on collecting, analyzing, and mixing both quantitative and qualitative data in a series of studies, with the central premise that combining quantitative and qualitative data provides a better understanding of research problems than either approach alone. In the convergent parallel mixed-method design, data is collected concurrently (within a similar timeframe), data is analyzed separately, and results are then compared and interpreted together (Creswell, 2011).

The reason for collecting both quantitative and qualitative data is to tap into the strengths of both methodologies to provide a broader perspective on the overall issue. A quantitative survey can offer an overall pattern, while interviews provide nuances that cannot be captured in forced-choice surveys (Creswell, 2014). As Hodgkin (2008) points out, ‘‘quantitative data may assist in providing the big picture, but it is the personal story, accompanied by thoughts and feelings, that brings depth and texture to the research study’’ (p. 296). Mixed method designs can expand the research in a way that a single approach cannot. For example, the process of offering a statistical analysis along with interview observation creates a more comprehensive study of inquiry. For this

dissertation, it was believed that the integration of qualitative responses could offer a number of benefits, such as: provide corroborating evidence to the statistical data, thereby strengthening validity of the findings (Driscoll, Appiah-Yeboah, Salib, & Rupert, 2007); help to explain or augment complex or contradictory survey responses; and to allow new insights and topics to emerge that may have been overlooked with the quantitative approach. Using a mixed method approach is in line with suggestions from Macaulay and Salsberg (2013) who report that more research should emphasize mixed method and (social) theory-driven approaches in order to effectively investigate the mechanisms and contexts needed to understand stakeholder engagement in KT (dissemination and uptake of knowledge). The mixed method approach is often recommended to ensure that the scale (i.e., number of participants) and the extent (i.e., depth) of research are not considered limiting factors in interpreting findings and translating them into policy and practice.

Together, these studies were designed to uncover variables that are important in trainees' decisions to support and engage in one type of KT activity. Understanding which factors are important to graduate students in deciding whether to take part in KT activities will be valuable in guiding interventions and providing resources in order to create more favorable KT intentions among junior researchers as well as assist in designing more effective graduate school training opportunities. Fishbein and Cappella (2006) contend that in order to understand why people do or do not hold a given intention (or perform a given behavior), it is important to first determine the degree to which that intention (or behavior) is under attitudinal, normative, or self-efficacy control in the population in question. It is in this way that the TPB framework can assist in clarifying

the most effective strategic direction for increasing research participation in KT. Take for example the hypothetical case of an academic institution with an initiative to improve KT activities among graduate student researchers. One of the specific behavioral goals of the institution may be to increase student involvement in dissemination and knowledge sharing to various communities (such as patients and clinicians). The first step would be to understand the key beliefs, attitudes, subjective norm, and perceived behavioral control issues that students hold in relation to this desired behavior. Armed with such information, training opportunities could better address the dissemination challenges of graduate students on the basis of their individual attitudes, subjective norm, and perceived behavioral control. For example, graduate students with high behavioral control but negative attitudes toward dissemination with non-academic audiences (the goal behavior), would benefit from intervention focusing on their attitudes. This might include courses or communication messages that address the science behind why there would be benefit in researchers' involvement, including how it benefits the student, their institution, their target audiences, and their community. The goal would be to deliver an intervention that will impact a mediator (such as attitude) that may result in a change in behavior. For students who already have very positive attitudes toward this goal behavior but have low levels of perceived behavioral control, the previously described intervention would likely provide only modest benefits. For this group it would be necessary to modify the intervention to problem solve with the students and offer programs to enhance their self-efficacy and perceived behavioral control in actually learning to disseminate to non-academic audiences. This focus on skill development rather than attitude may prove more helpful in this scenario. If, in contrast, subjective and descriptive norms are more

predictive of intentions, then perhaps mentorship, encouragement, and messages to increase awareness of other researchers' participation in KT activities would be effective learning tools.

In summary, in an effort to bridge the gap between research and practice, it will be important to understand the relationship that occurs between researchers and users (decision-makers, policy-makers, practitioners, public, etc.), but, more imminently, it is essential that we learn how aspiring researchers perceive KT activities and what barriers and influences they encounter in determining whether they will participate in such activities in the future.

CHAPTER 2:

SURVEY DEVELOPMENT

This chapter outlines the process involved in developing the national online survey that is reported on in Papers 1 and 2 of this dissertation. Survey development was accomplished with two phases: (1) an elicitation study, and (2) a validity study. When appropriate, information related to the elicitation study and survey development is also summarized in the papers (Chapters 3 and 4) that comprise this dissertation.

2.1 BACKGROUND & RATIONALE

The survey development protocol was based on recommended empirically-tested guidelines, set forth for assessing the TPB (Ajzen, 2006; Francis et al., 2004). The purpose of the first phase of survey development was twofold and involved a qualitative approach. It was designed to elicit information about graduate students', (a) beliefs about research and, (b) awareness of non-traditional research dissemination (NTD). Participants registered in an online discussion forum, which was designed to mimic an online focus group, and offered written commentary on a series of open-ended questions. Results from this phase helped inform the item development for the national online survey. Phase two served as the questionnaire development and refinement phase. A small sample of participants completed the electronic survey online and commented on its usability and readability. Ethical approval was provided by the Dalhousie University Research Ethics Board. This chapter describes the objectives, participants, study procedure and analytic approach for each phase.

2.2 PHASE 1: ELICITATION STUDY

2.2.1 Objective

The objective of the elicitation study was to elicit graduate students' beliefs about knowledge sharing (dissemination) with the ultimate intention of constructing questionnaire items for the national survey (chapters 3 and 4). The elicitation study assessed beliefs about dissemination for two time periods, (a) graduate school and (b) anticipated career, with the purpose of evaluating if or how beliefs might change from graduate training to career and to determine the appropriateness of investigating both time periods in the national survey. The generated questionnaire items predominantly

represented the indirect belief-based measures for each of the predictor constructs (attitude, subjective norm, and perceived behavioral control) in the TPB.

2.2.2 Methods

Participants

Recruitment. Participants were not individually selected for recruitment; instead health-focused departments (n = 17) were randomly selected from approximately 700 departments across Canada. All graduate students within the selected department were recruited through an email sent to their department administrative staff. Department staff were asked to kindly forward a recruitment email to their graduate students. In total, 12 of the 17 departments that were contacted forwarded along the recruitment email to their students (three departments did not respond to the request and two indicated that they would not be forwarding the email to their students). This recruitment was conducted in three waves of time in order to produce three focus groups. To obtain a representative sample of graduate students, a stratified random sampling method (Portney & Watkins, 1999) was used for each wave of recruitment. This form of sampling can lend credibility to qualitative research when there is reason to believe that certain characteristics (e.g., type of health field) might influence how a phenomenon manifests itself (Cohen & Crabtree, 2006). University departments were selected based on two attributes (strata): geographical region and health-related field. For each Canadian region, one department was randomly selected from each of the three health-related fields of study:

a) *Geographical region.* Canada was categorized into four Canadian regions: mountain provinces *(British Columbia & Alberta),* prairie provinces

(Saskatchewan, Manitoba), central provinces *(Ontario, Quebec),* atlantic provinces *(New Brunswick, Prince Edward Island, Nova Scotia, Newfoundland).*

b) *Health-related field*. A list of university departments from three health-related fields of study was generated from the Directory of Canadian Universities database (Association of Universities and Colleges of Canada, 2010)[1]. The three selected categories were chosen based on their connection with health-related research and were as follows: (1) Health Professions and Related Clinical Sciences; (2) Human & Social Sciences (includes Psychology); and (3) Biological & Biomedical Sciences.

Participants were included if: (a) they were currently enrolled full or part-time in a Masters or PhD program in Canada, (b) they had completed at least one year of graduate level training, (c) their enrolled program required a thesis/dissertation for the degree, (d) their enrolled program focused on health-related topics, and (e) they were able to read and write English. The focus of phase one was to explore students' perspectives on KT activities, and more specifically thoughts about research dissemination. Therefore, it was important that participants had exposure to a research environment; hence the inclusion criteria of at least one year of graduate level training, and the program requirement for a thesis.

Sample size. According to Francis et al. (2004), approximately 25 participants is the recommended sample size for an elicitation study when constructing a TPB survey study. The current elicitation study recruited 30 graduate students from health-related disciplines who participated in one of three focus groups: A (n = 14), B (n = 13), and C (n

[1] Directory was last accessed in 2010 at: http://oraweb.aucc.ca/dcu_e.html. This website no longer exists and the directory is now (2016) hosted on www.universitystudy.ca with limited search capabilities compared to the original directory.

= 3). The timing of recruitment for group C was not ideal (late summer), and because the total sample size had exceeded the recommended 25 participants, further recruitment efforts were consequently concluded.

Measures

Participants were asked to complete two measures: (a) a demographic survey (such as age, sex, and years of graduate training) and, (b) a discussion forum involving six open-ended questions related to their beliefs about disseminating research findings. These measures were designed and created as follows:

Demographic survey. Thirteen background items were generated into a survey that was hosted with an online service called AskitOnline.com. Assessment of eligibility and the consent form process were also delivered along with the demographic survey. This survey service was chosen because it offered several features that would protect the confidentiality and privacy of data while it was being transmitted over the Internet.

Discussion forum. A website was created for the elicitation study in consultation with website designer, Trifold Consulting. The online discussion forum presented the following six questions that are recommended for the TPB elicitation studies (Ajzen, 2006; Francis et al., 2004): (1) In your opinion, what do you think the *advantages* and *disadvantages* are of [behaviour], (2) Are there any individuals or groups who would *approve* or *disapprove* of [behaviour], (3) What factors or circumstances would make it *easier* or *difficult/impossible* for you to [behavior]. These three standard questions were intended to elicit the beliefs that comprise each of the TPB motives (attitudes, subjective norm, perceived behavioural control).

For this elicitation study, the behavior being assessed was "*participating in non-traditional research dissemination activities*". Non-traditional dissemination was defined to participants as "*any scientific communication about research that engages audiences outside of academia (i.e., clinicians, patients, the public, policy-makers, etc.). Specific examples are: workshops for clinicians on the evidence behind managing a particular condition, educational talks for the public, patient education material, newsletters, interviews with the media, etc.*". This was compared to *traditional research dissemination,* which was defined as "*scientific communication (usually peer-reviewed publications) about research that engages the academic community (i.e., researchers, professors, etc.)".*

The three standard questions were repeated for two different contexts, (a) during graduate school (e.g., "*In your opinion, what do you think the advantages and disadvantages are for graduate students to participate in non-traditional research dissemination activities?*"), and (b) during their intended career (e.g., "*During your intended career, what do you think the advantages and disadvantages would be to participating in non-traditional research dissemination activities?"*). Questions were presented all on the same page starting with the graduate school context; however, participants were free to respond to questions in whatever order they chose.

Procedure

From the recruitment email, graduate students who were interested in participating were guided to the study website. At the study website homepage, interested graduate students were provided with a short synopsis of the study and directed to click on "Step 1" to proceed. Clicking "Step 1" opened a survey that first assessed eligibility

criteria and then provided them with the consent form. In line with Varnhagen et al.'s (2005) recommendations, participants were able to actively consent or decline to participate by selecting a "Yes" or "No" response. If they agreed to the study conditions, the survey continued with the demographic survey (13 items). Upon completion of the demographic survey, participants were rerouted to the study homepage where they were instructed to select "Step 2". This link opened the discussion forum, where they were required to register with an anonymous username (which would be viewable to other participants) and email (only viewable by the principal investigator). A password was sent to their email account. Once students signed-in with their password, participants were directed to the "discussion" page, where they were asked to comment on six different questions. Participants could see responses from other participants in their assigned focus group. Instructions encouraged participants to contribute both their own views to the question as well as comment on posts from other participants. Participants were only requested to contribute to the discussion on one occasion; however, they were free to return to post additional comments at any time before the study closed. This type of data collection has been described as an asynchronous (non-real-time) online focus group (Mann & Stewart, 2000). The online discussion was used to simulate the benefits often seen with a focus group. By definition, focus groups depend upon, and are created by, the contributions of multiple participants (Mann & Stewart, 2000). It is the group interaction and contributions that produce the data and insights that would be less accessible without the interaction found in a group. Similar to face-to-face focus groups, the elicitation study's online discussion served to encourage participants to both challenge and respond to each other and, as a result, potentially help clarify arguments as

well as reveal a diversity of views and opinions. Interviews or focus groups are recommended for the elicitation pilot work (Ajzen, 2006; Francis et al., 2004) and have been successfully applied in TPB studies, such as medication adherence (e.g., Lewis, 2010), healthy eating (e.g., Kahlor et al, 2011), and beverage consumption (Zoellner et al., 2012), to name a few.

According to Mann and Stewart (2000), advantages to online focus groups are: increased ease of communication between participants, greater equality of participation in the discussion, anonymity of participants, reduction in bias, and the ability to recruit diverse geographic populations. Maintaining anonymity was an important aspect for the current study in order for participants to feel comfortable revealing opinions about their training and mentorship without the fear of repercussion. Moreover, anonymity allowed for other potential biasing factors, such as a student's seniority, degree, or discipline to be a less salient or observable variable to other participants when disclosing beliefs. Disadvantages associated with on-line focus groups, however, include underrepresentation of the overall population because only internet users are included, loss of verbal cues during communication, difficulty controlling the user's environment for privacy, a high no-show rate among participants agreeing but failing to take part in the online focus groups, and potential issues regarding flaming discussions within an online discussion (Geiser, 1997; Schneider, Kerwin, Frechtling, & Vivari, 2002). Many of these disadvantages were not salient concerns in this elicitation study because the targeted sample all were internet users (and therefore the sample was not biased in that respect), risks related to privacy of the discussion were minimized due to the secure

website and anonymity of the participant, and topics of discussion were not of a sensitive nature and unlikely to spark heated debates.

The asynchronous (non-real-time) form of data collection was chosen versus the synchronous (real-time) because of the advantages it provides (Mann & Stewart, 2000). First, it overcomes the problems of distance and time. This multi-institutional sample included graduate students with distance and time constraints that would preclude them from participation in an onsite focus group. The asynchronous online focus group does not require that participants be online at the same time. The sender transmits a message, which can be responded to by other participants at some time in the future. Thus, it can overcome differences in time zones. Second, the asynchronous discussion forum creates an immediate transcript of the focus group that can be reviewed by both the participants and the researchers. This eliminates the need for costly transcribing of audio and allows the participants to comment on or correct any information immediately or at a later date. Third, asynchronous focus groups are particularly valuable when detailed and highly reflective comment is sought. This is particularly relevant to the present elicitation study, as the topic of NTD was presumed to be less familiar to participants and so opinions were perhaps less readily accessible. If NTD beliefs are indeed less readily accessible, then having time to reflect on open-ended questions (similar to a questionnaire format) and the opportunity to be prompted by others' thoughts (similar to a focus group approach), would provide benefits beyond what either a questionnaire or focus group could offer alone. For this reason, the current study's asynchronous discussion group was believed to be an effective approach in generating beliefs for a potentially unfamiliar behaviour.

Upon completion of the discussion question, participants were provided with a copy of the unpublished e-book, “How to write a thesis and keep your sanity” (author: Dr. Brad McRae), as a token of participant appreciation. Permission for distribution was granted from the author. The electronic book was available for download on the study website.

Analytic Approach

Descriptive statistics were calculated and qualitative thematic analysis (Braun & Clarke, 2006) was used to outline the themes generated from the elicitation study discussion forum. Guided by Braun and Clarke’s step-by-step directions, four phases of analysis were performed. First, the principal investigator read and re-read the data to become familiar with it. Second, every response was coded and data were then collated by code. Third, themes were generated by combining relevant codes, or renaming codes into broader, more encompassing terms. Fourth, a thematic map was created that helped identify overarching themes, along with sub-themes. Thematic analysis was conducted separately for responses related to graduate school versus intended career. For verification and validity purposes, analysis involved a peer review process whereby the coding decisions and sample transcripts were reviewed by the principal investigator’s research supervisor (LR). Responses to discussion questions aimed at identifying normative beliefs were not included in the qualitative analysis. Instead, a list of reported referent groups was generated from the responses. After a thematic map was created, a list of the belief themes corresponding with the TPB construct (behaviour, normative, control) was produced. Belief themes were ranked by saliency, which was determined by discussion frequency within and or across the three focus groups.

2.2.3 Results

Recruitment statistics

The elicitation study was divided into two steps, the demographic survey and the online focus group. Overall, 71 graduate students (from 12 departments) opened the demographic survey to view it, 57 started the survey, 8 stopped after reading the consent form, and 46 completed the demographic survey. Of the 46 participants who enrolled and completed the demographic survey, 37 continued and signed-in to participate in the online discussion. Of those who signed-in, 30 posted contributions to the online discussion portion of the study (referred to hereafter as completers). This indicates that 16 (out of 46) participants consented to participate, completed the demographic survey, but then did not participate in the discussion forum (referred to hereafter as non-completers).

Demographic statistics

Table 2.1 offers details of the descriptive data for the three focus groups (completers) and the non-completers. Across the three groups, participants were mostly female (80%) with an average age of 34 years (*SD* = 9.55 years)[2]. Despite efforts to recruit participants across Canada, the sample had a strong representation from Ontario or Quebec (67%). Half of the participants were enrolled in a health science program (e.g., health & rehab sciences; health promotion). Participants perceived their programs as being predominantly research focused with an *M* of 8.50 (*SD* = 1.14) on a scale of 1 (no research focus) to 10 (extremely research focused). The majority were completing a PhD with an average of four years of graduate level training (*SD* = 2.60). Most anticipated a career as a researcher (37%) or one that combined research and health practice (40%).

[2] The age range was 22 -57 years and the median of 31.5 years was not substantially younger than the reported mean. These ages are comparable to the age demographics found in the current dissertation's national survey of 419 students (*M* age = 29.9 years, range = 22 – 60).

Table 2.1

Descriptive statistics of participants in the three online focus groups, reported separately (A, B, C) and together (T), and graduate students that provided demographic information but did not participate in the focus group (D).

		Group				
		A	**B**	**C**	**T**	**D**
N		14	13	3	30	16
Age	Mean	34.1	32.6	40.0	34.0	29.3
	SD	10.4	8.0	13.1	9.6	8.4
	Range	24-57	22-48	25-49	22-57	22-49
Sex	Female	11	10	3	24	10
Field of study	Health sciences/services	3	9	2	14	7
	Physio	0	4	0	4	0
	Psychology	4	0	0	4	2
	Biological sciences	3	0	1	4	4
	Pharmacology	3	0	0	3	2
	interdisciplinary	1	0	0	1	1
Degree	PhD	8	10	1	19	8
Total Grad years	Mean	4.3	4.5	1.2	4.1	3.0
	SD	2.4	2.8	0.3	2.6	1.8
	Range	1-8	1-11	1-1.5	1-11	1-7
Geographic location	Mountains and the West	5	0	1	6	6
	The Prairies	1	0	0	1	2
	Central Canada	5	13	2	20	6
	East Coast	3	0	0	3	2
Past Research Behaviour	TD. Yes	13	13	2	28	15
	NTD. Yes	7	8	1	16	8
Intended career	Practitioner	4	1	0	5	3
	Researcher	5	5	1	11	4
	Researcher & practitioner	4	6	2	12	3
	Other	1	1	0	2	6
Program Research emphasis, 0-10	Mean	8.3	8.5	9.7	8.5	8.5
	SD	1.4	0.8	0.6	1.1	1.5
	Range	6-10	7-10	9-10	6-10	4-10

Note. T= total of all groups, D = did not participate. TD = Traditional research dissemination, NTD = Non-traditional dissemination

Almost all participants had experience with TD (93%) and half had experience with NTD (53%). Compared to participants with no NTD experience, those who endorsed experience with NTD were older (NTD experience: *M* age = 36.9 years, *SD* = 10.7; No NTD: *M* age = 30.8 years, *SD* = 7.1), were more likely to be in a PhD degree (NTD experience: 68.8 %; No NTD: 36.0 %) and had more years of graduate training (NTD experience: *M* = 5.0 years, *SD* = 2.6; No NTD: *M* = 3.1 years, *SD* = 2.3). They were also more likely to be planning for a career as a scientist-practitioner (NTD experience: 62.5%; No NTD: 21.4%) versus researcher only (NTD experience: 25.0 %; No NTD: 50.0 %)

There was no obvious demographic or educational difference between the focus groups. Similarly, the non-completers also endorsed comparable descriptive data compared to completers, with one noticeable exception; there was a larger representation of non-completers who did not endorse a research or practice career, but instead reported an anticipated career as "other" (38%) compared to completers (7%).

Thematic analysis

Belief themes were identified separately for (a) graduate school and (b) anticipated career. A thematic map, outlining the positive and negative beliefs regarding research dissemination, is illustrated for the graduate school (figure 2.1) and career (Figure 2.2) time period. Beliefs about NTD emerged as being related to three areas: relevancy to student's research, to the non-academic community, and to self (i.e., their academic progress, professional growth).

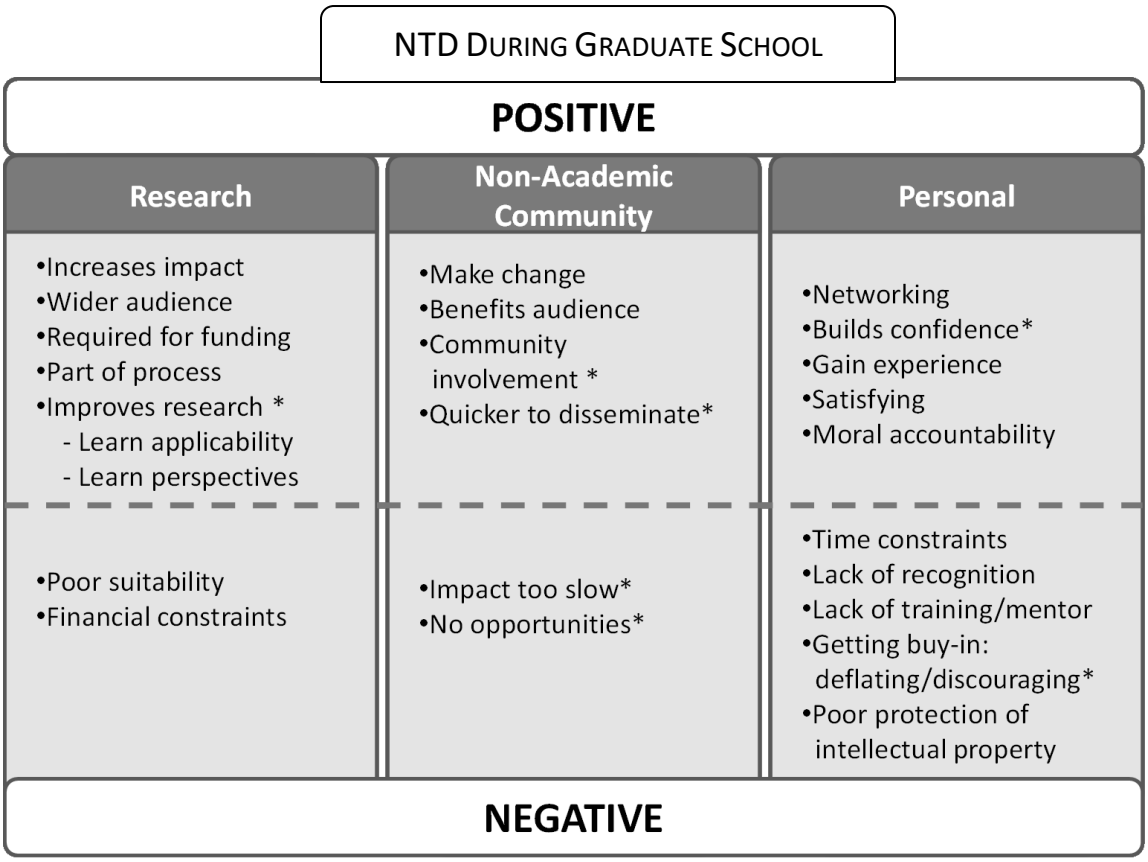

Figure 2.1. Map of beliefs that emerged from the elicitation study, about non-traditional research dissemination (NTD) during graduate school. *Note*. Beliefs that were not represented in the final questionnaire are asterisked (*).

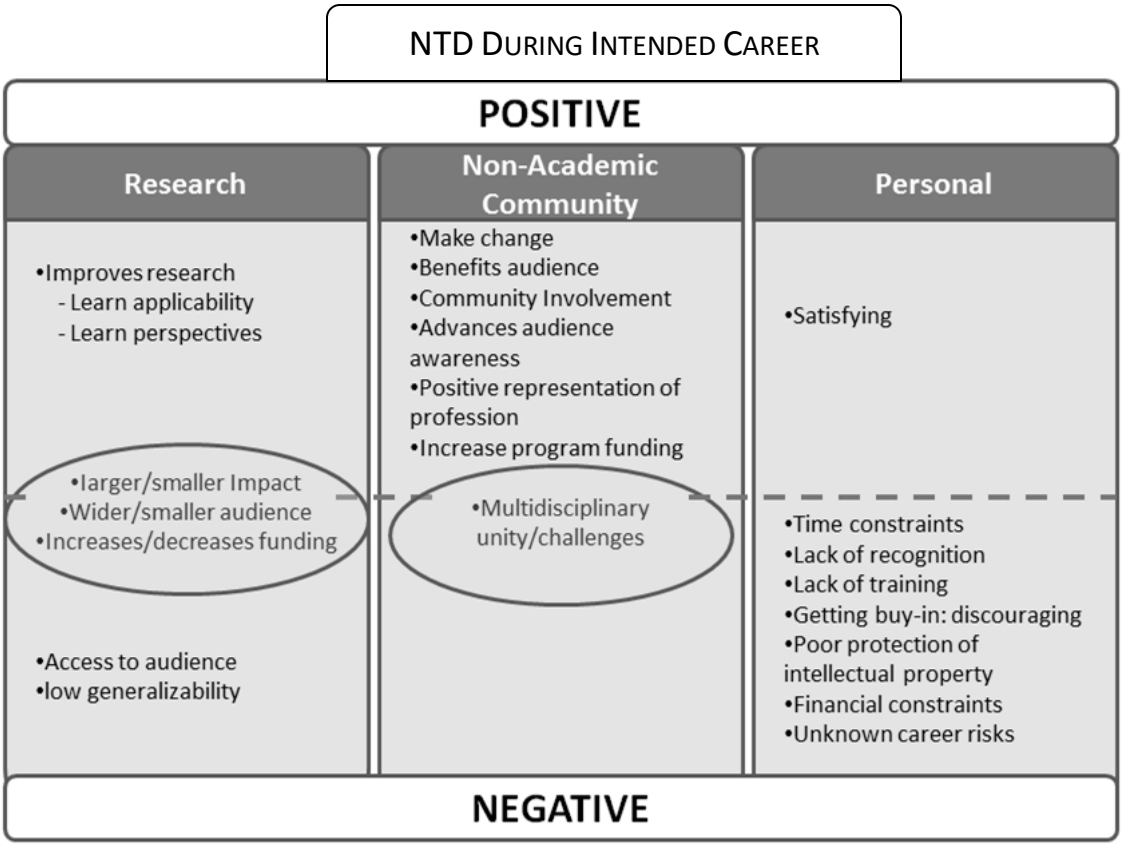

Figure 2.2. Map of positive and negative beliefs about non-traditional research dissemination (NTD) during students' intended career. *Note*. Beliefs themes for which participants had mixed positive-negative orientations are enclosed in a circle.

a) Beliefs about graduate school. In observing the number of belief themes, participants endorsed a strong emphasis on the positive impact that NTD would have on their research during graduate school (e.g., increase impact, reach a wider audience, and improve applicability of research). A similar number of themes were identified for NTD in considering personal benefit (networking, satisfying, gaining experience) during graduate school. The beliefs for personal benefit were counteracted, however, by the same number of belief themes related to negative personal impact (e.g., time constraints, lack of recognition, lack of training). It appears that students respond favorably to the potential impact NTD could have on their research, but that they hold both positive and negative beliefs about how participation in graduate school could affect them personally. Although participants agreed on the benefit that NTD would have on the community (e.g., make change), they were divided as to whether they believed NTD would be a quick or slow process in having a community impact (e.g., quick to disseminate but slow to make a difference). See Figure 2.3 for sample participant quotes for the belief themes.

b) Beliefs about career. Themes that emerged for NTD during one's anticipated career were similar to beliefs during graduate school. However, the emphases (number of themes per research/community/personal category) were markedly different. Participants had predominantly positive beliefs about the benefits that NTD would have to the non-academic community (e.g., benefit audience, represent profession); whereas their beliefs about the impact dissemination would have on them personally were predominantly negative (e.g., unknown career risks, lack of professional recognition). Participants were not unanimous in their beliefs about whether NTD would help with research funding, improve the impact of their research, what size of audience it would reach, or whether

Theme*: Make a Difference*

> *"The advantages of non-traditional dissemination are huge. In my opinion, this is where research findings/results should be presented - what is the point of research if it doesn't benefit someone or influence policy/practice?"*

Theme: *Improves Research*

> *"*[KT] *forces us as researchers to answer the "so what?" question that can sometimes bring us back to earth when we can get too carried away in abstract theories."*

Theme: *Lack of Academic Recognition*

> "[KT] *Not as beneficial in a "publish or perish" world of academic research"*
>
> *"…the Academy only values my efforts if my presentation is in a peer-reviewed conference, symposium, or publication"*
>
> *"I feel the bottom line is that I have to disseminate in the traditional methods to develop my career and establish a reputation as a skilled researcher"*

Theme: *KT training and mentorship*

> [it would be easier to participate in non-traditional research dissemination*] …. "If I could see this in action. If I could see what exactly is meant by this type of research display"*
>
> *"…many grad students don't have the experience, knowledge, or support (financial or academic) to do non-traditional dissemination."*

Figure 2.3. Sample graduate student quotes related to select belief themes about non-traditional dissemination during graduate school.

it would create multidisciplinary unity or challenges. Overall, and as might be expected, the discussion for the career time-frame was less elaborate and less detailed compared to the graduate school time frame.

Summary & Implications

The results reveal that graduate students consider KT to be an important endeavor during graduate school; one that would have a positive impact on their research (e.g., networking, collaboration, diverse audience). However, graduate students also believe their involvement would come at a cost to their own educational/career advancement. The lack of academic recognition, time, financial support, KT training and mentorship, were commonly described impediments. It would appear that the KT movement has been successful in advancing graduate students' positive attitudes towards knowledge sharing. However, despite the recognized value of KT, future researchers still feel that the consequences of participating may be too risky. According to these results, students would benefit from an academic environment that recognizes and encourages their KT efforts (e.g., KT funding opportunities, KT training/ mentorship, academic credit). It became apparent from the qualitative analysis that beliefs about career-related dissemination were less developed. Participants offered fewer comments about the career time period (compared to during graduate school), and commentary was more ambiguous and less certain (e.g., "*I'm not sure who would or wouldn't approve*" or "*there will always be people who will approve and others that disapprove*"). It is possible that a more thorough discussion, with prompting from an investigator, could have assisted in generating beliefs that were not immediately accessible. However, with the demonstrated difficulty in generating more developed thoughts, the value in further exploring career-

related beliefs in a survey format became questionable. With that said, participants often spontaneously offered their own hopes and plans for dissemination during their career (e.g., "*During my research career I hope to use non-traditional methods for dissemination*"), suggesting that participants could make a determination of their own future involvement in dissemination, but perhaps were less able to elaborate on the reasons why, without further prompting. Thus, the decision was made to not further explore the beliefs and correlates of career dissemination intentions, but to focus the national survey on more thoroughly uncovering the correlates involved in dissemination during graduate school.

What was also notable from the results was the frequency with which participants' comments on NTD were compared to their beliefs about traditional dissemination (TD) activities. For example, participants often used comparative terms such as "more/less" or "quicker/slower" to communicate their opinions of NTD in relation to TD; demonstrating that TD was often being considered when formulating thoughts about NTD. Although the terms used in the study questions (non-traditional and traditional) may have prompted this comparison, it also seemed useful for participants to explore their thoughts about NTD (a less familiar behaviour) in comparison to their (possibly) more accessible beliefs about TD (a more familiar behaviour). For example, participants made comments like, "*it [NTD] can reach a large number of people in a quicker way than a peer-reviewed journal*" or "*you can make it more audience appropriate, and focused. To reach certain audiences it does not make sense to write in a peer-reviewed journal if your target audience will never read it*". Consequently, the decision was made to assess both TD and NTD in the national survey. The benefit of

considering both dissemination methods was believed to be two-fold. One, because TD is a more familiar behaviour, participants may have more accessible beliefs about this behaviour in contrast with the less familiar NTD. As such, by rating responses to both TD and NTD, participants can determine their NTD responses by evaluating how they feel it compares to their beliefs about TD (the method participants used in responding to the elicitation study). Two, by asking questions about TD and NTD, there is less apparent questionnaire focus on NTD, which may serve to reduce the challenge of social desirability bias (Podsakoff, Mackenzie, Lee, & Podsakoff, 2003) and offer more valid self-report responses. In summary, the elicitation study revealed that the national survey would be best to target the more proximal time period of graduate school and to include an exploration of TD along with NTD.

2.3 PHASE 2: QUESTIONNAIRE DEVELOPMENT

2.3.1 Objective

The objective of phase two was to develop the questionnaire to be used for the main national online survey (Chapters 3 & 4). This was achieved in two parts. In part one, questionnaire items were generated based on results from the elicitation study and existing TPB guidelines. In part two, the developed questionnaire was pilot tested and modified accordingly in order to optimize face & content validity.

2.3.2 Method. Part 1: Questionnaire development

Item generation was predominantly guided by the methods outlined by Francis et al. (2004) and Ajzen (2006) as well as findings from relevant studies (Poliakoff & Webb, 2007; Rhodes, Plotnikoff, & Spence, 2004). In line with Francis et al.'s (2004) guide, seven steps were considered to design a questionnaire with a TPB framework. Based on

findings from the Elicitation Study and the TPB literature, Figure 2.4 illustrates the proposed augmented TPB model that guided questionnaire development.

Step 1. Define the population of interest. The population selected for this study was graduate students enrolled in a thesis-requiring program with a health research focus.

Step 2. Carefully define the behaviour under study using the TACT principle. The behaviour of interest for the current study was the intention of graduate students to participate in non-traditional (behaviour #1) and traditional (behaviour #2) research dissemination during graduate school. Using the TACT principle, the behaviour is further defined by doing *what*, to *whom*, *where* and *when* (action, target, context, time). The action is research dissemination, the target is the non-academic audience (behaviour #1) and academic audiences (behaviour #2), the context is trainee KT, and the time is during graduate training. The definition of each behavior was further clarified at the start of each section of the questionnaire as follows:

> *Non-traditional dissemination*. Any communication about research that engages audiences outside of academia (i.e., clinicians, patients, the public, policy-makers, etc.). Specific examples are: workshops for clinicians on the research evidence behind managing a particular condition, educational talks for the public, patient education material, newsletter articles, interviews with the media, etc.
>
> *Traditional dissemination*. Scientific communication (usually peer-reviewed publications & conferences) about research that engages the academic community (i.e., researchers, professors, etc.).

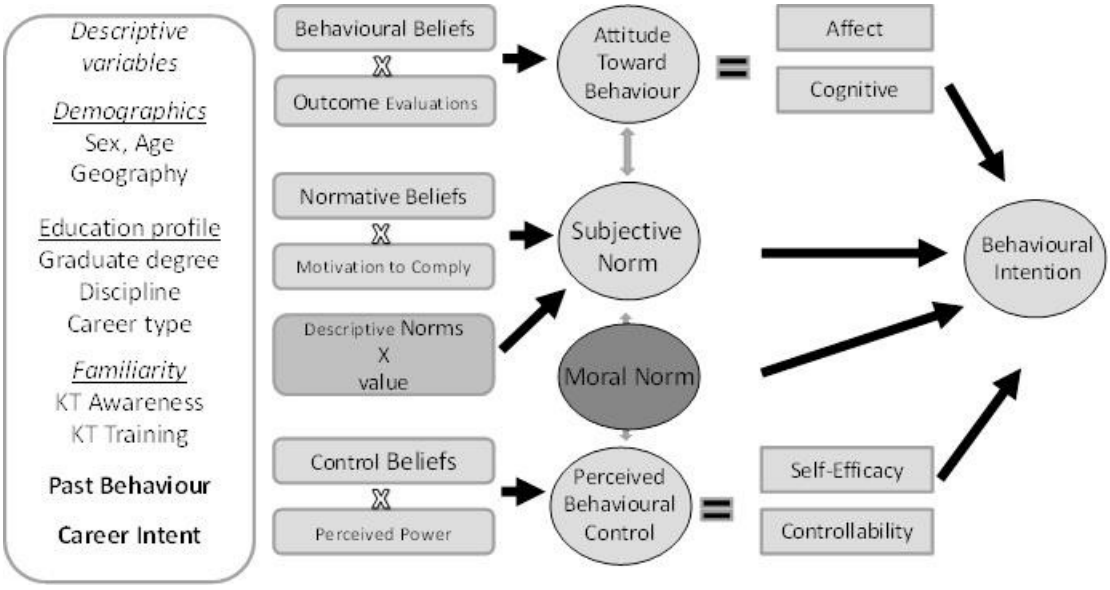

Figure 2.4. Proposed augmented TPB model that guided questionnaire development.

Step 3. Decide how best to measure intentions. Francis et al. (2004) outline three methods of measuring intentions: intention performance, generalized intention and intention simulation. Intention performance uses a single item to assess intention, which is generally not advised for a main outcome variable (Ajzen, 2015). Intention simulation uses hypothetical scenarios to which a respondent would indicate their intention decision. This approach seemed less conducive to an assessment of research dissemination intentions and possibly more time-intensive for participants. Generalized intention, which uses the mean score of multiple intention questions, has been the most commonly used method of intention in the TPB literature and determined to be the most appropriate approach for the current study. Based on empirical evidence (Armitage & Conner, 2001), Francis et al. (2004) recommend using three items that have demonstrated adequate internal consistency in assessing intentions: (1) *I expect to*; (2) *I want to*; and (3) *I intend to*. Additionally, Ajzen (2006) recommends using the item "*I will try to*" when assessing intentions. Thus, these four items were created for the current study questionnaire. Items were rated on a 7-point scale with "1" being strongly disagree and "7" indicating strongly agree. A 7-option response format is most often recommended in the TPB literature (Francis et al., 2004) and was used for all items in the current questionnaire. A composite of the four intentions items was used as the outcome variable.

Step 4. Develop the direct and indirect measures of the TPB. Each TPB construct may be measured directly (e.g., by asking respondents about their overall attitude), and indirectly, (e.g., by asking respondents about specific behavioral beliefs). It is recommended that both be included in a TPB assessment in order to first discern overall orientation toward each construct (e.g., favourable or unfavourable), and then

uncover the underlying beliefs that constitute that orientation. The following section describes the items created to represent the scale constructs. Scale statistics are further detailed in Paper 1 (Chapter 3) of this dissertation.

TPB measures. Both direct and indirect measures of the TPB constructs are listed below. The *direct measures* represent the TPB global constructs and were operationalized as follows: attitude, the most frequently perceived advantages and disadvantages of performing the behavior; subjective norm, the most important people or groups of people who would approve or disapprove of the behavior; and perceived behavioral control, the perceived barriers or facilitating factors that could make it easier or more difficult to adopt the behavior (Ajzen, 2006). For the *indirect measures,* themes generated from the elicitation study and recommendations from Francis et al. (2004), guided item development for the final questionnaire. Qualitative analysis from the elicitation study mapped 21 beliefs across three contexts (research, non-academic community, and personal relevancy) that were generated from questions designed to elicit behavioural and control beliefs (normative beliefs were not included in the qualitative analysis, instead a list of referent groups was generated from questions pertaining to normative beliefs). Integrating the responses into the map of themes offered a more cohesive understanding of the belief orientations. However, in order to create questionnaire items, the themes were returned back to a behavioural or control belief, which was determined by whether the belief was reported by participants as an advantage/disadvantage (behavioural belief) or barrier/facilitator (control belief). Within the respective belief category, elicitation study themes were ordered by most to least frequently discussed in the focus groups. Theme frequency was defined first by the theme's occurrence across the three focus

groups and then the number of participants who mentioned the theme within each focus group. Highly frequent themes were converted into questions for the final questionnaire. Attempts were made to include as many themes as possible, but questionnaire length was also a consideration in order to reduce participation fatigue and response rates. Thus, a number of themes were not included in the questionnaire for behavioural beliefs (e.g., increase community involvement, improve research), normative beliefs (e.g., committee member, community members, funding agencies), and control beliefs (e.g., no opportunities). For further detail, Figure 2.1 illustrates the behaviour and control belief themes generated from the elicitation study; and themes that were not included in the questionnaire are asterisked.

Furthermore, as recommended by Francis et al. (2004) and Ajzen (2006), for each of the indirect items measuring strength of that belief, a corresponding value item was generated to assess for the importance of the belief. In the interest of a reasonable questionnaire length, some value component items were excluded from the questionnaire because they were predicted to generate little variability (e.g., "if participation takes too much time, I am [less likely/more likely] to participate"). Appendix A lists the final list of belief items generated from the themes identified in the elicitation study.

Attitude. The direct measurement of attitude usually involves the use of bipolar adjectives, i.e., pairs of opposites that are evaluative, such as good-bad. Francis et al. (2004) recommend the use of at least four items following a single stem that defines the behavior under investigation. The good-bad scale is recommended as it is believed to capture an overall evaluation of the attitude toward the behavior (Francis et al., 2004). In addition to the good-bad scale, this questionnaire included two instrumental items (i.e.,

whether the behavior achieves something), *useful-worthless* and *harmful-beneficial*, as well as three affective items (how it feels to perform the behavior), *enjoyable-unenjoyable* (recommended by Francis et al., 2004), *dull-interesting* (used by Skar et al., 2008 in a measure of affective attitude), and *satisfying-unsatisfying* (generated from the elicitation study and also presented as an affective measure of attitude in Conner & Norman, 2005). The majority of these adjectives were recommended by Francis et al. (2004), with the exception of *dull-interesting,* which is credited to Skar, Sniehotta, Araújo-Soares, and Molloy (2008), and *satisfying-unsatisfying,* which emerged in the elicitation study. The items were arranged so the end-points of the 7-point scale were a mix of positive and negative, in order to minimize response bias. The plans were for two composite scales to be created from the responses, one for affective attitude and the other for instrumental attitude.

For the indirect measure, Six behavioral belief expectancies were asked using 7-point Likert-type scales from 1 (strongly disagree) to 7 (strongly agree) and were preceded by the statement, ‘‘*I believe that participating in [traditional/non-traditional] research dissemination during graduate school would . . .*”. The corresponding value term was measured with a similar 7-point scale by asking how important the belief outcome was for the participant’s graduate studies, from 1 (not at all important), to 7 (extremely important).

Subjective Norm. The direct measure of subjective norm assesses how much the respondent feels social pressure to perform the behaviour. The developed questionnaire followed recommendations from both Francis et al. (2004) and Ajzen (2006) and included three items: “*it is expected of me”, “I feel under social pressure”, “people who*

are important to me think I should". The objective was for the mean of the three items to represent a subjective norm composite score.

For the indirect subjective norm measures, both injunctive norm (what important people *think* a person should do) and descriptive (what important people *actually* do) items were generated for the referent groups identified in the elicitation study. The identified normative referent groups were not included in the qualitative analysis as presented in Figure 2.1. Instead referent groups were listed in order of frequency (using the frequency ordering method described previously). Two injunctive norm referents (research supervisor, graduate program) and three descriptive norm referents (research supervisor, professionals in discipline, fellow graduate students in program) were selected. For injunctive norm expectancies, participants were asked, ''*When it comes to participating in* [traditional/non-traditional] *research dissemination during graduate school, I believe my* [research supervisor/ graduate program] *thinks I should*", from 1 (strongly disagree) to 7 (strongly agree). This was followed by corresponding value (or motivation to comply) questions about how important it is to do what the referent wants the participant to do in terms of dissemination, rated from 1 (not important) to 7 (extremely important) . The descriptive norm expectancy questions asked whether participants believe each of the three referents "…*participate(s) in [traditional/non-traditional] research dissemination",* and was rated on a scale from 1 (untrue) -7 (true) as was seen in Rhodes, Blanchard, Courneya, and Plotnikoff (2009).The corresponding value items asked how important it was for the participant to do what the referent does related to dissemination, rated from 1 (not important) to 7 (extremely important).

Perceived Behavioural Control. Items were designed to reflect the extent to which the respondent feels in control of participating in research dissemination by assessing self-efficacy and the controllability beliefs toward the behavior. As recommended by Francis et al. (2004), self-efficacy was assessed by asking, "*I am confident that I could participate*" and "*it would be easy for me to participate*" Controllability was assessed by asking, *the decision to participate would be beyond my control" and "the decision to participate would be entirely up to me".* Two composite scores were intended for controllability and self-efficacy.

For the indirect measure, control expectancy questions asked participants to rate the strength of their beliefs related to six potential barriers to participating in dissemination. The six barriers (e.g., it would be costly to do) were preceded by the statement, ''If I participate in *[traditional/non-traditional]* research dissemination during graduate school, even if I really wanted to...'', and rated from 1 (strongly disagree) to 7 (strongly Agree). Belief value (corresponding power) was measured for four of the six control beliefs, and rated on the likelihood of participating if the barriers existed, from 1 (less likely) to 7 (more likely to participate).

Moral norm. Findings from the Elicitation Study suggested beliefs of moral accountability may contribute to motivation to participate. Consequently, two appropriate items, used in a relevant study (Poliakoff & Webb, 2007), were included to assess moral norm, "*I feel morally obligated to take part (e.g., because taxpayers' money funds research)*", and "*I feel I have a duty as a researcher to take part*". Although the moral norm measure is an addition to the Francis et al. (2004) questionnaire recommendations,

moral norm items followed the same wording recommendations and scale choice (7-point, strongly disagree/strongly agree) as the other TPB constructs.

Step 5. Creation of the demographic and educational profile questions. Descriptive questionnaire items assessed individual factors (e.g., age, sex), graduate program factors (e.g., geographic location, field of study, perceived strength of graduate program's research emphasis), and a personal academic profile (e.g., degree, years of training, years to completion, intended career type, thesis type). Questions also addressed the amount of dissemination training received, perceived knowledge about dissemination, and past dissemination behaviour. To assess future oriented goals related to career, a 7-point item was included that asked about intentions to participate in research dissemination during one's anticipated career ("*I intend to [participate] … during my career*"). Participants were asked separately about TD and NTD activities.

Step 6. Pilot test the questionnaire. See Part 2 of this Chapter (section 2.3.2).

2.3.2 Method. Part 2: Pilot and Validity Testing

Participants. For this pilot administration, a convenience sample of eight senior psychology graduate students (seven females, one male) completed and commented on the first draft of the online questionnaire. This single discipline focused sample did not entirely represent the multidisciplinary population of the national survey; however, the goal was to reach a population in a timely manner, while roughly matching research training expectations as well as reading ability and computer navigation skills to the intended population.

Procedure. All items were assembled in a draft questionnaire, which was then pilot tested in order to clarify the meaning and readability of the items. Senior graduate

students (10 students from 5th year onward) from the PI's own department (Dalhousie University, Psychology), were sent a recruitment email as a group from the PI. Interested students were directed online (via a link) to the electronic study survey. Items were presented as they were intended to be in the main national survey using the online survey platform Opinio (software licensed and hosted by the Principal Investigator's host University). However, the survey did include space for feedback (at the end of each screen) from participants in the pilot test. Participants were instructed to provide any commentary, but were encouraged to include feedback on clarity of item wording, format, length, and ease of survey navigation. Participants were not asked to reveal any identifying information and efforts were made to protect participant anonymity.

Results. Feedback predominantly revolved around minor wording changes and ordering of items. One comment suggested that the term "participation", from the target behaviour, (*e.g., "do you intend to participate in research dissemination during graduate school'*), be further clarified. In response to this feedback, a definition of "participation" was included in the survey: *"to assist in the development or delivery of … [a research dissemination activity] (note: for purposes of this survey, being in the audience or on the receiving end of disseminated information does NOT qualify as "participation")".* All recommended changes were made to the original items. With usability and readability assessed, it was agreed that face validity had been established and the questionnaire was considered to be in its final format (see Appendix B for the final questionnaire used for the national online survey).

CHAPTER 3: PAPER 1

USING THE THEORY OF PLANNED BEHAVIOUR TO EXPLAIN THE INTENTIONS OF GRADUATE STUDENT RESEARCHERS TO PARTICIPATE IN KNOWLEDGE TRANSLATION

The manuscript based on this study is presented below. Nicolle Vincent, under the supervision of Dr. Lynne Robinson and her dissertation committee, developed the research questions, methodology, and analytic approach for this research. She was responsible for developing the study protocol and proposal, applying for and obtaining funding to support this research, applying for and obtaining ethical approval, submitting ethical amendments, creating the survey, managing participant recruitment, data collection, and data analyses. She conducted the background research and literature review for this manuscript and was responsible for all aspects of manuscript writing. This manuscript will be submitted to a journal in the field of science communication. Ms. Vincent will be responsible for making all the edits and resubmitting the manuscript following the review process. The manuscript reference will be as follows:

Vincent, N., Robinson, L., Blanchard, C.M., Jacques, S., Johnson, S.A. (2016). Using the theory of planned behaviour to explain the intentions of graduate student researchers to participate in knowledge translation.

3.1 ABSTRACT

Background: Knowledge translation is considered imperative in the quest to improve the research-to-practice gap that currently exists, but few studies have examined what motivates researchers to participate in knowledge sharing/science communication. **Objective:** The purpose of the study was two-fold. The first was to uncover the correlates of graduate students' intentions to participate in knowledge sharing activities (Non-Traditional Dissemination) using the theory of planned behaviour (TPB) to guide the investigation. The second was to explore how the correlates differ for Non-Traditional Dissemination and Traditional Dissemination (e.g., peer-reviewed publications, conferences). **Methods:** A total of 419 graduate students conducting health research were recruited through a random sample of Canadian universities. These individuals completed a self-report survey assessing TPB constructs of attitude, subjective norm, perceived behavioral control (self-efficacy & controllability) and dissemination intention in addition to moral norm, past dissemination behaviour and career dissemination plans. The survey assessed Non-Traditional Dissemination (NTD) separately from Traditional Dissemination (TD). **Results:** The model explained 54% and 45% of the variance respectively for NTD and TD intentions during graduate school. Subjective Norm, past experience, and career dissemination intentions held the strongest influence on NTD intentions, whereas attitude was the strongest determinant of TD intentions. Perceived behavioural control (self-efficacy only) and moral norm predicted NTD intentions, but not TD intentions. **Conclusion:** Based on the TPB, these results may guide the development of appropriate NTD interventions for junior researchers.

Keywords: Theory planned behaviour; dissemination; knowledge translation; graduate students; researchers

3.2 INTRODUCTION

In recent years, there has been a movement to bridge the gap between research knowledge and health practices. Funding agencies are requesting that researchers have a dissemination plan (Palmer & Schibeci, 2014), and major initiatives are being carried out to investigate the best approaches to translate knowledge into actions (Holmes, Scarrow, & Schellenberg, 2012; World Health Organization, 2004). In a time of limited funding resources, there is increasing pressure for health research to demonstrate public benefits (Bornmann, 2012). In an effort to maximize the impact of health research, those researchers generating the knowledge are increasingly being expected to take part in the shared responsibility of KT (Wilson, Petticrew, Calnan, & Nazareth, 2010). Traditional forms of science communication (e.g., scholarly publications and conferences) have demonstrated limitations in yielding speedy translation of research evidence into clinical practice (Morris, Wooding, & Grant, 2011) and have proven insufficient (though often necessary) in influencing policy and health practice (Newson et al., 2015); hence the emphasis on KT efforts. Though it is widely acknowledged that it takes a whole system of contributors to move research knowledge into practice, evidence suggests that the impact of research is improved when researchers engage in dissemination activities beyond only traditional scholarly publications (Newson et al., 2015).

So how do we engage researchers in the KT process? Interestingly, despite the recognized importance of including researchers in the KT process, very little empirical attention has been directed at understanding what motivates individual health researchers to participate. It has also been established that researchers require specific skills in order to effectively share research knowledge and encourage research utilization (Jacobson,

Butterill, & Goering, 2004; Lavis, Robertson, Woodside, Mcleod, & Abelson, 2003). Ensuring that researchers have the appropriate skills places demands on training institutions to educate student researchers in the competencies required for KT. In order to engage students in competency building training efforts, there is a need to better understand what motivates and influences junior researchers to participate in KT activities. Graduate students, as the next generation of researchers, have the potential to shape future KT practices, thus, learning about the prevailing perspectives on knowledge sharing would offer insight into how training efforts might best be targeted.

Accordingly, the purpose of the current study was to uncover what factors are important in graduate students' decisions to support and engage in KT activities. More specifically, this study hones in on a subset of KT activities, dissemination. Dissemination is considered a planned and tailored form of communication with an intended audience in order to share knowledge (Lomas, 1993). The study was guided by the Theory of Planned Behaviour (TPB; Ajzen, 1991), one of the dominant social-cognition models used to predict human behaviour that has been applied and refined through hundreds of studies (Conner & Sparks, 2005). The advantage of using a theoretically-based framework is that it allows for a systematic investigation of the factors that are most relevant in the decision to participate in research dissemination activities and facilitates interpretation and future replication of results (Eccles, Grimshaw, Walker, Johnston, & Pitts, 2005). According to the TPB, intent to perform a behavior is the most important and influential determinant of behavior and on average explains 20-34% of the variance of behaviour (e.g., see McEachan, Conner, Taylor, & Lawton, 2011; Cooke & Sheeran, 2004, for meta-analytic reviews). The TPB further postulates that

intention is influenced by three direct constructs: attitude (overall evaluation towards performing the behavior), subjective norm (perceived social pressure about performing the behavior), and perceived behavioural control (overall difficulty or confidence in performing the behaviour).

With its widespread support as a model of behaviour, the TPB has primarily been applied to the prediction of health behaviours, but has also been used in investigating factors that affect the dissemination process by teachers (Burak, 2002; Haney, Czerniak, & Lumpe, 1996) and health providers (Thompson-Leduc, Clayman, Turcotte, & Légaré, 2015), as well as factors that affect the adoption of scientific information by professional users, such as mental health clinicians (Breslin, Li, Tupker, & Sdao-Jarvie, 2001; Casper, 2007; Tasca, Grenon, Fortin-Langelier, & Chyurlia, 2014). These studies demonstrated that the TPB successfully contributes to the prediction of intention and behaviour surrounding knowledge sharing and acquisition; however, there is much heterogeneity in the strength of its predictive ability (explaining 18%-88% of the variance in intention), and inconsistency for which TPB construct significantly contributes to the prediction. For example, Poliakoff and Webb (2007) applied the TPB to investigate researchers' participation in public engagement activities (communicating research to the public) and found that an augmented version of the TPB model contributed to the explanation of researchers' intentions to participate. As expected, attitude ($\beta = .28$) and perceived behavioural control ($\beta = .23$) were significant contributors to researchers' intentions; however, subjective norm (academic colleagues $\beta = -.07$; friends/family $\beta = -.05$) was not found to predict researchers` decisions to participate. It should be noted that these TPB constructs were assessed after controlling for past behaviour ($\beta = .58$). According to the

TPB, these psychosocial determinants will vary in importance depending on the behaviour and population being considered (Fishbein & Cappella, 2006). To understand why individuals do or do not hold a given intention, it is valuable to first uncover whether the behaviour is under attitudinal, normative or behavioural control. For example, evidence suggests that some individuals are more prone to normative control than others (Trafimow & Sheeran, 1998) and that proneness can depend on how strongly one identifies with a relevant referent group (Terry & Hogg, 1996). Graduate students may identify with an accessible group membership and subsequently be more normatively influenced than their scientist mentors. Consequently, it is conceivable that subjective norm, along with TPB constructs of attitude and perceived behavioural control, would predict intentions in this particular group.

In addition to subjective norm (usually identified in TPB literature as injunctive norm), other types of norms have been identified. For example, moral norm (feeling morally obligated towards performing a behaviour), has shown promise in improving the prediction of intention, particularly for behaviours that have a moral or ethical dimension (Godin, Conner, & Sheeran, 2005). Moral norm was originally proposed as a determinant of behavioural intention in the theory of interpersonal behaviour (Triandis, 1977), and has since gained evidence to support its inclusion in the TPB (Conner & Armitage, 1998). Additional constructs to the TPB have emerged as valuable contributors in the prediction of intentions. Past behaviour has demonstrated independent prediction of intentions and behaviour (Conner & Armitage, 1998; Ouellette & Wood, 1998) including scientists engagement with the public (Delli Carpini, Cook, & Jacobs, 2004). The current study also included the influence of career dissemination plans on graduate school intentions.

Considering that graduate education is a training platform for an intended career, the motivation to learn and participate in graduate activities is innately future oriented; that is, graduate school training and participation occurs for the purpose of advancing towards a future career. As such, it seems intuitive that a student's plans and expectations regarding future career activities would influence motivation to participate in similar activities during graduate school. For example, if a graduate student envisions knowledge sharing and dissemination as an activity that will occur during his/her anticipated career, it is likely that the graduate student will see this as a worthwhile activity to participate in during graduate school. The measurement of career dissemination intention in the current study was not meant to act as a proxy measure for future dissemination behaviour, but rather to tap a future oriented career goal. Despite the relative success of the TPB components in predicting intentions across various behavioural domains, there is question regarding its sufficiency. Theory integration (Noar & Zimmerman, 2005) and theory broadening (Perugini & Bagozzi, 2001) have been proposed as strategies to reduce redundancy and highlight theory strengths. In response to this, researchers frequently broaden the TPB with relevant constructs for the behaviour of focus (Thompson-Leduc, Clayman, Turcotte, & Légaré, 2015). In line with this, the current study augmented the traditional TPB theoretical framework with three variables: moral norm, past behaviour and career dissemination intentions. These were expected to contribute to the prediction of graduate students' intentions to participate in research dissemination during their graduate studies.

The KT field recognizes that the traditional method of knowledge sharing (e.g., scholarly publications) is still necessary (albeit not sufficient) in a quest to mobilize

research evidence (Straus, Tetroe, & Graham, 2013). Given that scholarly dissemination (e.g., peer-reviewed publications and conferences) has been the traditional mode of training for knowledge sharing in graduate training, it seemed imperative to investigate the familiar behaviour of TD (to academic audiences) as well as the newer, non-traditional, research dissemination (to audiences outside academia). The benefit of considering both dissemination methods was believed to be two-fold. One, participants may have more accessible beliefs about TD behaviour in contrast with the less familiar NTD. As such, by rating beliefs about TD and NTD, participants can determine their NTD responses by evaluating how they feel it compares to their beliefs about TD. Two, by asking questions about TD and NTD, there is less apparent questionnaire focus on NTD, which may serve to reduce the challenge of social desirability bias (Podsakoff, Mackenzie, Lee, & Podsakoff, 2003) and offer more valid self-report responses. Ultimately, understanding how beliefs about NTD differ from TD would allow for dissemination training to be uniquely tailored and ultimately assist in the adoption of a newer behaviour of knowledge sharing.

In line with the augmented TPB model, the current study hypothesized that graduate students' endorsement of attitude towards dissemination activities, subjective norm, and perceived behavioural control (both self-efficacy and controllability) would predict their intention to participate in research dissemination (NTD and TD). Furthermore, perceptions of moral norm, past behaviour, and career dissemination intentions were also proposed to predict intention. However, given the paucity of empirical attention to this topic, there were no a priori hypotheses about how these predictors would differ between NTD and TD intentions.

3.3 METHOD

The data presented in this manuscript were collected as part of a larger study examining two research questions. The purpose of the current study was to examine the utility of the theory of planned behaviour (or TPB global constructs) in predicting dissemination intentions. Another paper by the current study authors (Vincent et al., forthcoming; presented in Chapter 4) examined belief-level targets to understand dissemination intentions. Methods presented below contain details relevant to the present study. Ethical approval was obtained from the authors' host university ethics board (REB #: 2012-2653).

3.3.1 Participants

Respondents were 419 university graduate students (78 men, 341 women) who participated in the study. Participant geographical distribution reflected the graduate student enrollment population across the four Canadian regions (Statistics Canada, 2015). Participants' mean age was 29.9 years (*SD* = 7.0) and ranged from 22 to 60 years. The majority were enrolled in a PhD program (*n* = 255), had an average of 3.45 years (*SD* = 2.09) of graduate training, and were anticipating another *M* = 3.26 years before starting their intended career. Just over half the participants (58%) planned to pursue a research-oriented career. On average, participants rated their program's research focus as an 8.25 (*M, SD* = 1.82), on a scale of 1-10 (1 = no research focus; 10 = extremely research focused). Participants' thesis topics represented four research areas, clinical (32.8%), biomedical (27.0%), population health (22.2%), and health services (17.7%). The majority (69.5%) were also involved in research outside of their thesis. A fifth of participants (21%) had never heard the term "knowledge translation".

3.3.2 Procedure

Respondents participated in a cross-sectional online survey and were recruited by email through their respective graduate programs. To ensure representation of graduate students across Canada, both geography and health-related field were considered through a stratified random sampling procedure (Portney & Watkins, 1999). A list of graduate programs was derived from the Directory of Canadian Universities database, from three health-related fields of study: 1. Health Professions and Related Clinical Sciences; 2. Human & Social Sciences; 3. Biological & Biomedical Sciences. Graduate programs were categorized into one of four Canadian regions: mountain provinces *(British Columbia & Alberta),* prairie provinces *(Saskatchewan, Manitoba),* central provinces *(Ontario, Quebec),* atlantic provinces *(New Brunswick, Prince Edward Island, Nova Scotia, Newfoundland).* For each Canadian region, a department was randomly selected from each of the three health-related fields of study and this recruitment procedure continued until the participant sample was deemed sufficient. Students were forwarded the recruitment email from their program administrators. The recruitment email invited graduate students to participate in the online survey and provided an electronic link. The electronic link directed participants to a website that outlined the eligibility criteria. Eligibility for participation was at least one year of graduate level training, a required thesis/dissertation for the degree, and a research focus on health-related topics (defined broadly as any investigation of mental or physical health, such as biomedical, clinical, policy, environmental, etc.).[3] If participants agreed to the eligibility and provided consent

[3] Definition: Guided by the CIHR definition, the present study defined health-related research as "any investigation in the area of mental or physical health, such as biomedical; clinical; health policy; health services; and social, cultural, environmental, and population health research".

to participate, they were then connected to one of four possible surveys that differed only in the sequence of scales. Altering the scale order was intended to minimize biased responses resulting from a phenomenon known as order-effect, whereby respondents' answers may be influenced by the order in which the questions are presented (Schuman & Presser, 1981). Upon completion of the survey, participants were entered into a $50 bookstore gift certificate draw.

3.3.3 Measures

A self-report questionnaire was developed to gather demographic/academic information, research dissemination experience, and measures of the TPB. All TPB items and some descriptive items asked in parallel about TD and NTD. TD was defined as "scientific communication (usually peer-reviewed publications & conferences) about research that engages the academic community (i.e., researchers, professors, etc.)". NTD was defined as "any communication about research that engages audiences outside of academia (i.e., clinicians, patients, the public, policy-makers, etc.). Specific examples are: workshops for clinicians on the evidence behind managing a particular condition, educational talks for the public, patient education material, newsletters, interviews with the media, etc.".

Demographics. Descriptive questionnaire items assessed individual factors (e.g., age, sex), graduate program factors (e.g., geographic location, field of study, perceived strength of graduate program's research emphasis), and a personal academic profile (e.g., degree, years of training, years to completion, intended career type, thesis type).

Research Dissemination Experience. Questions addressed the amount of dissemination training received, perceived knowledge about dissemination, past

dissemination behaviour, and future career intentions to participate. Participants were asked separately about TD and NTD activities. The amount of dissemination training was assessed with the question, "*On a scale of 1-5, how much training or mentorship have you received in the following forms of research dissemination (during your time as a graduate student)".* Scale response options were from 1-5 (1 = none, 3 = about right, 5 = far too much) for each TD and NTD. The question, "*What **grade** would you give yourself in your knowledge of (e.g., delivering/producing/familiarity with, etc.) the following forms of research dissemination: TD/ NTD*", was used to assess a participant's perceived dissemination knowledge. Response options were in the form of a school grade: A+, A, B, C, D, F. Past Behaviour was assessed with one item, "*Approximately how many research dissemination activities have you taken part in (helped in the development or delivery of) during graduate school*", using the following seven ordinal categories: none (1), 1 activity (2), 2-5 activities (3), 6-10 activities (4) 11-15 activities (5), 16-20 activities (6), 21+ activities (7). Career Dissemination Intentions was assessed with the question, "*I intend to participate in [traditional/non-traditional] research dissemination during my career*", using a 7-point response scale (strongly disagree (1) to strongly agree (7)).

Theory of Planned Behaviour. The survey components related to the TPB were measured with multi-item or single-item scales in relation to participating in research dissemination during graduate school (either TD or NTD). To reduce the effects of response bias, some of the measures comprised a number of negatively worded items, which were reverse-scored prior to scale construction. Items measuring the same construct were always presented together; however, the sequence of TPB constructs were

organized into four differently ordered surveys to minimize order effects. Participants responded to each item separately for TD and NTD. Unless indicated otherwise, item wording and scale components were developed based on the questionnaire guidelines of Francis et al. (2004) and Ajzen's (2006) recommendations.

Intention. The strength of participants' dissemination intention was assessed with four items (I intend/I expect/I want/ I will try) that are recommended by Francis et al. (2004) and Ajzen (2006). Each item was proceeded by the statement "*to participate in [traditional/non-traditional] research dissemination during graduate school*". Items were rated on a scale from 1 (strongly disagree) to 7 (strongly agree). All four items were subjected to a principal components analysis with oblimin rotation, which suggested they loaded onto one factor (eigenvalue above 1). All factor loadings exceeded the minimum .50 cut-point (Ford, Maccallum, & Tait, 1986). Internal reliability was acceptable for the four-item scale (Chronbach's α TD = .93; NTD = .91) so responses were averaged to create a composite score for each of NTD and TD intention.

Further exploration, using residual scatterplots of the intention outcome variables, revealed that TD intention violated the distributional assumptions for multiple regression analyses. Examination of the TD intention composite scores demonstrated a dichotomous response profile, with more than of half the participants (56.6%) scoring a "7" (strongly agree) for their TD intentions. The remaining responses clustered predominantly around "6" (23.9%) and "5" (11.75). This high endorsement of TD participation is not surprising given that this is a sample of researchers. Consequently, TD intention was created into a dichotomous variable; those that intended to participate, score of 7 (coded as "1"), and those that expressed ambivalence/did not intend to participate, score less than 7 (coded as

"0"). This is labelled hereafter as "confident intenders" and "ambivalent intenders". NTD intention remained an interval composite scale.

Attitude. Attitude was measured using the stem "*For me to participate in [traditional/non-traditional] dissemination during graduate school would be*" followed by six semantic differential 7-point items, with higher scores indicating a more positive attitude toward participation in dissemination. As suggested by Ajzen (2006), three items were aimed at capturing instrumental attitude (worthless-useful, good-bad (reverse-coded), harmful-beneficial) and three items were intended to capture affective attitude (enjoyable-unenjoyable (reverse-coded), dull-interesting, satisfying-unsatisfying (reverse-coded)). Principal components analysis revealed that the scale was not multi-component as anticipated (i.e., affective and instrumental), but instead loaded onto a single factor. Internal reliabilities were appropriate (α TD = .87; NTD = .87), thus a composite attitude score was derived from the mean of all six items, created separately for TD and NTD.

***Subjective Norm*.** Subjective norm was measured by three items that represented injunctive aspects (what others would like you to do). Items were rated on a 7-point scale that ranged from 1 (strongly disagree) to 7 (strongly agree) and were preceded by the statement, *"When it comes to participating in [traditional/non-traditional] research dissemination during graduate school*". The three items that followed were: "I believe it is expected of me", "I believe most people whose opinions I value (personally or professionally) think I should", and "I feel under social pressure to do so". Principal components analysis confirmed that the injunctive norm items loaded onto one factor. The internal reliabilities for the composite measures were borderline acceptable (α TD = .67; NTD = .76). Only one item ("I feel under social pressure"*)* marginally improved

reliability of the TD scale if removed (α TD = .75; NTD = .76), so the decision was made to retain all three items in the composite measure. A composite subjective norm score was derived from the mean of all three items.

Moral Norm. Based on results from an elicitation study[4] (see Chapter 2 of this dissertation) and past research (Poliakoff & Webb, 2007), two items were included to measure moral norm: "*I feel morally obligated to take part (e.g., because taxpayers' money funds research)*" and "*I feel I have a duty as a researcher to take part*" and were rated on scales that ranged from 1 (strongly disagree) to 7 (strongly agree). These items were preceded by the statement, "*When it comes to participating in [traditional/non-traditional] research dissemination during graduate school"*. Principal components analysis suggested these items loaded onto one factor (and were separate from injunctive subjective norm). Internal reliabilities for the composite measures were borderline acceptable (α TD = .62; NTD = .70)[5]. Though a multi-item scale has historically been considered a superior form of measurement, evidence suggests that a single-item scale can be appropriate and perform similarly to aggregated items (Gardner, Cummings, Dunham, & Pierce, 1998; Rhodes, Plotnikoff, & Spence, 2004). Considering that both items demonstrate face validity, the one item that more closely reflected the terminology and sentiments expressed in the elicitation study was selected to represent the moral norm

[4] Prior to the present study, an elicitation study was conducted on a small sample (n=30) of respondents who answered open-ended questions on the advantages and disadvantages of participating in non-traditional research dissemination along with the individuals or groups who would approve or disapprove of them participating and the circumstances that might facilitate or prevent them from participating.

[5] There is some disagreement about whether to use correlation or Cronbach alpha as an indicator of internal reliability for a two-item scale. Cronbach alpha is reported in the text of this paper, whereas the correlations between the two moral norm scale items were TD r=.47 and NTD r=.54. The debate about assessing reliability was addressed in a special issue: Hulin, C., Cudeck, R., Netemeyer, R., Dillon, W. R., McDonald, R., & Bearden, W. (2001). Measurement. *Journal of Consumer Psychology (Lawrence Erlbaum Associates)*, *10*(1/2), 55-69. The authors argue that, "coefficient alpha should be computed and reported as the estimate of a reliability index for a two-item test. The simple correlation between the two items should not serve as a proxy for reliability" (p.60). Consequently, for this dissertation, coefficient alpha was used as an estimate for scale reliability.

construct: “I feel I have a duty as a researcher to take part”. This item was also more highly correlated with the other TPB predictor variables (attitude, subjective norm, PBC) as well as intention (TD r = .39; NTD r = .43) compared to the item “I feel morally obligated” (intention TD r = .24; NTD r = .28).

Perceived Behavioural Control. Perceived behavioral control was measured with four items, rated on scales that ranged from 1 (strongly disagree) to 7 (strongly agree). Two items measured aspects of self-efficacy: (a) “*I am confident that I could participate*”, (b) “*it would be easy for me to participate*”; and two items reflected controllability (personal control over behaviour): (c) “*the decision to participate would be beyond my control*” (reverse-coded), and (d) “*the decision to participate would be entirely up to me*”. All items were preceded by the statement, “*If I wanted to participate in [traditional/non-traditional] research dissemination during graduate school*”. This statement has been shown to improve measurement of volitional control and to disentangle results from the attitudinal component that can be generated from a colloquial interpretation of these items (e.g., I am not confident I could participate because I dislike dissemination activities; Rhodes et al., 2004). A principal components analysis confirmed the existence of two distinct components, self-efficacy (e.g., ease/difficulty, confidence) and controllability. Although the multi-dimensionality of PBC is debatable (e.g., Courneya, Conner, & Rhodes, 2006), the present multi-component structure is consistent with past studies that have demonstrated this distinction (see Hagger & Chatzisarantis, 2005 for a review). Composite scores were derived from mean ratings of the self-efficacy scale (PBC-SE) and the controllability scale (PBC-CON). Internal reliability for PBC-SE was acceptable (α TD = .90; NTD = .88); however, PBC-CON demonstrated less than

acceptable internal reliability (α TD =.67; NTD = .62)[6]. Neither item of PBC-CON demonstrated a decent correlation with NTD or TD intention, thus, the item that was not reverse-coded was chosen to represent the PBC-CON construct: "the decision to participate would be entirely up to me"[7].

3.3.4 A Priori Sample Size Estimation

The analytic plan for the national survey (described in Chapters 3 and 4) was multiple regression in order to examine the predictive value of the theoretical model. Thus, a priori sample size estimation was based on multiple regression sample size requirements (Tabachnick & Fidell, 2001) and recommendations for TPB questionnaires (Francis et al., 2004; Rashidian, Miles, Russell, & Russell, 2006). Power calculations for sample size in multiple regression depend upon the number of cases per predictor variable. The literature suggests that it is reasonable to expect a moderate effect size for TPB studies (i.e., a multiple R of around 0.3; Cohen, 1998) using multiple regression, leading to a minimum recommended sample size of 80 (Francis et al., 2004). This study applied an augmented TPB theory and as such has a greater number of predictor variables (7 variables) than a traditional TPB survey. According to Tabachnick and Fidell (2001), a minimum sample size of 50+ 8m (where m is the number of predictor variables) is recommended for testing the overall regression model and 104+ m for testing individual predictors. These sample size suggestions are based on detecting a medium effect size (R^2 = .30), with critical α <= .05, and a power of 80%. This study has seven predictor variables, four for TPB (Attitude, Subjective Norm, PBC-SE, PBC-CON), and three

[6] Correlation of the two-items: TD $r = .51$, $p < .01$; NTD $r = .45$, $p < .01$

[7] The analyses were also conducted using (1) only the other item, "the decision to participate would be beyond my control" to represent PBC-CON, and (2) a composite score of the two items. The results did not differ from the approach presented in this dissertation (using the one item "it would be easy for me to participate").

additional (moral norm, past dissemination experience, and future career intentions with research dissemination). Tabachnick and Fidell's equation results in a minimum of 109 participants needed to test the regression model and 111 to test the individual predictors. This sample size is smaller than that recommended by Rashidian et al. (2006) who suggested a minimum of 148 participants when undertaking regression analyses using the standard TPB constructs. Consequently, a sample size of 148 participants was sought as an absolute minimum sample size.

3.4 RESULTS

3.4.1 Preliminary Analysis

Of the 116 health-related graduate programs that were contacted across Canada, 67 programs distributed the recruitment email to their students, reaching an estimated 7,000 graduate students (although not all would have been eligible). In total, 656 students started the survey, 186 did not continue with the survey after the eligibility questions, and 51 surveys were removed due to substantial missing data from dropout (more than 20% of the questionnaire). Of the remaining participant responses who completed the questionnaire, missing data analysis revealed that only a small portion of data was missing (0.4%). More than 5% of missing data is generally considered problematic (Schlomer, Bauman, & Card, 2010). Missing data was replaced using the series mean from each of the variables of interest (attitude, subjective norm, PBC-CON, PBC-SE, moral norm). Rubin, Witkiewitz, St. Andre, & Reilly (2007) found that mean substitution was an equivalent strategy to other missing data techniques when there was less than 5% missing data. Regression analyses were run pre (n = 406) and post (n = 419) the mean imputation and showed identical results for effect size and significance testing.

Participants reported on the amount of dissemination training and mentorship they had received during their graduate training. The majority (71.4%) reported adequate training for TD; conversely, a similar number (76.6%) reported receiving minimal to no training in NTD. Comparably, participants graded themselves on their knowledge of TD and NTD, with the majority reporting higher grades of A+, A or B for TD (87.6%) and lower grades of B, C, D or F for NTD (77.3%). This distribution of grades is further illustrated in Figure 3.1. For past experience with dissemination, most reported participating in TD during graduate school (93%) while half reported having participated in NTD (57.5%). See Figure 3.2 for a more detailed illustration of the number of dissemination activities reported.

Basic descriptive and zero-order correlations among the augmented TPB model constructs were calculated in addition to comparing the means via paired t-tests and the correlations via Fisher-z transformations. Results (see Table 3.1) revealed that graduate students had significantly higher subjective norm, PBC-SE, moral norm, past TD behaviour, and intentions for TD compared to NTD. Conversely, students had significantly higher PBC-CON for NTD compared to TD. Attitude for TD and NTD were not significantly different from one another, with both mean scores indicating favourable appraisals towards dissemination. Finally, 2 out of 28 correlations were significantly stronger for the TD, whereas three correlations were significantly stronger for NTD. As was predicted for the TPB model, attitude, subjective norm, PBC-SE, and moral norm were all significantly related to intention (both TD and NTD). Inconsistent with the TPB framework, PBC-CON did not correlate with intention for TD, and only marginally for NTD (see Table 3.2).

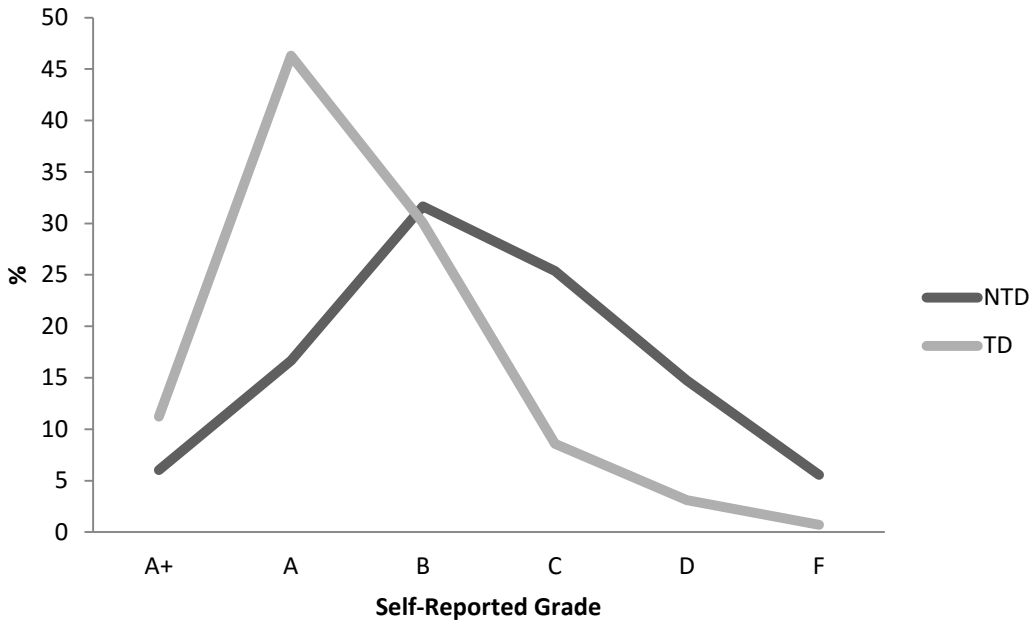

Figure 3.1. Percentage of graduate students reporting their knowledge of research dissemination as a school grade (A+ to F), presented separately for traditional (TD) and non-traditional (NTD) dissemination.

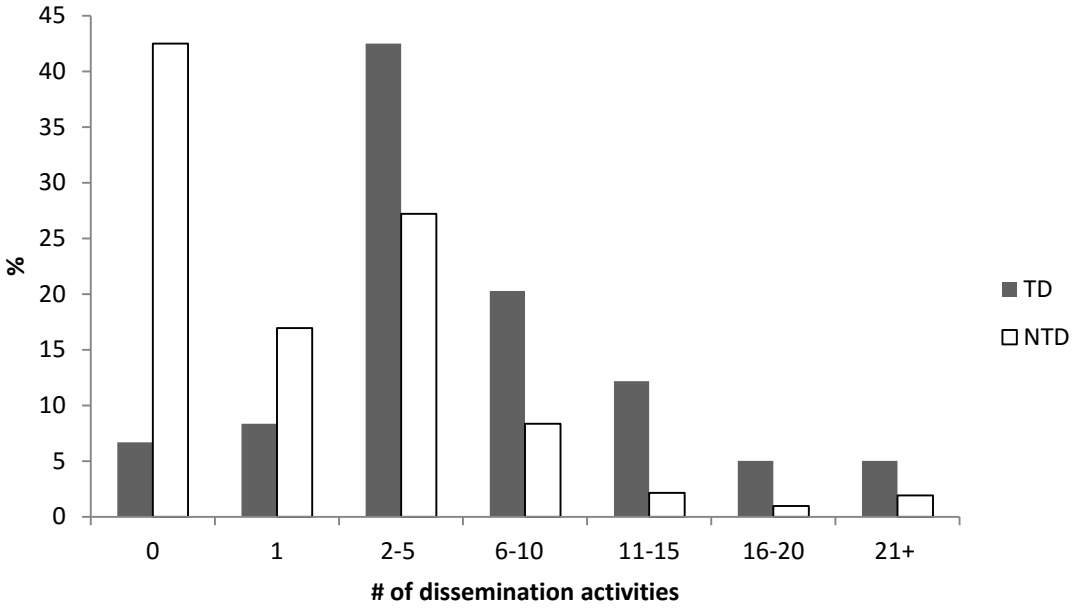

Figure 3.2. Percentage of graduate students who have participated in dissemination activities during graduate school, presented in an ordinal categorization of number of dissemination activities and separated by dissemination type (TD and NTD, $N = 419$).

Table 3.1. *Summary of scale items intended to generate the theory of planned behavior constructs for traditional (TD) and non-traditional dissemination (NTD).*

	TD			NTD		
	M	SD	Factor loading[a]	M	SD	Factor loading[a]
Intention						
Intend to	6.47	1.16	.95	5.02	1.78	.90
Expect to	6.39	1.25	.90	4.60	1.91	.78
Will Try to	6.47	1.20	.97	5.43	1.72	.89
Want to	6.20	1.39	.76	5.74	1.53	.83
			α = .93			α = .91
Attitude						
Useful	6.43 [c]	1.03	.69	5.96	1.32	.70
Good	6.42 [c]	1.02	.89	6.25	1.07	.82
Beneficial	6.53 [c]	.85	.78	6.09	1.09	.84
Enjoyable	5.29	1.55	.52	5.86 [d]	1.34	.68
Interesting	5.63	1.36	.64	6.01 [d]	1.14	.82
Satisfying	5.90	1.27	.79	6.06 [d]	1.17	.79
			α = .87			α = .87
Subjective Norm						
Expected of me	6.35 [c]	1.26	.61	3.42	1.80	.81
Others feel I should	6.25 [c]	1.20	.55	4.40	1.76	.64
Feel social pressure	5.16 [c]	2.05	.74	3.05	1.79	.80
			α = .67			α = .76
Moral Norm						
Morally obligated	4.15 [c]	2.13	.82	3.73	2.08	.91
Have a duty [b]	5.81 [c]	1.55	.67	5.01	1.82	.71
			α = .62			α = .70
PBC – SE						
Confident	6.08 [c]	1.45	.95	5.02	1.76	.95
Easy for me	5.62 [c]	1.62	.93	4.46	1.76	.90
			α = .90			α = .88
PBC- Control						
Up to me [b]	4.37	1.96	.85	4.59 [d]	1.90	.85
Under my control	4.73	2.01	.90	4.98 [d]	1.79	.85
			α = .67			α = .62

Note. All TPB constructs were measured using 7-point scales, α = unstandardized chronbach's alpha
[a] Principal components analysis with oblimin rotation
[b] Item selected to represent TPB construct as a single-item scale.
[c] Mean is significantly higher for traditional dissemination ($p < .05$).
[d] Mean is significantly higher for non-traditional dissemination ($p < .05$).

Table 3.2. *Descriptive and correlation statistics among the theory of planned behaviour model constructs for TD and NTD.*

Traditional Dissemination	1	2	3	4	5	6	7	M	SD	#[a]
1. Attitude								6.03	0.94	6
2. Subjective Norm	.18***							5.92[e]	1.21	3
3. PBC - SE	.31***	.29***						5.85[e]	1.46	2
4. PBC- Control	.17***	-.05	.17**					4.37	1.96	1
5. Moral Norm	.35***	.40***	.35***	.07				5.81[e]	1.55	1
6. Past Behaviour	.17**	.21***	.34***	.05	.27***			3.58[e]	1.40	1
7. Career TD	.51***[c]	.13**	.30***	.14**	.38***	.22***		5.90	1.53	1
8. Intention	.55***[c]	.40***	.35***	.03	.39***	.33***	.48***	6.38[e]	1.13	4
Non-Traditional Dissemination										
1. Attitude								6.04	1.54	6
2. Subjective Norm	.18***							3.62	0.93	3
3. PBC - SE	.23***	.35***						4.74	1.47	2
4. PBC- Control	.04	.16**	.34***[d]					4.59[f]	1.90	1
5. Moral Norm	.35***	.38***	.26***	.15**				5.01	1.82	1
6. Past Behaviour	.15**	.31***	.36***	.16**	.31***			2.21	1.71	1
7. Career NTD	.40***	.29***[d]	.36***	.13**	.38***	.30***		6.04	1.35	1
8. Intention	.39***	.48***	.43***	.15**	.44***	.50***[d]	.56***	5.20	1.36	4

Note. *p < 0.05, ** < 0.01, *** < 0.001 (2-tailed)
[a] # = number of items; [c]Correlation is significantly stronger for TD; [d]Correlation is significantly stronger for the NTD; [e]Mean is significantly higher for TD; [f]Mean is significantly higher for non-traditional dissemination

3.4.2 Predicting Intention

A hierarchical multiple regression was performed in which intention to disseminate was regressed onto the augmented TPB model. At Step 1, the constructs representing the standard TPB model were entered (i.e., attitude, PBC-SE, PBC-CON, and subjective norm) along with moral norm (arguably considered a TPB construct to be considered along with subjective norm, Conner & Armitage, 1998). Past behavior was entered at Step 2, and career dissemination intention was entered at Step 3.[8] Regression models were conducted for each intention outcome variable, with binary logistic regression conducted for the dichotomous TD intention outcome variable (Table 3.3), and linear multiple regression for NTD intention (Table 3.4). Demographic and background variables (i.e., sex, age, geographic region, years of graduate training) were not included because they are considered antecedents to the beliefs that comprise the TPB constructs and proposed to function indirectly in the chain of intention formation (Ajzen, 1991).

Traditional Dissemination Intention. Inclusion of the TPB variables attitude, subjective norm, PBC-self-efficacy, PBC-Controllability, and moral norm at Step 1 demonstrated a significant logistic model in predicting TD intention, ($\chi^2(5) = 148.11$, $p < .001$). The addition of past behaviour in Step 2 and career TD intention in Step 3 each significantly added to model prediction. Goodness of fit statistic revealed an increase in Nagelkerke R^2 at each Step 1-3 (.40, .42, .45, respectively) and a nonsignificant Hosmer-Lemeshow statistics (final step, $\chi^2(5) = 12.42$, $p = 0.13$), indicating good model fit (Peng, Lee, & Ingersoll, 2002). The final model was able to classify 77.3% of

[8] Past behavior was entered prior to career intention in the regression equation in order to test whether career items accounted for a unique proportion of the variance over and above the variance accounted for by past behavior. A regression analysis in which past behavior and career variables were entered at the same step revealed an identical pattern of results.

participants as ‘confident intenders’ or ‘ambivalent intenders’ correctly. However, the model was more successful at classifying ‘confident intenders’ (85.6%) compared to ‘ambivalent intenders’ (66.5%). This suggests that the model contains nearly all the variables needed to predict when an individual intends to participate in TD but that the model could be further improved to explain when an individual does not intend to participate in TD. Regression coefficients and corresponding Wald significance test results for each step are shown in Table 3.3. In Step 1, attitude, subjective norm, and PBC-SE emerged as significant predictors of TD intention, with attitude demonstrating the strongest positive relationship to intention (odds ratio of 3.79, $p < .001$). The effects of PBC-CON and moral norm were not significant. In the second step, past behaviour significantly predicted intention, while PBC-SE failed to maintain its significant impact on intention. This suggests that past behaviour could be acting as a mediator to PBC-SE and intention (see post-hoc mediation analysis below). In the final step, four predictors emerged as significant predictors to intention. The strongest predictor remained attitude toward TD, where a unit increase on the 7-point scale increased the odds that an individual would be classified an intender by more than a factor of 3. The three other predictors, subjective norm, past TD behaviour, and career TD intentions, contributed similarly to the prediction of intention (odds ratio = 1.32 - 1.45).

Non-Traditional Dissemination Intention. Inclusion of attitude, PBC, subjective and moral norm at Step 1 accounted for 41% of the variance in intention, $F(5, 413) = 56.21$, $p < .001$. In line with the TPB, and in support of the study hypothesis, beta weights revealed significant independent effects of attitude, subjective norm, PBC-SE, and moral norm. Stronger NTD intentions were associated with more positive attitudes

Table 3.3. *Hierarchical logistic regression analysis predicting traditional research dissemination intention.*

		Predicting Traditional Dissemination Intention									
		Step 1			Step 2			Step 3			
Variable	R^2	*b*	SE	OR	*b*	SE	OR	*b*	SE	OR (CI)	β
Step 1 ($\chi^2(5) = 148.11^{***}$)	.40										
Attitude		1.33	.18	3.79^{***}	1.37	.18	3.92^{***}	1.16	.19	3.20^{***} (2.23-4.60)	.26
Subjective Norm		0.32	.12	1.38^{**}	0.31	.12	1.36^{*}	0.35	.12	1.41^{**} (1.11-1.79)	.10
PBC-Self Efficacy		0.21	.09	1.23^{*}	0.13	.10	1.14	0.12	.10	1.13 (0.93-1.38)	.04
PBC-Controllability		-0.02	.06	.98	-0.02	.06	.98	-0.05	.07	0.95 (0.84-1.09)	-.02
Moral Norm[9]		0.17	.09	1.19	0.13	.09	1.14	0.06	.10	1.06 (0.88-1.28)	.02
Step 2 ($\chi^2(1) = 10.07^{**}$)	.42										
Past Behaviour					0.31	.10	1.36^{**}	0.28	.10	1.32^{**} (1.08-1.61)	.10
Step 3 ($\chi^2(1) = 14.88^{***}$)	.45										
Career TD Intentions								0.37	.10	1.45^{***} (1.20-1.76)	.14

Note. b = unstandardized beta weights, SE = standard error, OR = Odds Ratio, CI = confidence intervals (significance based on Wald statistic test, not reported), R^2 = Nagelkerke, β = standardized beta at final step (Step 3). TD intentions: 0, 1 (n = 181, 237 respectively)
$^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

[9] Moral norm as a two-item construct did not change the results. It did not demonstrate significant predictive ability at Steps 1-3.

(b = .36), t(413) = 5.28, p < .001; more perceived pressure from others to disseminate (i.e., subjective norm, b = .31), t(413) = 6.94, p < .001; greater self-confidence (PBC-SE) about disseminating (b = .21), t(413) = 5.28, p < .001; and stronger feelings of moral responsibility to disseminate (b = .16), t(413) = 4.38, p < .001. Contrary to TPB predictions, participants who perceived greater control over their behavior did not have stronger dissemination intentions, (b = -.01), t(413) = -.39, p = .44. The addition of past behavior at Step 2 was associated with a significant increase in the variance explained (ΔR^2 = .07), F(1, 412) = 55.62, p <.001. As expected, higher levels of past dissemination behavior were associated with stronger dissemination intentions during graduate school (b = .34), t(412) = 7.46, p < .001. All Step 1 TPB variables remained significant. At Step 3, the inclusion of career NTD intention accounted for a further 6% of the variance in intention, F(1, 411) = 54.21, p < .001. Individuals who planned to participate in NTD during their career had stronger intentions during graduate school, (b = .33), t(411) = 7.36, p < .001. All significant Step 1 and Step 2 variables remained significant[10]. Regression coefficients for each step are shown in Table 3.4.

Post Hoc Mediation Analysis. Results from the regression analyses suggest a possible mediating effect of past behaviour on the relationship between PBC-SE and dissemination intentions (both TD and NTD). Consequently, follow-up mediation analysis using PROCESS for SPSS (Hayes, 2012) was conducted. PROCESS is a computational procedure that provides coefficient estimates for total, direct, and indirect effects of variables using OLS regression (for continuous outcomes) and maximum likelihood logistic regression (for dichotomous outcomes). 95% bootstrap confidence interval for the indirect effect using 1,000 bootstrap samples was used.

[10] For additional clarity, a TPB map of the beta weight results is illustrated in Appendix C.

Table 3.4. *Hierarchical multiple linear regression analysis predicting non-traditional research dissemination intention.*

		Predicting Non-Traditional Dissemination Intention						
Variable		R^2	ΔR^2	ΔF	b^{1}	b^{2}	b^{3}	β
Step 1		0.41	0.41	56.21***				
	Attitude				.36***	.36***	0.23***	.14***
	Subjective Norm				.31***	.26***	0.24***	.23***
	PBC-Self Efficacy				.21***	.14***	0.09*	.10*
	PBC-Controllability				-.01	-.02	-.02	-.02
	Moral Norm[11]				.16***	.11**	.07*	.08*
Step 2		0.48	.07	55.62***				
	Past Behaviour					.34***	0.30***	.26***
Step 3		0.54	.06	54.21***				
	Career NTD Intention						0.33***	.30***

Note. For Step 1, *df* = 5, 413; Step 2, *df* = 1, 412; Step 3 = 2, 410; $b^{(1-3)}$= unstandardized beta for regression Steps 1-3; β=standardized beta at final step (Step 3).
*$p < .05$. **$p < .01$. ***$p < .001$.

[11] The two-item moral norm composite generated similarly significant beta results at Step 1 and 2 ($b^{1} = .15^{***}$; $b^{2} = .09^{*}$), but failed to reach significance at Step 3 ($b^{3} = .05$). Thus, moral norm, used as the two or one-item construct, offers additional explanatory value when presented with the main TPB constructs. However, as the two-item construct, moral norm loses its predictive power when the strongly associated career intention is included. Despite some ambiguity in how to represent the moral norm scale, either method (two vs. one item) demonstrates a role for moral norm in explaining NTD intentions.

Non-traditional dissemination. Results from the mediation analysis showed that the direct effect of PBC-SE on NTD intentions (the relationship between them when controlling for Past Behaviour) was significant, $b = 0.258$, $p < .001$. There was a significant indirect effect of past behaviour on PBC-SE and NTD intentions, $b = 0.133$, BCa CI [.102, .177], with a significant Sobel test ($z = 5.985$, $p < .001$). This represents a medium to large mediation effect, $\kappa^2 = .150$, 95% BCa [.116, .191].

Traditional dissemination. Using maximum likelihood logistic regression, the direct effect of PBC-SE on TD intentions was significant, $b = 0.327$, $p < .001$. There was a significant indirect effect of past behaviour on PBC-SE and TD intentions, $b = 0.119$, BCa CI [.056, .202], with a significant Sobel test ($z = 3.596$, $p < .001$).

These results suggest that PBC-SE significantly affects intention (both NTD and TD) when operating through past behaviour. A diagram of the mediation model results can be found in Figure 3.3.

3.5 DISCUSSION

To improve the disparity that exists between research knowledge and health practice, it is helpful to understand what influences researchers to disseminate their research knowledge. For purposes of dissemination training and advocacy efforts, it is particularly valuable to learn the perspectives of the next generation of researchers, graduate students. The current study applied an augmented TPB model to predict the dissemination intentions of graduate students conducting health research. These models were analysed separately for TD and NTD. The augmented TPB model was found to be predictive of graduate student intentions, with 51% of the variance explaining NTD intention and 45% percent explaining TD intentions.

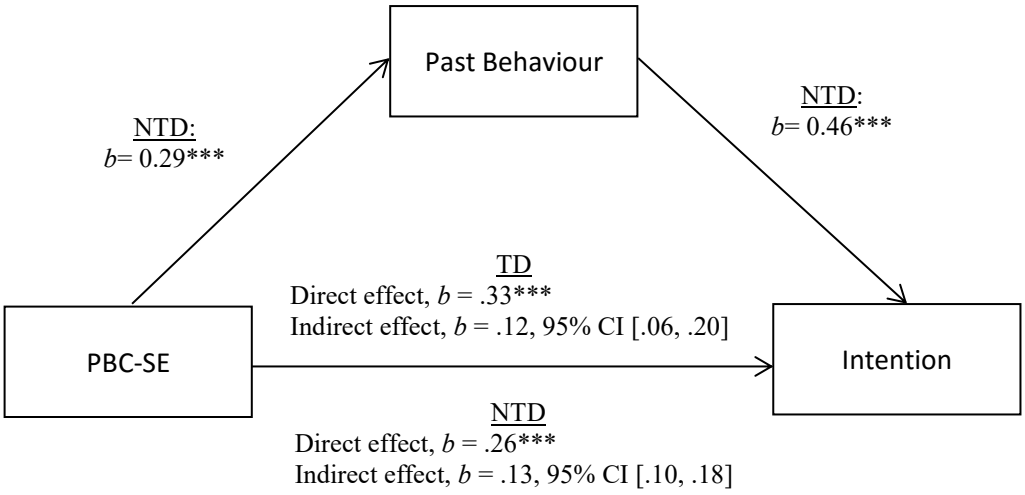

Figure 3.3. Model of perceived behavioural control self-efficacy component (PBC-SE) as a predictor of dissemination intention (traditional, TD, and non-traditional, NTD, separately), mediated by past behaviour. ***$p < .001$.

In both NTD and TD models, TPB constructs explained approximately 40%, which is comparable to what has been reported in TPB reviews (39 - 42%, see Armitage & Conner, 2001; Cooke & Sheeran, 2004). The strength of prediction among the TPB constructs differed between the two models, however. Results suggest that NTD is more normatively controlled compared to TD, which appears attitudinally controlled (that is, among the TPB constructs, subjective norm was the strongest determinant of NTD intention and attitude the strongest of TD). Past dissemination behaviour and future career dissemination intentions offered additional predictive strength to the models, but demonstrated more influence for NTD than TD intentions.

In an investigation of researchers' public engagement intentions (a form of KT), Poliakoff and Webb (2007) similarly found that attitude, PBC-SE, and past behaviour offered predictive influence. Attitude has consistently been found to be a reliable predictor of intention in TPB studies (Armitage & Conner, 2001). In the current study, graduate students had equally positive evaluations of participating in TD and NTD. However, further exploration of the items that comprise the aggregate attitude scale revealed that graduate students more highly endorsed the instrumental benefits of TD (e.g., useful, good, and beneficial) and, conversely, the affective advantages of NTD (e.g., interesting, satisfying, enjoyable). This distinction is notable given research that suggests affective attitudes have a superior influence on behaviour (Rhodes, Blanchard, & Matheson, 2006). KT promotion efforts would benefit from trying to maintain the affective appeal of NTD.

PBC in the current study was found to be multicomponent (self-efficacy, SE, and controllability, CON), with only SE demonstrating a relationship with NTD intentions.

Contrary to the TPB assumptions, PBC-CON did not demonstrate a predictive relationship with intention for either type of dissemination. Comparably, Poliakoff and Webb found that perceived environmental constraints (time and money), beliefs akin to PBC-CON, did not contribute to the prediction of KT intentions. Poliakoff and Webb suggest that, combined with evidence from a meta-analysis (Webb & Sheeran, 2006), these perceived barriers play a larger influence as moderators in the translation from intentions to behaviour; that perhaps PBC-CON reflects determinants of volitional control rather than motivation (which is represented by intention). This hypothesis is also supported by findings from Breslin et al. (2001) that revealed PBC-CON did not predict clinicians' intentions to adopt a new intervention but did influence clinician behaviour. Breslin et al. proposed that different cognitions, such as attitudinal and normative, may be more relevant in the early stages of accepting a new behaviour, whereas plans to deal with the constraints (PBC-CON) become more relevant in later stages of enacting the behaviour. Indeed, consistent with the TPB, meta-analyses have found that PBC does explain a small additional variance in behaviour after intention has been controlled for (e.g., Armitage & Conner, 2001; Trafimow, Sheeran, Conner, & Finlay, 2002). So, despite the minimal effect PBC-CON had on intention formation, practically speaking, it would be unwise to dismiss it as influential until future studies can evaluate its role in dissemination participation behaviour.

Both the current study and Poliakoff and Webb (2007) found self-efficacy (PBC-SE) to predict NTD activities within a TPB model. There is further evidence that self-efficacy provides strong predictive value in assessing researchers' science outreach interests and participation (Besley, Oh, & Nisbet, 2013; Delli Carpini et al., 2004).

Although predictive of NTD intention, the current study found that PBC-SE did not predict TD intentions. Similarly, in another study of graduate students' (predominantly in education or engineering degrees) intentions to publish a scholarly manuscript during graduate school, Wei et al. (2015) also found that self-efficacy measures were not predictive. In the current study, as illustrated by mean scores, graduate students rated their PBC-SE significantly higher for TD than for NTD (and PBC-SE median scores were even higher for TD, 6.5/7 compared to 5.0/7 for NTD). Is it that graduate students feel especially confident about their TD abilities so that it becomes irrelevant in the decision-making process? Or could it be that the lack of familiarity with NTD makes the need for NTD knowledge more apparent, ultimately influencing deliberation of whether to participate or not? Some propose that a reciprocal relationship exists between self-efficacy and past behaviour in that early involvement creates direct mastery experience thus improving one's confidence in ability and increasing the likelihood of further involvement (Kahn & Scott, 1997). Indeed, post-hoc analyses in the current study revealed that past behaviour was positively correlated with PBC-SE for both TD and NTD intentions, and that past behaviour had a mediating effect on PBC-SE and intentions. These results suggest that past behaviour helps explain the PBC-SE and intentions relationship, whereby PBC-SE partially operates through past dissemination experience in order to influence intention.

The current study demonstrated that past dissemination behaviour adds predictive value to the TPB model for both TD and NTD intentions. Previous studies have demonstrated that past behaviour is a strong predictor of future behaviour (Ajzen, 1991) and has been shown to act both independently on behaviour as well as indirectly through

TPB constructs (Ouelette & Wood, 1998). A review of TPB studies (Conner & Armitage, 1998) found that past behaviour contributed an additional 7.2% of the variance in intention, which parallels the current study findings for NTD intentions. The current study results add to the evidence on past behaviour by confirming its relevance for graduate student intention formation. Using past behaviour in a TPB model has been criticized as it is argued to lack explanatory value (Ajzen, 2002) in uncovering the mechanisms behind behaviour. However, for the purposes of the current study, the findings offer evidence that early dissemination involvement in graduate school is likely to influence future involvement, especially for NTD.

Future career intention was also predictive of intentions to participate in the respective dissemination activity during graduate school. Though this finding seems logical, it serves to reinforce the strong influence that career goals have on motivation to seek matching training/experience in graduate school. This career goal - graduate school goal connection is supported by Kahn et al. (1997) who found that graduate students who intended to pursue a research-related career were more productive in research activities. In the current study, career NTD intentions had the strongest influence on NTD intentions during graduate school. In comparison, career TD intentions did not have the same predictive strength on TD intentions. It makes sense that an activity (like NTD) that is not as commonplace in graduate school and does not have the same expectations for participation would be largely driven by whether it is congruent with career plans. In fact, one might argue that the strong positive association between past NTD behaviour, the more proximal NTD intentions, and the distal NTD intentions, correspond with how one perceives oneself, in other words, one's self-identity. Rise et al. (2010) explained that

people apply socially meaningful categories to describe themselves when trying to answer the question "who am I?" Categories might include, for example, social roles (e.g., student or professional), social type (e.g., healthy eater, smoker), or personality traits (e.g., hard worker, honest, giving). It would seem plausible, then, to presume that a graduate student who self-identified as someone who participates in knowledge sharing, that they would be more likely to participate in and endorse a future of NTD participation in order to be consistent with their identity standard. The concept of self-identity has been proposed to be an independent contributor in the development of behavioural intentions (Rise et al., 2010) and would benefit from further empirical attention in investigating knowledge sharing behaviour.

The current study found subjective norm and moral norm to influence NTD intentions. This is in contrast to Poliakoff and Webb (2007), who did not find a significant contribution of these constructs for researchers' public engagement intentions. Terry and Hogg (1996) suggested that strong identification with a group can cause people to weight subjective norm more heavily when making behavioural decisions. It's plausible that graduate students have a very accessible and easily identifiable referent group, who rely on others' evaluations and input for advancement in their training, thus making subjective norm a relevant motivator. It is noteworthy that, of the TPB variables, subjective norm had the strongest predictive influence for NTD but not for TD. TD subjective norm were rated higher (M =5.92) compared to NTD (M = 3.62), which suggests that, overall, graduate students perceive less social pressure to participate in NTD activities, but nonetheless are more highly influenced by these social expectations. In a study exploring physicians' intentions to engage in shared decision making with their

patients, subjective norm proved to be the most predictive of intentions (Thompson-Leduc et al., 2015). The authors propose that the interpersonal nature of the shared decision making behaviour strengthens the perceived pressure from others as an influencer in motivation. A similar argument could be made about the interpersonal nature of knowledge sharing, both with the target audience and the likely collaboration with one's supervisor that would be required to fulfill participation.

Moral norm proved to be a significant predictor for NTD intentions, but not for TD intentions. Although graduate students endorsed both TD and NTD as part of a researcher's duty; this sense of duty only influenced NTD intentions. It seems that graduate students attribute a moral value to NTD that perhaps fulfills a type of civic responsibility and activates one's own values, ultimately influencing motivation to act. What is promising about moral norm is the implications it has on behaviour; that is, intentions based on moral norm are more likely to be translated to behaviour than intention based predominantly on attitude alone (Godin, Conner & Sheeran, 2005). Unlike Poliakoff and Webb (2007), the current study did not include descriptive norm (the perception of what others do) in the prediction of intention, so it is unclear how the addition of descriptive norm might have affected the contribution of moral norm in the model (especially given that moral norm had the lowest predictive strength of the significant variables in the NTD model). Descriptive norm, however, was investigated by the current study authors through a belief-level analysis in a separate study (see Vincent et al., paper forthcoming; Chapter 4 of this dissertation).

Interpretations should be viewed in the context of the current study's limitations. First, the data in the current study are correlational and do not allow for conclusions

about causation. Future studies that track dissemination efforts longitudinally would help interpretations of how/if the TPB variables shift over time and how these relate to behaviour for graduate students. Second, although the current study achieved a robust sample size representing regions across Canada and various health disciplines, participants who chose to respond to the survey may differ from those who chose not to participate, possibly biasing results. Third, the behavioural intention investigated in the current study defined the timeframe as "during graduate school", which represents varying lengths of time among participants depending on their years of training. Students who are near degree completion may be better able to comment on their intentions with higher accuracy, whereas junior students would have more years to consider in their intention reporting and may not offer temporally stable intention ratings (that is, their intentions may be more susceptible to change). Given that graduate students have many demands on their time, the "during graduate school" timeframe was chosen over a more confined proximal time (such as "in the next year), to maximize the opportunity for dissemination intention to be plausible and increase variability in responses. Fourth, the current study explored dissemination intentions and not behaviour. Measures of behavioural intention are often used as a proxy for actual behaviour (Eccles et al., 2006); in line with the principle of TPB that intention is a direct antecedent of behaviour (Ajzen, 1991). However, studies show that intention is not a perfect substitution for behaviour (Armitage & Conner, 2001; Cooke & Sheeran, 2004), so, despite favorable attitudes and intentions towards dissemination, these do not guarantee that participation will follow. But even though intention is not sufficient in predicting behaviour, intention is considered necessary for behaviors that are performed infrequently or when there is

instability in the context (e.g., time, place, with whom) of the performance (Wood, Quinn, & Kashy, 2002). So although the current study cannot make definitive predictions about dissemination behaviour, it is one step closer to understanding how these decisions are enacted.

In summary, the current study highlights that NTD is a less familiar activity in graduate school than TD and the results provide support for the TPB to be used as a model to explain graduate students' intentions to participate in research dissemination (TD and NTD separately). NTD intentions differed from TD intentions in that intentions were more normatively controlled (compared to attitudinally controlled for TD) and were influenced by PBC-SE and moral norm, whereas TD was not. Additionally, past experience and future career intentions to participate held more predictive power for NTD intentions in graduate school compared to TD intentions. Together, the results suggest that in order to promote dissemination in general, interventions should encourage students to participate early in their graduate studies (past behaviour), provide models and education about the integration of NTD into anticipated careers (future career), and design an environment that supports and encourages such activities (attitude and subjective norm). To further promote the less familiar activity of NTD, interventions should also offer training opportunities to build competence and confidence (PBC-SE), and focus on the moral considerations of NTD by producing awareness of how NTD can help alleviate the needs of others (e.g., how shared information can assist clinicians, policy-makers, patients, etc.).

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CHAPTER 4: PAPER 2

BELIEFS ASSOCIATED WITH GRADUATE STUDENT INTENTION TO PARTICIPATE IN RESEARCH DISSEMINATION

The manuscript based on this study is presented below. The manuscript was written as a stand-alone paper; however, it is based on data from samples described in the previous two chapters. Nicolle Vincent, under the supervision of Dr. Lynne Robinson and her dissertation committee, developed the research questions, methodology, and analytic approach for this research. She was responsible for developing the study protocol and proposal, applying for and obtaining funding to support this research, applying for and obtaining ethical approval, submitting ethical amendments, and overseeing data collection, and analysis. She conducted the background research and literature review for this manuscript and was responsible for all aspects of manuscript writing. This manuscript will be submitted to a journal in the field of science communication. Ms. Vincent will be responsible for making all the edits and resubmitting the manuscript following the review process. The manuscript reference will be as follows:

Vincent, N, Robinson, L., Blanchard, C.M., Jacques, S., Johnson, S.A. (2016). Beliefs associated with graduate student intention to participate in knowledge translation.

4.1 ABSTRACT[1]

Background: The knowledge-to-practice gap has created a movement to encourage health researchers to participate in knowledge sharing. **Method:** Guided by the theory of planned behaviour, in this study a belief-level analysis was performed to identify the important targets in promoting knowledge dissemination activities among 419 health-focused graduate students (future researchers). Salient beliefs that predicted intentions to participate were investigated separately for traditional dissemination (e.g., peer reviewed publications) and non-traditional dissemination (knowledge sharing beyond academic community). **Results**: Beliefs unique to non-traditional dissemination involved believing that participation would make a difference, that a research supervisor expects it, and that other graduate students participate. **Conclusion:** Findings will assist in the development of interventions aimed at promoting knowledge translation efforts.

Keywords: knowledge translation, dissemination, researchers, theory of planned behavior, graduate students, publication

[1] Please note that this chapter is based on data obtained from the same two samples already described in the previous two chapters (Chapter 2: Survey Development and Chapter 3: TPB Global Constructs). However, the chapter itself is written as a self-contained, publishable manuscript; hence, it doesn't refer to these chapters explicitly

4.2 INTRODUCTION

There is growing consensus that a disparity exists between what is known from research and what is practiced in health care. Studies demonstrate that between 20-50% of patients are not receiving evidence-based care (Schuster, Mcglynn, & Brook, 2005), patients do not optimally benefit from advances in health research, and many disciplines are citing low practice concordance with the guideline recommendations (Grol, 2001), such as diabetes management (Glasgow, Boles, McKay, Feil, & Barrera, 2003), neonatal pain management (Spence & Henderson-Smart, 2011), and bladder cancer care (Walker et al., 2015), to name a few. According to Eccles, Grimshaw, Walker, Johnston, and Pitts (2005), these lagging health care practices demonstrate a failure of effectively implementing research findings into clinical practice. The authors further suggest that research implementation is a matter of changing human behaviour (i.e., citizens, patients, health professionals, managers, policy makers) in the process of knowledge translation (KT) and that interventions aimed at promoting participation should be guided by theories of behaviour. Most of the empirical attention to date has focused on the behaviour of the users of knowledge, such as clinicians (e.g., Breslin, Li, Tupker, & Sdao-Jarvie, 2001; Perkins et al., 2007; Winter, 2003), policy makers (e.g., Hanney, Gonzalez-Block, Buxton, & Kogan, 2003; Innvaer, Vist, Trommaled, & Oxman, 2002), and the public (e.g., Malhi et al., 2015). With a few exceptions (e.g., Landry et al., 2007; Poliakoff & Webb, 2007), minimal attention has been directed at understanding what motivates researchers, especially health researchers, to participate in KT activities. Understanding the underlying determinants of knowledge sharing behaviour among knowledge makers (i.e., researchers) is important to interventions aimed at improving

that behaviour. Graduate students are a valuable population to investigate as they are considered the next generation of researchers (Posselt & Black, 2012) and have more access to training opportunities.

The theory of planned behaviour (TPB) is a model used frequently in the health and science communication literature to predict behavior by uncovering the relevant cognitions. In TPB (Ajzen, 1991), the main antecedent to behaviour is intention, an indicator of one's overall motivation to perform the behaviour. The degree of control a person feels they have over the behaviour, perceived behavioural control (PBC), is also considered a proximal determinant of behaviour. The three determinants of intention are attitude, one's appraisal of the behaviour (both affective and instrumental evaluations); subjective norm, the perceived social pressure to perform the behaviour (both injunctive and descriptive norm); and PBC, one's perception of capability. The three constructs are proposed to develop from salient beliefs about the behaviour: behavioural beliefs (attitude), normative beliefs (subjective norm), and control beliefs (PBC). The theory postulates that each of these salient beliefs is weighted by how much they are valued or how important they are to the individual. Thus, a belief is believed to be composed of the belief strength and the belief value, though the contribution of belief value has been debated (Gagné & Godin, 2000).

The model proposes that in order to change behaviour, it is necessary to change behavioural intentions and, for intention to change, the underlying beliefs need to be modified or introduced (Ajzen, 2006a). Walker, Grimshaw, and Armstrong (2001) indicate that, to plan an intervention, the first step is identifying the salient beliefs. Ultimately, the salient beliefs about KT that carry the strongest weight as predictors of

intention should serve as targets to guide KT advocacy and training efforts. Von Haeften, Fishbein, Kasprzyk, and Montano (2001) contend changing one or more of these salient beliefs should increase the potential effectiveness of the intervention. Currently no research has focused on TPB belief-level correlates for KT, nor has there been a focus on junior researchers, such as the graduate student population. Learning about future researchers' beliefs about KT could strengthen competency building training efforts and provide insight into how best to encourage future participation. In the current study, the assumption was made that KT practices are less commonplace for graduate students compared to the more traditional forms of research sharing in graduate school, such as peer-reviewed journals and conferences. Therefore, inquiring about NTD (sharing research to audiences outside the academic/scientist community) alongside beliefs about TD (sharing research to academic audiences), may provide valuable insight in uncovering how perceptions about KT differ.

The purpose of this study was to a) elicit salient beliefs about research dissemination, and b) identify the critical beliefs, related to the TPB, that have the strongest influence on graduate students' intentions to participate in dissemination activities (traditional and non-traditional, separately). A secondary objective was to assess the importance of the value component (how important the belief is perceived to be) over the belief expectancy in predicting intention. Although the analysis was relatively exploratory, we hypothesized that given the impressionable nature of a trainee, normative beliefs would hold strong predictive power; consistent with other studies exploring correlates of graduate student intentions (Vincent et al., forthcoming; Wei, Sadikova, Barnard-Brak, Wang, & Sodikov, 2015).

4.3 STUDY A: BELIEF ELICITATION

4.3.1 Method

Participants and Design. Participants were 30 university graduate students enrolled in Masters or PhD programs across Canada. A stratified random sampling method was used to select the university departments (n=17) based on their health related field (e.g., Health Professions, Biological Sciences) and geographical region (e.g., Prairie Provinces). Eligibility for participation was at least one year of graduate level training, a required thesis/dissertation for the degree, and a research focus on health-related topics (defined broadly as any investigation of mental or physical health, such as biomedical, clinical, policy, environmental, etc.). All graduate students within the selected department were recruited through an email sent to their department that included an electronic link to the web-based questionnaire. Descriptive statistics are presented in in Table 4.1.

The recruitment process was completed in three waves, generating three groups of participants. Participants registered anonymously to the web-based questionnaire. Once registered, participants could see other participants' anonymous responses in their assigned group. Instructions encouraged participants to contribute both their own views as well as to comment on posts from other participants. This form of data collection has been described as an asynchronous (non-real-time) online focus group (Mann & Stewart, 2000) and was intended to simulate the benefits of a focus group, such as the creation of new thinking about a topic and more in-depth discussion that can come from focus group dynamics (Geiser, 1997), while also enabling a more geographically diverse sample of graduate students.

Table 4.1

Demographic and Graduate Education Profile[a]

Characteristic	Study A (*N*=30)	Study B(*N*=419)
Demographic profile		
Age, *Mean* (*SD*)	34.0 (9.55)	29.9 (7.0)
Female	80.0	80.9
Education Profile		
In PhD (vs. Master's)	63.3	60.9
Yrs of graduate training, *Mean* (*SD*)	4.1 (2.60)	3.5 (2.09)
Thesis Research type	N/A	
Clinical		32.8
Biomedical		27.0
Population health		22.2
Health services		17.7
Yrs to intended career, *Mean* (*SD*)	N/A	3.26 (2.35)
Primary career focus		
Researcher	36.7	33.8
Clinician-scientist	40.0	24.5
Practitioner	16.7	19.2
Instructor/Educator	6.7	10.3
Graduate Program		
Perceived program research-focus (1-10), *Mean* (*SD*)	8.5 (1.14)	8.3 (1.82)
Canadian Region:		
Central(ON; QC)	66.7	54.4
West (BC, AB)	20.0	20.8
Prairies (SK; MB)	3.3	13.1
East (NB, NS, PEI, NLD)	10.0	11.7
Research Dissemination Profile		
Participated in dissemination before:		
TD	93.3	92.4
NTD	53.3	56.8

Note. TD= traditional research dissemination, NTD= non-traditional dissemination, KT= knowledge translation

[a]Data in percentage unless otherwise stated.

Measure. The online questionnaire followed recommendations by Francis et al. (2004) for a TPB elicitation study. Participants were asked to respond to a series of six open-ended questions on, a) the advantages and disadvantages of participating in NTD during graduate school, b) the individuals or groups who would approve or disapprove of them participating, and c) the circumstances that might facilitate or prevent them from participating.

4.3.2 Results

Qualitative thematic analysis (Braun & Clarke, 2006) was used to outline the belief themes. Analysis of the themes revealed that beliefs could be conceptualized into three categories: beliefs about 1) the participant's research, 2) the non-academic community, and 3) personal factors (i.e., their academic progress, professional growth, enjoyment).

Participants' research. Beliefs predominantly emphasized the positive impact NTD would have on their research during graduate school (e.g., increase impact, reach a wider audience, and improve applicability of research).

The non-academic community. Participants agreed that NTD would have positive benefits for the community (e.g., make change). They disagreed, however, on whether NTD would have a quick or slow impact on the community.

Personal factors. Participants had mixed beliefs about how participation in NTD would impact them personally. Benefits of participation were related to intrinsic considerations, such as satisfaction, moral duty, and building confidence; whereas, negative beliefs about participation tended to be more about extrinsically focused

impediments, such as time constraints, lack of training, and no formal recognition (see Figure 2.1 from Chapter 2 for a map of belief themes).

Participants often discussed NTD in comparison to the more familiar activity of TD. For example, participants frequently used TD as a reference in gauging expectations about NTD, e.g., "*non-traditional dissemination is potentially more fun/interesting than writing a peer-reviewed paper*". As such, we believed that there could be benefit in investigating and comparing beliefs for both TD and NTD for Study B; thus, questionnaires were developed to inquire about both types of dissemination. Questionnaire items were based on belief themes that were ranked by saliency (Francis et al., 2004), which was determined by theme frequency within and across focus groups. Themes were selected for the questionnaire if they were discussed by two or more participants within a focus group or identified in at least two focus groups. The questionnaire was then pilot tested with nine graduate student volunteers to generate feedback on survey usability and readability. Minor wording changes were made in response to the feedback and face validity was established.

4.4 STUDY B: BELIEF VALIDATION

4.4.1 Method

Participants. Respondents were 419 university graduate students (78 men, 341 women) who participated in the study. Criteria for eligibility were the same as Study A: Elicitation study, reported previously in this paper. As outlined in Table 4.1, participants' average age was 29.9 years (*SD*=7.0) and ranged from 22 to 60 years. The majority were enrolled in a PhD program (*n*= 255) versus a terminal master's degree, and had an average of 3.45 years (*SD*= 2.09) of graduate training. Over half the participants (58%)

were intending to pursue a research-based career. On average, participants rated their program's research focus as an 8.25 (*M*, *SD*= 1.82) on a scale of 1-10 (1=no research focus; 10= extremely research focused).

Procedure. A cross-sectional online survey was carried out. Ethical approval was obtained from the authors' host university. Of the 116 health-related graduate programs that were contacted across Canada, 67 distributed the recruitment email to their students, reaching a minimum of 7,000 graduate students. The recruitment email invited graduate students to participate in the online survey using the link provided and this electronic link then directed them to one of four possible surveys that differed only in their sequence of scales. Upon completion of the survey, participants were entered into a $50 bookstore gift certificate draw. In total, 656 students started the survey, 186 did not continue with or were not eligible for the survey, and 51 surveys were removed due to substantial missing data (more than 20% of the questionnaire).

Measures. There were three categories of measures: demographic information, TPB beliefs, Intentions. These are described below.

Demographic and graduate training measures. Items were collected through self-report and consisted of personal factors (e.g., age, sex), graduate program factors (e.g., how research focused, geographic location. discipline), and personal training factors (e.g., degree, years of training, years to completion, intended career type, thesis type).

Theory of planned behaviour beliefs. Beliefs were generated from the elicitation study and, unless indicated otherwise, developed based on the TPB questionnaire guidelines of Francis et al. (2004). The same beliefs were used to assess TD and NTD. Belief expectancies and corresponding values were measured. Six behavioral belief

expectancies were asked using 7-point Likert-type scales from 1 (strongly disagree) to 7 (strongly agree), such as "*help me to acquire research funding*" and were preceded by the statement, ''*I believe that participating in [traditional/non-traditional] research dissemination during graduate school would . . .*". The corresponding value term was measured with a similar 7-point scale by asking how important the belief outcome was for the participant's graduate studies, from 1 (not at all important), to 7 (extremely important).

For normative expectancies, two injunctive norm referents (research supervisor, graduate program) and three descriptive norm referents (research supervisor, professionals in discipline, fellow graduate students in program) were assessed. For injunctive norm expectancies, participants were asked, ''*When it comes to participating in* [traditional/non-traditional] *research dissemination during graduate school, I believe my* [research supervisor/ graduate program] *thinks I should*", from 1 (strongly disagree) to 7 (strongly agree). This was followed by corresponding value (or motivation to comply) questions about how important it is to do what the referent wants the participant to do in terms of dissemination, rated from 1 (not important) to 7 (extremely important). The descriptive norm expectancy questions asked whether participants believe each of the three referents "…*participate(s) in [traditional/non-traditional] research dissemination",* rated on a scale from 1 (untrue) -7 (true). The corresponding value items asked how important it was for the participant to do what the referent does related to dissemination, rated from 1 (not important) to 7 (extremely important).

Finally, control expectancy questions asked participants to rate the strength of their beliefs related to six potential barriers to participating in dissemination. The six

barriers (e.g., it would be costly to do) were preceded by the statement, ‘‘If I participate in *[traditional/non-traditional]* research dissemination during graduate school, even if I really wanted to...’’, and rated from 1 (strongly disagree) to 7 (strongly Agree). Belief value (corresponding power) was measured for four of the six control beliefs[2], and rated on the likelihood of participating if the barriers existed, from 1 (less likely) to 7 (more likely to participate).

Intention. As recommended by Francis et al. (2004) and Ajzen (2006), the strength of participants' intention was assessed with four items: 1) "*I intend to",* 2) *"I expect to",* 3) *"I will try to",* 4) *"I want to"….participate in [traditional/non-traditional] research dissemination during graduate school.* Items were rated on a scale from 1 (strongly disagree) to 7 (strongly agree). All four items were subjected to a principal components analysis with oblimin rotation, which suggested they loaded onto one factor (eigenvalue above 1). Internal reliabilities were appropriate for the four-item scales (α TD =.93; NTD =.91), thus responses were averaged to create a composite score for behavioral intention. The composite scale satisfied normal distribution assumptions for NTD but not for TD intention (skewness= -2.68, kurtosis= 7.93). Although reciprocal transformation improved normality, further analysis revealed that the TD intention variable appeared dichotomous in nature, with 56.6% of participants responding with a "7" (strongly agree) for their intentions to participate in TD during graduate school. The remaining responses clustered predominantly around "6" (23.9%) and "5" (11.75). This

[2] Beliefs about, (a) time & (b) research suitability, were not assessed for value because it was believed these items would have very little response variability and may in fact affect response rates or response validity. For example, as is recommended by Francis et al. (2004), the following statement was omitted to avoid burdening the respondent with questions that are unlikely to elicit much variability, "if participating in research dissemination takes up much of my time, I am *less likely - more likely (1-7)* to participate".

high endorsement of TD participation is not surprising given that this is a sample of researchers. Because of this non-normal distribution, the TD intention scale variable was converted into a dichotomous response, with those that intended to participate in TD (responded with a "7") and those that expressed ambivalence about their intentions (responded with anything less than "7"), labelled hereafter as "confident intender" and "ambivalent intenders".

Analysis plan. To identify critical beliefs associated with intention to participate in research dissemination, an analytical strategy was employed based on the recommendations of Fishbein, Von Haeften, & Appleyard (2001) and Von Haeften et al. (2001). This analytic plan has proven helpful in delineating TPB beliefs in a range of topics, such as exercise (Blanchard et al., 2008), and risk-behaviours (Hamilton & Schmidt, 2013), for example. Consistent with these past belief analysis strategies, the present study followed a univariate assessment of each belief composed of four steps. Step one, zero-order correlations between the beliefs and intentions were conducted. Step two, all significant correlations within a given belief grouping (behavioural, normative, control) were converted to z-scores to reduce non-essential multicollinearity (Tabachnick & Fidell, 2001) and then entered into a regression to predict intention. Step three, all significant beliefs from the three aforementioned regressions were entered into a final regression model. Finally, step four, frequency counts were conducted to discern the percentage of participants who endorsed ‘‘agree’’ and ‘‘strongly agree’’ (on the 1 to 7 scales) for each significant belief from step three. This is valuable in informing where change can occur. Fishbein et al. (2001) argue that when designing interventions to affect intention, a belief needs to show enough variance for substantive change to occur. If most

participants already strongly hold the belief in question, targeting the belief in an intervention would add little value (Hornik & Woolf, 1999). All analyses were done separately for TD and NTD items.

The outlined belief analysis focused on the expectancy-only component of the beliefs, and not the value or expectancy x value weighted composite. Ignoring the contribution of the value component is a departure from the TPB framework; however, prior studies have found that value or value-weighted components fail to provide additional predictive utility over expectancies (Fishbein et al., 2001; Gagné & Godin, 2000; Rhodes, Blanchard, Courneya, & Plotnikoff, 2009). To confirm that these findings hold true for intentions in dissemination, and to be confident that interpretations with belief expectancy alone is sufficient, a secondary analysis assessed whether value and expectancy x value provided further predictive utility over expectancy alone. Focusing on the behaviour of interest, NTD, the secondary analysis was conducted on NTD beliefs and intentions only. Each belief was evaluated separately and all expectancies and corresponding values were mean centered to reduce multicollinearity with the interaction variable (Aiken, West, & Reno, 1991) using the SPSS macro PROCESS v212 (Hayes, 2013).

4.5 RESULTS

4.5.1 Preliminary Analysis

Participants who did not complete the survey and were consequently missing more than 20% of survey responses were removed from the dataset (n=51). Of those participants whose data were kept, missing data analysis revealed that only a small portion of data was missing (< 0.4%). More than 5% of missing data is generally

considered problematic (Schlomer, Bauman, & Card, 2010). Missing data was replaced using the mean from each of the variables of interest. (Rubin, Witkiewitz, St. Andre, & Reilly, 2007) found that mean substitution was an equivalent strategy to other missing data techniques when there was less than 5% missing data.

Descriptive results of each belief, along with comparisons between TD and NTD, are presented in Table 4.2. Paired sample *t*-test revealed that participants more strongly endorsed all beliefs for traditional dissemination with two exceptions. First, there was no significant difference between TD and NTD mean scores for '*concern for protection of intellectual property (IP)*', and second, mean scores for the expectancy, it will '*make a difference*' was significantly higher for NTD.

The relations between NTD and TD demographic variables, age and sex, were evaluated. Only sex (female = 0, male = 1) and NTD intention were significantly correlated (r= -.14, $p > 0.05$). However, because the correlation was not strong, this variable was not used as a covariate.

4.5.2. Main Analysis

Primary Analysis. Results revealed that all belief expectancies significantly correlated with TD intention (dichotomously scaled), with the exception of the control expectancy of '*time intensive'* and *'intellectual property concerns'* (see Table 4.3). For NTD, all of the behavioural and normative expectancies significantly correlated with NTD intention, but only two of the six control expectancies ('*academic credit'* and '*research suitability'*) significantly correlated (see Table 4.4).

Table 4.2

Belief expectancy and value descriptive statistics and paired samples t-test between traditional (TD) & non-traditional (NTD) dissemination

	Belief Expectancy			Belief Value
	Mean (SD)		Paired *t*-test	*Mean (SD)*
Belief (*unit*[a])	TD	NTD		
Behavioural *(agreement)*				*(importance)*
Increase research impact	6.18 (1.22)	5.52 (1.56)	7.83***	6.05 (1.09)
Receive program recognition	6.48 (1.14)	4.85 (1.76)	9.30***	5.69 (1.26)
Help achieve desired career	6.07 (1.50)	5.25 (1.71)	8.61***	6.50 (0.92)
Important to research process	6.43 (1.07)	5.45 (1.57)	1.72***	6.07 (1.04)
Make a difference	5.61 (1.40)	5.93 (1.47)	-3.75***	6.38 (0.89)
Help secure funding	6.38 (1.35)	4.35 (1.95)	20.15***	5.89 (1.43)
Normative *(agreement)*				*(importance)*
Research supervisor	6.37 (1.21)	4.21 (1.95)	20.35***	5.75 (1.14)
Graduate program	6.33 (1.27)	3.76 (1.81)	25.33***	4.94(1.48)
Research Supervisor (DN)	6.64 (0.95)	4.97 (2.05)	16.78***	N/A
Discipline Professionals (DN)	6.57 (1.00)	4.47 (1.67)	22.20***	4.79 (1.57)
Graduate students (DN)	6.20 (1.29)	3.37 (1.59)	29.99***	3.78 (1.71)
Control *(agreement)*				*(behaviour likelihood)*
Academic credit	5.90 (1.64)	4.24 (2.00)	16.29***	2.88 (1.33)
Time intensive	5.68 (1.48)	5.20 (1.53)	6.51***	N/A
Costly	4.06 (1.90)	3.67 (1.70)	4.60***	2.81 (1.44)
Will receive training	5.41 (1.75)	4.15 (2.01)	12.75***	2.73 (1.27)
Intellectual property concerns	2.62 (1.82)	2.70 (1.83)	-1.10	2.76 (1.27)
Research suitability	6.09 (1.53)	5.71 (1.80)	5.05***	N/A

Note. *$p < .05$. **$p < .01$. ***$p < .001$; DN= Descriptive Norm (expectancy unit of measurement: untrue-true)

[a] Unit of measurement on scale of 1-7 (7= strong endorsement)

Table 4.3

Correlations of beliefs with intention (Step 1) and associated logistic regression coefficients predicting intention (Step 2 and 3) for traditional research dissemination

	Predicting Traditional Dissemination Intention				
	1	2		3	
Belief	*r*	β	OR	β	OR
Behavioural					
Increase research impact	.42***	.65***	1.92	.59***	1.80
Program recognition	.26***	-.05	.95		
Help achieve career	.40***	.48**	1.62	.37*	1.44
Important to research process	.43***	.78**	2.19	.62**	1.86
Make a difference	.30***	.04	1.04		
Secure funding	.29***	.04	1.04		
Normative					
Supervisor	.29***	.28	1.32		
Graduate program	.29***	.36*	1.43	.27[a]	1.32
Supervisor (DN)	.18***	.19	1.21		
Professionals in discipline (DN)	.28***	.39**	1.48	.26[a]	1.29
Graduate students (DN)	.26***	.15	1.16		
Control *(agreement)*					
Academic credit	.25***	.39**	1.48	.04	1.04
Time intensive	.03	-			
Costly ($)	-.16**	-.23*	.80	-.24[a]	.79
Receive Training	.29***	.44***	1.54	.27*	1.31
Intellectual property concerns	-.09	-			
Research is suitable	.23***	.34**	1.41	.27*	1.30

Note. *p < .05. **p < .01. ***p < .001; β =standardized; DN= descriptive norm; OR=Odds Ratio; TD intentions =0,1 (ambivalent intenders, confident intenders)

[a] Approached significance, p=0.07

Table 4.4

For non-traditional research dissemination, correlations of beliefs with intention (Step 1), associated linear regression coefficients predicting intention within a belief grouping (Step 2) and a final model (Step 3), and percentage endorsing (agree and strongly agree)

	Predicting Non-Traditional Dissemination Intention			
	1	2	3	
Belief	*r*	*b*	*b*	β
Behavioural				
Increase impact	.40***	0.24**	0.16*	.11*
Program recognition	.20***	-0.06		
Help achieve career	.45***	0.48***	0.37***	.24***
Important to research process	.39***	0.15		
Make a difference	.37***	0.17*	0.15*	.10*
Secure funding	.20***	-0.07		
Normative				
Supervisor	.43***	0.57***	0.36***	.23***
Graduate Program	.28***	-0.06		
Supervisor (DN)	.26***	0.06		
Professionals in discipline (DN)	.24***	0.05		
Graduate students (DN)	.30***	0.25**	0.22**	.15**
Control				
Academic credit	.17***	0.21**	-0.03	-.02
Time intensive	-.03			
Costly ($)	-.07			
Training	.09			
Intellectual property concerns	-.08			
Research suitability	.25***	0.35***	0.20**	.13**

Note. *$p < .05$. **$p < .01$. ***$p < .001$; *b* =unstandardized; β = standardized; DN= Descriptive Norm

Subsequent regression analyses (steps 2 & 3) showed that TD and NTD intentions had three common critical beliefs, these were: 1) '*increase research impact'*, 2) '*help achieve career'* and 3) '*research suitability'*. In addition to these shared beliefs, two unique belief expectancies emerged for TD intentions: '*important to research process*' (behavioural); and believing TD '*training'* or mentorship would be available (control). No normative expectancies were significantly associated with TD intentions. Of the five beliefs positively associated with TD intentions, the strongest belief associations (based on odds ratio) were '*important to the research process*' and '*increases research impact'*. For NTD intentions, three unique beliefs were identified for NTD intentions: '*make a difference'* (behavioural); '*supervisor thinks I should'* (normative); and '*most graduate students in my program participate*' (normative, descriptive). Of the six beliefs positively associated with NTD intentions, the beliefs most strongly associated were '*help achieve career'* and '*supervisor thinks I should'*. Collectively, significant beliefs accounted for 43% (Nagelkerke R^2) in predicting TD intention variance ($\chi^2(9) = 161.18$, $p < .001$) and 36% of NTD intention ($F(7, 411) = 33.25$, $p < .001$). This suggests that these beliefs may have a strong influence on intention.

The number of participants who hold these beliefs can provide further insight (see Table 4.5). That is, inspection of the endorsement frequencies for TD intentions (to determine if any beliefs have a ceiling effect in their relationship with intention) revealed that more than 85% were already in agreement (chose 6 or 7 on 1-7 scale) with the most strongly associated belief, '*important part of research process'*, and close to 80% endorsed three other beliefs (*Increase impact, Help achieve career, Research suitability*). Only the '*I will receive training'* belief showed possibility for substantive change, with

Table 4.5

Percentage of graduate students (N=419) endorsing the identified critical beliefs (score of 6 or 7), separated by traditional and non-traditional research dissemination (step 4 of belief-level analysis)

Traditional Dissemination		Non-Traditional Dissemination	
Critical Belief	% ≥ 6 [a]	% ≥ 6 [a]	Critical Belief
	Matching beliefs		
Help achieve career	76.8	50.6	Help achieve career
Increase research impact	79.2	57.3	Increase research impact
Research suitability	78.8	68.7	Research suitability
	Different beliefs		
Important to research process	86.6	72.1	Make a difference
Training	58.5	29.4	Supervisor (thinks I should)
		10.3	Graduate students (DN)

Note. DN= descriptive norm

[a] Percentage endorsing a 6 or 7 for the respective belief. Measured on a 7-point scale (1=least accepting of belief, to 7=most accepting of belief).

56% endorsing this belief. For NTD, frequencies for strongly endorsing beliefs ranged from 10-72%, suggesting that there is still room for substantive change and that all these beliefs may be beneficial to target in an intervention.

Secondary analysis. Further analysis was conducted to discern the contribution of belief expectancy, the corresponding value, and their interaction, by exploring beta coefficients in each respective belief regression. The study focus is on NTD, thus, only results for NTD beliefs were analysed and presented in Table 4.6. Because of the number of regression analyses and potential for experiment-wise Type 1 error, alpha was held at a more conservative .01. Findings revealed that all behavioural and normative expectancies had significant positive relationships with intention, but only one of four control expectancies was significant (for two belief expectancies the corresponding value components were not measured). Coefficients for behavioural values were significant for three of the six beliefs, while no normative or control values predicted intention independent of their respective expectancies. Interactions of beliefs and their respective values were not significant across any belief.

4.6 DISCUSSION

By applying a belief-based TPB model to the investigation, this study offers new insight into graduate students' perceptions of research dissemination. Salient beliefs for NTD (science communication to audiences outside the academic community) were explored alongside beliefs for the more common practice activity of TD. Thus the TD results served as an informal benchmark for beliefs about dissemination in general, in order to explore how NTD beliefs are different. Prior research has examined the attitudes and behaviours of scientists related to NTD activities (Poliakoff & Webb, 2007), but this

Table 4.6

Regression coefficients of belief expectancy, value and their interaction when predicting non-traditional research dissemination

	Predicting NTD Intention *Unstandardized b*		
Belief	E	V	E x V
Behavioural			
increase research impact	.37**	.20*	.05
program recognition	.17**	.01	-.01
help achieve career	.41**	.01	-.01
important to research process	.35**	.30**	.04
make a difference	.35**	.32**	.05
secure funding	.14**	.15	.05
Normative			
Supervisor	.34**	.00	.09
Graduate program	.25**	-.05	.08
Supervisor (DN)		N/A	
Professionals in discipline (DN)	.23**	-.06	.02
Graduate students (DN)	.30**	-.03	-.01
Control			
academic credit	.13*	-.08	.04
time intensive		N/A	
costly ($)	-.07	.05	.07
Training	.07	-.16	.02
intellectual property concerns	-.06	.11	.01
research suitability		N/A	

Note: E= Expectancy; V= Value; DN= Descriptive Norm. N/A= value data was not collected

*$p < .01$. **$p < .001$;

is the first study to conduct a belief-level analysis of graduate students, the next generation of researchers.

Results revealed that six NTD beliefs were salient for health-focused graduate students in predicting intention to participate. Three of these were shared beliefs with TD: it will help achieve desired career, increase the impact of the research (both behavioural expectancies), and perceived suitability of the research for dissemination (control belief). Unlike TD, NTD was not influenced by belief that the dissemination activity is important to the research process (behavioural expectancy) or whether dissemination training would be offered (control belief). However, three beliefs were unique to predicting NTD intentions: 1) participation will make a difference to others (behavioural expectancy), 2) that NTD participation is expected by the research supervisor (normative belief), and 3) that other graduate students participate in NTD dissemination (descriptive norm belief).

According to these results, what differentiates NTD intention from TD is the influence of normative beliefs and a more affect-driven belief of making a difference to others. Research suggests that attitude toward behaviours comprises both an affective (e.g., pleasant, enjoyable, revolting) and cognitive (e.g., wise, safe, harmful) evaluation (merged). Believing that NTD makes a difference could be considered an affective belief, as participants in the Belief Elicitation study described this as a gratifying reminder of their research purpose. For example, one participant explained, "*this is why we are doing health related research- to make life better for people!*". Moreover, this belief was the most strongly endorsed belief about NTD in the Belief Validation study and was the only belief that was held more strongly for NTD than TD. The influence of this item on

intention is in accordance with research that has found affective attitude (compared to cognitive/instrumental attitude) to be superior in predicting intention (Rhodes & Courneya, 2003). It is also parallels research on volunteerism (an action with no expectation of monetary reward) that suggests a value in helping others is among the primary motivators to volunteer (Clary & Snyder, 1999). Indeed, past research has found that scientists view participation in science outreach as a form of volunteer work that is auxiliary to their other responsibilities (Andrews, Weaver, Hanley, Shamatha, & Melton, 2005).

The current results also highlight the influence a research supervisor has on NTD intentions. In accordance with TPB, the perceived expectation of supervisors has predictive power for NTD, but this was not true for TD. Breslin et al. (2001) proposed that for new behaviours (and NTD is arguably a newer academic activity compared to TD), TPB cognitions might be more important at different stages of the adoption process. In particular, the anticipated response of others (such as subjective norm) might be more salient early in the adoption phase and less relevant when behaviour is more familiar and integrated. Notably, it is only the (perceived) supervisor expectation and not the supervisor's own NTD participation (descriptive norm) that influences student intention. Descriptive norm has been found to add to intention prediction of health behaviours (Rivis & Sheeran, 2003); however, the mechanism through which it influences behaviour is less clear. One could speculate that a supervisor's involvement in NTD may not be sufficient in identifying it as a valued activity. Students may believe that their supervisor's participation is a response to demands or requirements (e.g., obligations to funding agencies) and not a representation of a supervisor's attitude toward NTD.

Alternatively, graduate students may not identify with supervisors as a behaviourally relevant reference group and thus are not as influenced by their behaviour. Descriptive norm is known to be more strongly linked with intention when the referent group is perceived to be similar (Åstrøsm & Rise, 2001; Terry & Hogg, 1996). Group identification with other graduate students could explain why the belief that '*fellow graduate students participate in NTD*' predicted NTD intention. Similarly, in a study of practicing scientists, Poliakoff & Webb (2007) found that descriptive norm of fellow colleagues added to the model in predicting intentions to participate in public engagement. The authors propose that the role of descriptive norm in this closely matched referent group is consistent with social learning theory (Bandura, 1977); learning through modelled behaviour of others who are deemed similar.

Similar to TD, participants' NTD intentions were influenced by the perceived benefit of these activities on career achievement. Research on the role of NTD participation and career has been mixed. For example, Jensen, Rouquier, Kreimer, and Croissant (2008) did not find NTD to have any effect on a researcher's career, either by facilitating or hindering career advancement. Besley (2013) found that practicing researchers endorsed NTD as valuable to their careers, while Poliakoff and Webb (2007) did not find researchers' NTD intentions were influenced by recognition from their career. Despite the lack of consistency in the literature about career recognition and NTD participation, it would appear from the current results that graduate students are considering all forms of dissemination as important to career attainment. In addition to career influence, and not surprisingly, students that believe their research will be more visible (have more impact) as a result of dissemination and if they consider their research

suitable for dissemination, are more likely to express intent to participate. Consistent with the current results, Newson et al. (2015) demonstrated that researchers' perceptions about the suitability and implications of their findings influenced subsequent engagement in dissemination activities. The authors note the significance of basing knowledge sharing decisions on the perceived value of the findings. There is potential for implications to be underestimated, especially if the researcher is unfamiliar with health policy and practices. To this end, it would be of value to explore what criteria graduate students use to judge suitability. Grimshaw, Eccles, Lavis, Hill, & Squires (2012) contend that the basic unit of KT should be current systematic reviews or research syntheses. Others argue that dissemination should be done in an appropriate but timely manner in order to maximize mobilization of science and to engage providers, organizations and the public (Fernández-Peña et al., 2008; Kessler & Glasgow, 2011; Zorn, Roper, Weaver, & Rigby, 2012) even if this means dissemination of single studies (Wilson & Petticrew, 2008). Thus, further inquiry into how graduate students determine suitability for dissemination (e.g., is it replicated findings, availability of a systematic review, or only positive findings of primary studies?), would benefit KT training efforts.

It is surprising that graduate students did not endorse NTD training availability as a predictor of intention, as they did with TD. Graduate students were much less likely to have participated in NTD (57%) suggesting that these activities are not commonplace in the graduate study experience. Given that feelings of self-efficacy are often associated with behaviour (Bandura, 1977) and have been linked to participating in NTD activities (Besley et al., 2013; Delli Carpini, Cook, & Jacobs, 2004) it could be hypothesized that training efforts for less familiar activities (like NTD) would improve self-efficacy and

thus encourage participation. The current findings, that training availability (and most other control beliefs) is not predictive of intention, may be consistent with Breslin's (2001) proposal that earlier in the decision process of adopting a behaviour, attitude and normative beliefs prevail, and that perceived behavioural control emerges as more influential later with the development of implementation intentions and behaviour. In other words, it may be that when participants consider acting on their intentions, control beliefs (such as training) become more pertinent.

For the secondary analysis evaluating the influence of the value component, all the interaction terms and the majority (79%) of the belief values did not contribute to the prediction of NTD intention. Congruent with prior work that shows weighted and unweighted beliefs show similar associations with outcomes (Gagné & Godin, 2000; Rhodes et al., 2009), the current findings do not support the utility of an expectancy x value component. However, considering that three of the six behavioural belief values provided additional predictive power, it is less clear how the behavioural value system contributes to NTD intentions. Further research is needed. Nonetheless, the findings suggest that, overall; the value systems are unlikely to have a significant impact on NTD intervention efforts.

Hornik and Woolf (1999) outlined three criteria necessary for identifying beliefs to target in an intervention: 1) the belief should be possible to change, 2) belief should be strongly associated with intention/behaviour, and 3) there should be enough people who do not already hold the targeted belief (no ceiling effect). By employing TPB and the outlined belief analysis, criteria 1 and 2 were satisfied. Results outlined in Table 4.5 illustrate that none of the identified critical beliefs reached a ceiling effect and are

therefore still valuable beliefs to target. Fishbein, von Haeften, and Appleyard (2001) contend that, "interventions that successfully change critical beliefs should theoretically be most effective in changing intention" (p. 227). Based on the current findings, interventions aimed to improve NTD intentions would benefit from highlighting opportunities where NTD participation could have an obvious benefit in helping others (critical belief: make a difference), sharing the NTD practices of graduate students (critical belief: other graduates student descriptive norm), encourage research supervisor involvement in communicating about NTD (critical belief: my supervisor thinks I should), review benefits of NTD participation to career achievement and encourage including NTD activities on one's academic CV (critical belief: help achieve career), and provide guidance in discriminating appropriate content for NTD (belief: suitability of research). The identified critical beliefs represent the smallest set of beliefs that, if changed, could have the largest effect on intention.

Although this study has several methodological strengths (e.g., large sample size, multi-institutional and geographical distribution of participants) there are limitations that warrant consideration. First, this study focused only on intentions and not the behaviour of participating in dissemination. In a study on exercise behaviour, Rhodes et al. (2009) found that the critical beliefs were more strongly predictive of intention than behaviour; thus, it is not clear how the identified beliefs in the current study would influence actual dissemination behaviour. Second, our belief analysis involved multiple correlations so the experiment-wise error is possibly inflated. This may have affected the overall size of significant correlations. Third, the elicitation study did not specifically investigate TD beliefs. From the elicitation study, salient beliefs for NTD were selected and the decision

to compare these beliefs to TD was decided after the elicitation study. This means that the TD beliefs identified in the current study may not be a comprehensive representation of TD perceptions. Finally, beliefs identified in this study may not capture all salient beliefs related to dissemination. The current study followed commonly used elicitation study recommendations (Ajzen, 1991), which has been shown to generate predominantly instrumental behavioural beliefs through the "advantages/disadvantages" open-ended question (Sutton et al., 2003). However, affective beliefs have demonstrated stronger predictive power to short and long-term behaviour (Ajzen & Driver, 1991) and for this reason, Sutton (2003) argued that elicitation study wording be attentive in prompting for affective beliefs (e.g., what do you like/dislike about…). Future studies could prevent this bias by ensuring questions elicit both affective and instrumental beliefs.

In conclusion, a useful step in bridging the gap between research and practice is to understand the factors that motivate researchers, the knowledge creators, to disseminate their knowledge. This research offers insight into what drives graduate students to consider research dissemination activities both to academics and to communities outside of academia. Findings suggest that motivation for any type of dissemination is influenced by beliefs about the impact it will have on the research itself, on securing a career, and on the suitability of the research for dissemination. Moreover, motivation for dissemination activities outside of the academic community stem from a positive regard for how NTD will make a difference to others, the influence of supervisors' expectations, and the perception that that fellow students are participating. Findings from this study identified important beliefs relevant for promoting KT activities among graduate students and can assist in training endeavors aimed to improve participation of the knowledge creators.

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CHAPTER 5: PAPER 3

"I WANT TO, BUT I'M NOT ABLE TO": A QUALITATIVE INVESTIGATION OF GRADUATE STUDENTS' VIEWS ON KNOWLEDGE DISSEMINATION

The manuscript based on this study is presented below. Nicolle Vincent, under the supervision of Dr. Lynne Robinson and her dissertation committee, developed the research questions, methodology, and analytic approach for this research. She was responsible for developing the study protocol and proposal, applying for and obtaining funding to support this research, applying for and obtaining ethical approval, submitting ethical amendments, creating the interview questions, managing participant recruitment, conducting the interviews, and data analyses. She conducted the background research and literature review for this manuscript and was responsible for all aspects of manuscript writing. This manuscript will be submitted to a journal in the field of science communication. Ms. Vincent will be responsible for making all the edits and resubmitting the manuscript following the review process. The manuscript reference will be as follows:

Vincent, N, Robinson, L., Blanchard, C.M., Jacques, S., Johnson, S.A. (2016). "I want to, but I'm not able to": A qualitative investigation of graduate students' views on knowledge dissemination.

5.1 ABSTRACT

Health researchers are increasingly being encouraged to participate in improving the knowledge-to-practice gap that affects health-care practices. A better understanding of researchers' beliefs about knowledge translation (KT) could guide the development of interventions designed to increase KT participation. Investigating the graduate student population (the future generation of researchers) offers insight into the culture and beliefs that emerge early in the training process. This insight will ultimately assist with pre-emptive efforts to support KT participation. The current study explored beliefs around one particular form of KT, research dissemination to non-academic audiences. Thematic analysis was applied to the semi-structured interviews from 16 graduate students conducting health-related research across Canada. Four themes were identified as being influential in graduate students' motivation to participate: personal meaning, perceived normative behaviour, professional meaning, and perceived control of participating in dissemination activities. More barriers were identified to participation than facilitators. Most participants agreed that they felt minimal perceived control (e.g., not enough training to feel confident) or little professional meaning (e.g., not considered a professionally recognized or scholarly credited activity) from KT endeavors; however, graduate students unanimously commented on the favorable personal meaning KT participation offered (e.g., making a difference). The overall influence of normative behaviour was dependent on the supervisor's degree of support and the environment that students were exposed to (e.g., clinical institution or academic). The findings highlight how attention to these themes could assist training efforts in improving KT participation.

Keywords: *health researcher, knowledge translation, dissemination, graduate student, qualitative research*

5.2 INTRODUCTION

There are documented time lags for research evidence to reach clinical practice, with some estimates of 17 years between knowledge-to-practice (Green, Ottoson, García, & Hiatt, 2009; Morris, Wooding, & Grant, 2011). Increasing attention has been directed at improving this recognized gap between research, practice, and policy through KT efforts. Efforts have been predominantly directed at raising knowledge users' awareness of research evidence and facilitating the use of those findings (Canadian Institutes of Health Research, 2012). However, more recently, these efforts have demanded involvement from the knowledge makers (i.e., health researchers) most of whom consider themselves to be far from fluent in their KT abilities (Graham, Grimshaw, Tetroe, & Robinson, 2005). Despite researchers' expressed uncertainty and trepidation in disseminating to non-academic audiences, the majority of funding agencies consider KT to be a responsibility shared by the agency and the researchers (Tetroe et al., 2008) and most agencies request evidence of a KT plan for consideration of funding (Palmer & Schibeci, 2014). Compared to the 96% of health researchers who reported having disseminated to academic audiences (e.g., peer-reviewed publications, conferences), less than 50% of health researchers, in a sample of 228, had participated in a dissemination activity geared to non-academic audiences (e.g., newsletter, summary to patients/practitioners/consumers; Graham et al., 2005). Other study findings support the view that health researchers' lack familiarity with KT, suggesting that more empirical attention into researcher involvement would be valuable in order to uncover how to best support adoption of these new behaviours (Croissant & Jensen, 2007).

Behaviour change theorists propose that interventions designed to change behavior can be directed at one or more of its determinants (Ajzen, 1991). Thus, encouraging researcher engagement in KT efforts would be facilitated by understanding barriers and motivators, as well as the needs, experiences and perspectives that researchers hold about participating in KT. These insights could help inform advocacy efforts and ultimately improve the collaborative participation being requested of researchers. Exploring the perceptions of junior researchers could identify how best to intervene in influencing the practices of the future generation of health researchers. Indeed, studies on graduate students suggest that early research experiences contribute to long-standing attitudes toward research (Royalty & Magoon, 1985) and later career research practices (see Kuehne et al., 2014; Love, Bahner, Jones, & Nilsson, 2007). Consequently, the purpose of the current study was to focus on graduate students' experiences and perceptions towards KT. The term 'knowledge translation' generally refers to all the steps between the creation of new knowledge and its application in the real world (Canadian Institutes of Health Research, 2012). The current study focused on a specific type of KT, that is, research dissemination to non-academic audiences (Lomas, 1993). Dissemination to non-academic audiences (i.e., non-traditional dissemination) was selected as the study focus because it was presumed to be more familiar to and achievable by graduate students compared to other types of KT (such as Integrated KT; Canadian Institutes Health Research, 2012).

To date, studies have traditionally used a combination of closed and open-ended questionnaire approaches to investigate researchers' perceptions about KT. For example, through questionnaire analysis, European studies have found altruistic factors, such as

feeling a sense of duty and a desire to increase public awareness, to be primary motivators to researchers' KT participation (Kreimer, Levin, & Jensen, 2011; Royal Society, 2006). Moreover, these studies have highlighted the predominant sentiments that create obstacles to participation, namely lack of institutional support and perceptions about being underqualified to conduct KT. In a sample of UK researchers, Poliakoff and Webb (2007) also discovered that researchers gauge the relevance of KT and their own intentions to participate based on their colleagues' behaviour. Furthermore, two studies (Croissant & Jensen, 2007; Poliakoff & Webb, 2007) confirm that past experience with NTD is associated with future intention to participate. Given the influence that social norm and early experience have for established researchers, it would be helpful to learn how these determinants play out for graduate students.

Jensen, Rouquier, Kreimer, & Croissant (2008) argue that more qualitative analysis on this topic is needed. The current study aims to respond to this call. A related national study was conducted by the authors that examined the correlates of graduate students' (n=419, chapters 3 and 4) intention to participate in research dissemination as it relates to the TPB (Ajzen, 1991). The study was a quantitatively oriented survey, which defined research dissemination as either TD (dissemination activities oriented to academic audiences) or NTD (activities oriented to non-academic audiences). Although the national survey was undoubtedly useful in furthering an understanding of the variables that predict graduate students' support of and participation in research dissemination, any survey design has inherent limitations for gathering rich and detailed information about graduate students' beliefs. A qualitative design offers a more in-depth open-ended inquiry into this relatively unexplored area of graduate students' NTD, and

allows for discovery of the subtleties and complexities of the topic that may otherwise be neglected or minimized with quantitative investigations. Qualitative approaches are of benefit to an understudied phenomenon (such as researcher knowledge sharing) as they can hone in on the relevant unidentified variables. Open-ended interviews, for example, can elicit responses that are culturally salient and meaningful to the participant, and allow individual views to be expressed without the constraints of a group (as can be seen in focus groups) or fixed responses (such as with quantitative survey methodologies; Creswell, 2014). Consequently, in the current study we adopted a qualitative approach and interviewed a sample of graduate students from the national study in order to further explore their views and motivations to engage (or not) in NTD. In order to reduce participation bias, participants represented opposing NTD intentions (either high or low intentions). With this qualitative approach, the current study offers new insight into the perceptions of KT among Canadian graduate students conducting health research.

5.3 METHOD

5.3.1 Participants

A sample of 16 graduate students participated in a telephone interview. As is often recommended (see Glaser & Strauss, 1967), sampling was discontinued when theoretical saturation was determined by the interviewer (i.e., no additional data is generated). The sample size was consistent with recommendations (see Kuzel, 1992; Guest, Bunce, & Johnson, 2006) that link level of sample heterogeneity to thematic saturation. Although participants were a relatively homogeneous group (graduate students in health-related fields), nonprobabilistic purposive sampling was used to select those who differed on strength of intention to participate in research dissemination.

Participants were considered for inclusion if they: (a) participated in the related national study and indicated willingness to be contacted for follow-up interviews, (b) were enrolled in a health-related doctoral program, and (c) indicated on the national survey either high (response of 6-7) or low (response of 1-3) intention to participate in *non-traditional* research dissemination. Respondents with high and low intentions were selected to ensure varying perspectives were represented. Twenty-five graduate students were recruited via the email they provided in the previous study (the national survey). Of these, eight respondents with high NTD intentions (all indicated a value of 7 for intention) and eight with low NTD intentions (ranging from 1-3 for intention), agreed to participate in the study.

High Intenders. Participants were seven females and one male, with a mean age of 36.5 (*SD*=9.0) years old (range = 27-53). They ranked the research focus of their graduate program as an 8.38 (*SD*=1.60) out of 10, with a mean of 5.63 years (*SD*= 2.67) of graduate training and were in the following fields of study: psychology (2), nursing (1), medical sciences (population/community health (3), epidemiology (1), and physical sciences (1)). Three participants anticipated a career as a knowledge producer (e.g., researcher, clinician-scientist), while the remaining five expected careers as primarily knowledge users (e.g., clinician, educator, knowledge broker, public servant). All eight of the high intender participants had past experience engaging in NTD during graduate school. Participants graded their knowledge of NTD (on a scale of A+ to F), and reported a median grade between B and A. On a scale of 1-7 (with 7 being "strongly agree"), participants responded to the following statement: "I intend to participate in *non-traditional* research dissemination during [graduate school/my career]". All participants

reported a score of 7 for both NTD intentions during graduate school and during "my career"

Low Intenders. Participants were eight females, with a mean age of 31.4 (*SD*=10.9) years old (range = 23-57). They ranked the research focus of their graduate program as 8.00 (*SD*= 0.76) out of 10 (extremely research focused), with a mean of 4.88 years (*SD*= 2.30) of graduate training in the following fields of study: psychology (4), nursing (1), and biological sciences (microbiology (1), immunology (1), human ecology (1)). Four participants anticipated a career as a knowledge producer (e.g., researcher, clinician-scientist), while the remaining four expected careers as primarily knowledge users (e.g., clinician, educator). Two of the eight low intender participants had past experience engaging in NTD during graduate school. Participants graded their knowledge of NTD (on a scale of A+ to F), and reported a median grade between B and C. On a scale of 1-7 (with 7 being "strongly agree"), participants responded to the following statement: "I intend to participate in *non-traditional* research dissemination during [graduate school/my career]". For intention during graduate school, participants reported a mean score of 2.38 (*SD*=.74) compared to the mean score of 5.63 (*SD*=1.77) for intention during "my career".

5.3.2 Procedure and Measures

Telephone interviews were conducted by the first author (NV) using a semi-structured interview guide (see Appendix D). Ethical approval was obtained from the authors' host university. Informed consent was obtained before each interview. Interviews were audio-recorded using a phone tap (Nexxtech Recording Unity) that connected the telephone line to the computer, an audio recording program (Audacity),

and a program to balance the audio (Levalator) as the interviewer tended to be louder than the interviewee. Audio-recorded telephone interviews were transcribed and used for data analysis. Interviews ranged from 25 -55 minutes, with the average being 40 minutes.

Demographics were assessed by self-report from an online survey (as part of the larger study) and consisted of personal factors (e.g., age, sex), graduate program factors (e.g., the research focus of the program, program geographic location, discipline), and personal academic profile (e.g., degree, years of training, years to completion, intended career type, thesis type).

The semi-structured interview guide was created to facilitate discussion around participants' thoughts about participating in research dissemination, with an emphasis on NTD. Participants were first asked to rate, (a) their intentions, and (b) their desire to participate in research dissemination using a scale of 1-7 (strongly disagree - strongly agree). Ratings were done separately for TD and NTD. Participants were then asked to discuss what factors played into their ratings; why there was (or was not) a difference in 'intention' versus 'desire' scores; and the relevance of some previously identified motivating factors (e.g., employability, funding, training) to their own intentions. Lastly, participants were asked how they felt their intentions had changed (or not changed) since starting their degree (i.e., did they have these intentions of research dissemination before they entered), and what factors may have contributed to this change or maintenance of intention. To reduce response bias, interview questions addressed both TD and NTD discussion. Participants were entered into one of two draws for a $50 gift book-store gift certificate.

5.3.3 Analytic Approach

The focus of analysis was to uncover the motivators and barriers of NTD participation. Qualitative thematic analysis (Braun & Clarke, 2006), using nVivo9 software, was used for the telephone interviews (phase four). Guided by Braun and Clarke's step-by-step directions, four phases of analysis were performed. First, the first author (NV) read and re-read the data to become familiar with it. Second, line by line, concepts were identified and coded into units of meaning. Third, themes were generated by combining relevant codes, or renaming codes into broader, more encompassing terms (themes were only generated if there were two or more participants included). Fourth, a thematic map was created that helped identify overarching themes, along with sub-themes. Overall, Braun and Clarke define a theme as "something important about the data in relation to the research question, and represents some level of patterned response or meaning within the data set" (p. 82).

For consistency, all interviews were coded and analysed by NV (a clinical psychology doctoral-level student), however, for reliability, steps three and four were done in collaboration with author LR until both authors achieved consensus on thematic interpretation. Both authors study dissemination of health research and value KT practice. Several steps were taken to address scientific rigor and credibility, such as: ongoing verification and clarification was sought from the participants during the interview process; verbatim quotes were identified for each theme; an internal audit trail was maintained throughout data collection and analysis; diagramming was used extensively, particularly visually displaying categories and relationships between categories; and transcripts were retained to confirm precision of the findings (Miles & Huberman, 1994).

Thematic analysis was conducted on all 16 participants collectively rather than on each group. Analysis began as soon as the first transcript was created and followed an inductive approach. Inductive analysis means that the generated themes are data-driven; that the themes are strongly linked to the data themselves and not driven by the researcher's analytic preconceptions or pre-existing knowledge (Braun & Clarke, 2006). That being said, Braun and Clarke emphasize that thematic analysis acknowledges that researchers cannot operate in a theoretical vacuum and that data is always interpreted through the lens of the researcher. For this reason, it is recommended that the researchers 'lens' be transparent. In line with this recommendation, and as mentioned above, the authors of the current study were involved in a larger national survey that explored the utility of a model of behaviour, the TPB. Attempts were made to code the data inductively, without reference to the TPB. Instead, because of apparent similarities, the current study compared the inductively generated results to TPB upon analysis completion. It should be noted that some quotes are edited to enhance readability (i.e., the removal of non-meaningful words, such as, "you know", "like", "um"). The generated themes and subthemes are outlined in the results.

5.4 RESULTS

Graduate students' views on participating in NTD were explored, and grouped into four dominant themes that form the basis of the thematic model: 1) Attitude: Personal Meaning; 2) Attitude: Professional Meaning; 3) Normative Behaviours; 4) Perceived Behaviour Control (see Figure 5.1). Each theme is discussed separately, with

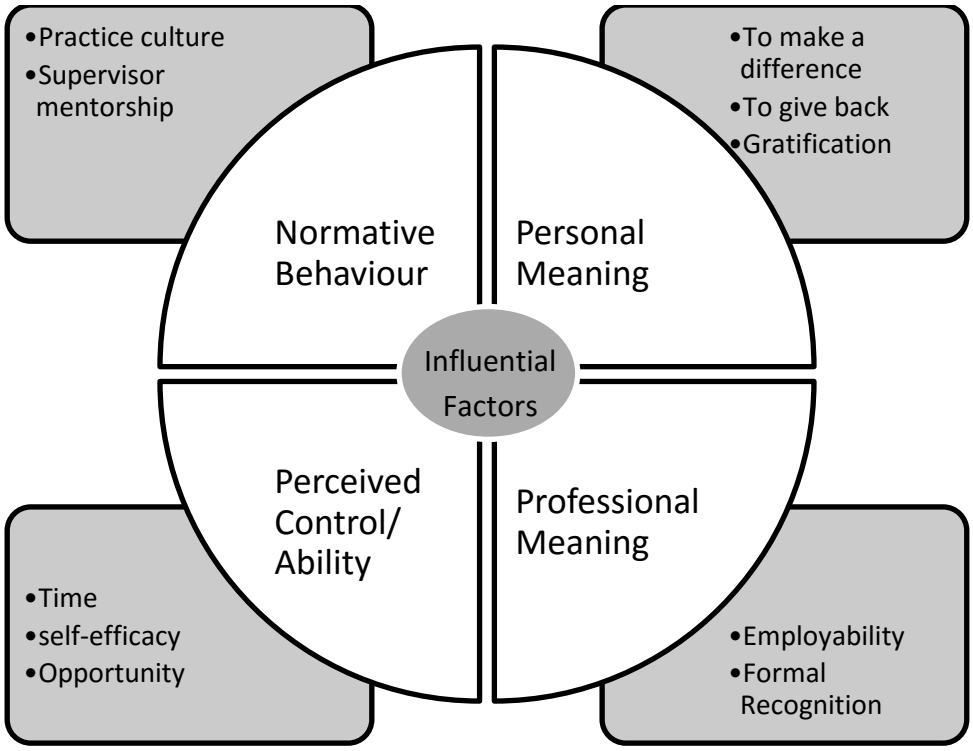

Figure 5.1. Conceptual map of central themes related to motivation to participate in non-traditional research dissemination during graduate school.

quotes to capture the essence of that theme. Not all participants are quoted, thus quotes are intended to represent the contribution of all graduate students. For anonymity, codes are used to identify participants and include an "H" (for high NTD intender) or "L" (for low NTD intender). Two participants, who were considered low NTD intenders from their original survey (conducted less than 4 months prior to interview), subsequently rated their NTD intentions as high (score of 6 out of 7) during the interview. These two participants are coded with an "ID# LH" to indicate a change in Low-to-High intention.

5.4.1 Theme 1: Attitude. Personal Meaning.

Attitude refers to the degree to which a participant has a favorable or unfavorable evaluation or appraisal of NTD. Most students expressed positive sentiments about the value of NTD activities. Regardless of personal NTD intention (i.e., low or high), students considered NTD a respectable and worthy endeavor, with comments like: "*it's incredibly valuable*", "*it's equally important [to TD]*", "*I feel very strongly about it*", "*there's a need for more non-traditional knowledge dissemination*". This positive attitude reflected students' overall appraisal of NTD. But, when discussing their own involvement in NTD, students communicated beliefs that were more specific to personal or professional gains and obstacles to NTD participation. Consequently, attitude beliefs appeared to reflect two distinct themes, those that reflected (a) personal meaning, and (b) professional meaning.

The Personal Meaning theme embodies attributes about NTD that are more intrinsically rewarding. These are beliefs about NTD that reflect motivation stemming from personal gratification rather than external recognition. Three subthemes emerged within the Personal Meaning theme: to make a difference, the desire to give back (e.g., to

society or one's own profession), and the affective appeal. Overall, all high intenders and the majority of low intenders commented on favourable personal meaning beliefs toward NTD.

Make a difference. Students, quite unanimously and spontaneously, identified a desire to participate in NTD in order to make a difference. Whether it was to influence policy change, inform patients, or educate other clinicians, students indicated that the intent of research was not only for the pursuit of knowledge but to ultimately be of benefit to others. Student 014H, who is training in public health, represented this sentiment well when explaining her motivation to participate in NTD:

> *"What we're doing is meant to actually have a purpose in the real world and not just for the pursuit of knowledge itself. I'm hoping to have some sort of impact on health at the population level. So, either by supporting clinicians in their work, or people who are developing health policy, or members of communities, it's absolutely necessary, the dissemination of the work that I do….every aspect of what we're doing is meant to feed into something that will have an impact."*

Similarly, students not only felt that NTD could offer a forum to influence change, but that it could and should benefit the end user, the person receiving the information. For example, Human Ecology Student 018LH said: *"I initially started my PhD with the hope of making some sort of contribution to help people on the ground level. The reason I would want to do it [NTD] is to produce a product that would make a difference at a kind of a ground level".* Similar to Student 018LH, who entered graduate training with an established interest in NTD, Student 007LH believed her graduate training broadened her understanding of who could benefit from NTD, subsequently

inspiring her to consider how she could make a difference to more than her nursing cohort. She explained that with "*a year and a half of the PhD program, I'm recognizing the significance of effecting change and making a difference through dissemination to political arenas."* Even with low or fluctuating NTD intentions, students articulated a desire to have their work be of benefit to others, *"I would want to feel like it [my research] was helpful to people"* (022L). Although making a difference was a common motivator for engaging in NTD, it was not always sufficient to influence behaviour. Student 022L expressed the ambivalence that many students reported feeling about balancing their desire to make a difference through NTD with the competing demands of their program: *"I would want to do it [NTD] . . . but I think it's going to be a lot of work to prepare for a one-hour talk, for example, and I don't know that that would be the best use of my time in general."* Part of the time demand for Student 022L stemmed from the challenge of translating her knowledge to a lay audience. This is reviewed further in the Perceived Behavioural Control theme.

Students discussed their perspectives on how NTD facilitates the impact of research. In particular, they highlighted two beneficial outcomes from NTD they believe can promote knowledge awareness and use. The first is that NTD can assist in establishing credibility with the non-academic community, and the second is that NTD is more likely to reach knowledge users relevant to their research, in order for change to occur. For the former, establishing credibility, one student who was also a faculty member of 25 years, noted that NTD would help researchers *"look more credible with the public … they [the public] would start to understand what university work is really about"* (003H). Another student (15H) described an experience witnessing the effects of

NTD in a remote rural community, and how it helped establish trust in researchers and subsequently opened the doors to future work with that population. She explained:

> *"It [NTD] was all handled in a way that was culturally relevant . . . And you're not going to get that just with your traditional research. And you're not going to get validation from the university for this [established trust] having happened. . . but ultimately I feel that that [NTD] made a big difference and it will make a difference moving forward for future research. . .so that's where I see the benefit in non-traditional knowledge dissemination."*

In addition to promoting credibility and establishing the trustworthiness of academia in general, some students suggested that NTD can develop one's personal credibility as a researcher, ultimately allowing for more individual influence in making a difference. For example, a student conducting health services research pointed out how NTD helped build his professional reputation as a person that is invested in both research and community. He explained: *"The other incentive for me to reach out in another way [other than TD] is that I needed access to NGOs, international organizations, to do my field work. So, you know, not being viewed as a traditional academic who's just out to publish a bunch of papers, but being somebody who's actually looking to contribute to the practice community in maybe a bit more of a practical way. So it ultimately opened doors for me to be able to do my research" (06H).* In his view, this reputation provided him with improved access to conduct relevant research that could be meaningful and ultimately make a difference.

The second NTD component discussed as instrumental in making a difference was reaching the appropriate audience. Students emphasized the limited accessibility of

scholarly resources to users outside of academia and the necessity to be more creative in how knowledge is shared. A student with no NTD experience shared her perspective on the importance of NTD: *"What's the point of all this [research], if we don't get it out to the people that actually should be using it…. if we don't share it with the people who actually need it"* (018LH). Overall, there was a general consensus among high and low intenders that *"Non-traditional forms would be more readily accessible to people of non-science background or of non-academic background"* (019L) and that "*traditional peer-reviewed journals are limited in terms of who they get to"* (03H). Consequently, reaching the relevant audience was highlighted as a personal motivator and necessary in order to make a difference.

In order to reach the relevant audiences, Student 06H emphasized that dissemination efforts must be tailored to the intended audience and go beyond scholarly journals: *"We know that people in public policy don't read journals. Journals are very much an academic tool, so if your audience is academics, then fine publish journals or publish a book, but if you want to reach out to people beyond that very narrow sphere then you just have to go elsewhere".* Similarly, Student 012H felt that participants were disadvantaged by the inaccessibility of TD: *"The [traditional] way of communicating research is so difficult and the English use is so extravagant that actually it's accessible to a very, very small elite of intellectuals who read it and they do research and that's great. But it's not available for the people who we actually investigate".* Furthermore, Student 05H echoed the same sentiments of the accessibility limitations, but also highlighted that poor research literacy among health professionals can serve as a barrier for TD effectiveness as well: *"The ability to find, understand and critically appraise research is generally low*

and pretty challenging, among health professions. So, the audience for our traditional methods of dissemination is very specific and circumscribed but even within that circumscribed audience, there's a smaller proportion there too that will be able to find and critically evaluate and understand research that's being disseminated. So I would argue that the non-traditional method certainly should reach a broader audience".

In response to the recognized limitations of TD reaching the relevant audiences, students pointed out the need to be creative and flexible with dissemination approaches. Student 03H summarized this sentiment:

> *"That's [NTD] critical for me to stay connected with the community and the stakeholders and those folks that maybe aren't engaged in traditional research and dissemination in their day-to-day work. Those are the key people I need to help me move policy . . . I've had people say 'just give me a quick, brief synopsis, just quick, I don't have time for this'. I have to come up with other ways to get my points across, yet based upon evidence and research. So for me to get to the people I need to make a change in the policy that's going to support the population I'm working with, I need to be very creative in how I disseminate what I'm trying to do and what I know."*

This awareness that creative NTD methods are necessary in order to appeal to a non-academic audience was shared by another student in applied health who indicated that his audience *"doesn't spend a lot of time reading journals, so you have to look at other ways of actually reaching out to them".*

In summary, students felt an inherent desire to be a part of making a difference with their work. There was consensus that NTD approaches facilitated the process of

making change and that TD had strong limitations in reaching important audiences. Engaging relevant audiences in order to make a difference emerged as an important component to NTD motivation. Some believed that NTD helped establish trust and credibility with non-academic audiences and many acknowledged that NTD required skill in being creative to reach those audiences.

Give back. Students discussed the motivation to participate in NTD in order to 'give back'. This feeling of reciprocity seemed to stem from a sense of professional responsibility and moral obligation. Student 07LH communicated that sharing knowledge is *"a professional responsibility, not part of a job that you're going to be paid for. So it comes from a commitment to see change and to help to shift or to inform about shifts in knowledge 'cause knowledge changes."* Student 004H echoed these sentiments with, *"it's a responsibility to share what I've learned".*

Some participants believed that NTD was a 'repayment' for taxpayers' contributions and felt morally compelled to participate. For example, Student 012H, who has four years of graduate training in psychology, said:

> *"If we are not funded externally, we are funded internally and it's taxpayers' money either way…I'm being completely funded to become a psychologist so the least I can do is to contribute to society… I'm using your money to educate myself, so I'm going to tell you what I'm doing with the money, this is what I found out. So you tell other researchers and then you tell the general population with an easier language …it's about giving back to society." (012H)*

Similarly, Student 03H suggested that NTD was about being an ethical researcher with a commitment to assisting those who participate in the research. She spoke of the

responsibility researchers have when it comes to university institutions and tax-payers' contribution: *"we need to think about what is the role of research within universities and within communities, because tax payers are paying big money to support it. So how are we sharing our research? It's not just for us and self-serving."*

In addition to giving back to tax-payers, other students spoke of a sense of duty or desire to give back to their own field; as one physiotherapy graduate student (013H) said, "*I feel it's important to bring it [the research findings] back to clinicians."* A nursing student (007H) highlighted that in the *"busy work world of nursing"* it's challenging to maintain evidence-based knowledge and argued that *"there needs to be more activism on the part of the researcher to do the dissemination of the findings… where we can get the information to them".*

Gratification. The drive to give back or make a difference was often discussed as inherently motivating to students. What became apparent about these goals is that they are motivating because they ultimately produce feelings of pleasure or satisfaction. For example, one student with plans of becoming a clinician-scientist (005H) described that the benevolent act of sharing draws her to NTD: "W*hen I think what would be in it for me, a desire to share the knowledge. You know if we've gone about asking some questions and seeking to find some answers then I would find intrinsic motivation in sharing that information with others."* Interviews revealed that making a difference and giving back generate outcomes that elicit affective states of enjoyment, pleasure, and gratification. One student (014H) highlighted how NTD offers more overt evidence of the influences of one's work, reinforcing the intended goal of making a difference, and ultimately being more gratifying as a result:

> *"I do think that it's more meaningful for me to do it, so I prefer doing that [NTD] than other forms. It's [NTD] also a little bit more desirable for me because I can actually see the outcome of what it is I'm doing. So I can provide information and in theory see that it's had an impact at the policy level…I'd say that the effects of the dissemination are a bit more tangible than in the scientific world….I want to do the non-traditional because it would be beneficial to me, it's enjoyable and I can see the outcome."*

In addition to the outcome of NTD providing gratification, many commented on the pleasurable component of producing and delivering the NT. High intenders, with past experience participating in NTD, typically endorsed the emotional appeal of NTD, saying "*I enjoy it"* (04H, 014H), or *"I like doing it"* (013H). Some low intenders, with no past experience in NTD, commented on the personally meaningful allure that NTD holds for them. For example, one student (017L*)* described the social appeal of NTD, "*interacting with people, I'd enjoy that",* and another student (019L) was drawn to the idea of producing something more creative, "*it would be fun to write to a different audience. . . Sometimes scientific writing can be so template; so writing in a newspaper, writing on a chat blog, or something different would just really mix it up"*. Finally, one student who anticipates a career as a knowledge broker (015H) described the fulfilment that comes from strengthening one's research through relationship development as a result of NTD and how this supersedes any external recognition:

> *"Academic validation or validation within the department isn't always the most important form of validation of your research. So although it's not recognized that it [NTD] takes a lot more time to do, at the end of the day, I think your*

research is richer because of it. I think the relationships you build with people who are not within academia, and how it plays into your academic findings, is richer and ultimately, hopefully it will be a more satisfying project and end result."

In summary, students described a number of different personally meaningful aspects to NTD that motivate them to participate, such as: benevolence, feeling one's work is useful, improving the public's perception about researcher, and a sense of moral obligation to reciprocate. Whatever the personally meaningful objective was, a feeling of enjoyment and gratification ultimately reinforced NTD's appeal and generated an overall favorable attitude towards the moral, benevolent, and emotional benefits of participating in NTD. The overall favorable intrinsically motivating attributes about NTD appeared to be distinct from the professional meaning students attributed to NTD.

5.4.2 Theme 2: Attitude. Professional Meaning.

The Professional Meaning theme reflects influencing factors that had extrinsic reward or consequence for students. Two subthemes emerged: a) the perceived value NTD has on students' employability (employment), and b) whether NTD activities garner formal recognition from important groups, such as graduate program or funding agencies (formal recognition).

Employment. Students discussed whether NTD activities would help them be more employable. Responses about whether NTD would have an impact on employability were mixed and independent of NTD high or low intentions. Comments predominantly surrounded three opinions: NTD is more helpful in the clinical employment realm; NTD will neither benefit nor hinder employment; and NTD is not

beneficial and may even hinder employment in academia where TD is valued. Students who believed in NTD's influence on employment commented on its applicability to clinical or community work specifically. For example, a student with plans of working in public health (014H) highlighted the beneficial connections that come from NTD for such employment: *"I think gaining expertise and finding ways to effectively communicate with people with lots of different backgrounds, it helps me in my career. And I think that people who are in public health, making those sorts of connections through that process is helpful to one's career".* Similarly, Student 018LH suggested that connections with the community would help with employment: *"I plan to work out in the community . . . so to make those connections with community members, to develop those relationships, to connect with people, to help them see the value in research, yah I think it [NTD] would help with employability".* Student 006H further emphasized the necessity of NTD for a clinical career: "*If you want to live in a lab and publish papers then you can probably do that and be reasonably successful at it, but if you want to be more of a practitioner as opposed to a lab researcher, then you know you need to be able to go out and mix with people*". Moreover, a senior psychology student's (017L) comments illustrated the common perception that NTD is a more practical, interactive-based dissemination method and therefore more helpful for a clinical career: *"I think [NTD] probably would be more relevant to my future career. Because my work is clinical and I'd say I'm kind of community outreach. I think talking to other professionals would be a skill; it would be more helpful for me in my career. And probably if I had done it earlier, it probably would have helped for getting internship as well."*

Interestingly, 017L's observations were a reflection on how NTD could have benefited her. This student noted that her perception about the benefits of NTD to employability only developed at the advent of her career search. It was not a belief she held during her eight years of graduate school, so her lack of participation was guided mostly by other factors, such as lack of time and supervisor expectation. In fact, despite some endorsements of the possible benefits to employability, no student explicitly stated choosing to participate in NTD for improved employability.

Discussions about academic employment, however, quite clearly emphasized the perception that NTD would not be valued by hiring bodies. Student 019L, with a research career ambition and no past NTD experience, explained that TD activities would be the only dissemination approach considered on a candidate's profile. She said, *"I'm sure many people out there are still a little bit old fashioned and they wouldn't be asking those sorts of questions in an interview setting. They wouldn't be asking you how you're reaching out to your community, the general public. They would be asking you how you're reaching out to the scientific community and how you're publishing in those peer-reviewed journals and so I'm sure that [NTD] is just not something that's on their radar".* Although she spoke highly of the personally meaningful benefits of NTD, she believed that academic hiring bodies had not yet evolved to consider other forms of research contribution, and this belief has guided her to "*to steer myself that way*" for employment purposes. Another student (005H), with high intentions of participating in NTD, agreed that a career in academia does not call for a background in NTD activities and pointed out that time dedicated to NTD could take away from TD (the main employment assessment criteria), thus hindering employment potential: *"in academia,*

those skills [NTD] are not specifically asked for. And we for sure know that we're being asked to demonstrate a history of dissemination in traditional areas. So [NTD] could in fact negatively affect employability [if TD is not as accomplished]".

The third camp of comments came from those who did not believe NTD to have any influence on employment potential, even in the clinical realm. For example, one student (012H), who was employed in a clinical psychology position at the time of the interview, believed her dissemination experience (TD or NTD) was irrelevant to securing her existing position: *"I don't think that [NTD] makes a difference [to employment]. To get this position, it was not related to disseminating research at all. It was about my clinical skills."* Another student suggested NTD might offer employers insight into an applicant's character, "*they might see [NTD] as taking initiative",* but ultimately she echoed the same sentiments, that NTD did not make you any more competitive.

Not all students had pre-formed opinions on the role of NTD in employment. One student's comments illustrate how the mere discussion about NTD in the interview generated new thoughts. Student 016L, with self-professed minimal NTD knowledge, indicated that she did not believe NTD would improve employability "*because I don't put it on my C.V.".* With further reflection on this, she began to change her mind, *"Well hmmm, I guess I should make a category on my C.V. for non-research based, or, how would you say it, non-professional? Or, I don't know, just have a separate category for other presentations, right? But I don't for some reason. So I guess if I were to do that, then yah, I think it can help 'cause then they [employers] could say 'oh wow, she's willing to do presentations to professionals in the area', so I think that's definitely an asset".* What this thought process emphasizes is that NTD is clearly a less familiar

behaviour for some, and that a small amount of time exploring one's beliefs can quickly change those beliefs. For Student 016L, inclusion on the curriculum vitae (C.V.) reflected the importance of a behaviour, which ultimately guided her goals and behaviour. Other students also mentioned the role of the C.V.; this is discussed further in the next subtheme, 'formal recognition of value'.

Formal recognition of value. All students believed that formal recognition of NTD, as a form of scholarship in academia, was minimal to nonexistent. Some students described receiving informal support from their program, but that it came in the form of a kudos approach to recognition. For example, Student 07H indicated that her program "*will give praise"* for NTD participation, and Student 024L said, *"I think I have seen them [graduate program] mention people's [NTD] accomplishments, usually it's of professors, but it's kind of more just like a pat on the back".* Lack of support from a student's program was described as a hindrance to NTD participation, because, as Student 018L noted, "*as a student you're just trying to get stuff done and within your timeline."*

A number of students pointed out that for evaluation of productivity, NTD held little value compared to TD. Student 017L emphasized that in the annual student progress evaluations, *"it [NTD] wouldn't have as much status as a publication",* and Student 03H was clear that academic advancement (both as a student and professor) was driven by TD participation. She said, *"although they say they support it [NTD], when the bottom line comes down to it, it's the number of publications you have and if they're in peer reviewed journals. It's tough to get that other part of scholarship [NTD] defined as a part of*

promotion." Consequently, with minimal time, students are faced with the decision to participate in the valued TD or the "pat on the back" NTD activity.

Despite the acknowledgement that there is a deficit in NTD recognition, students also appreciated that determining credit for NTD might be hard to quantify. For example, Student 019L empathized with the employers' challenge of assigning value to NTD work:

> *"It's difficult to grade something like that [NTD]. I mean with journals you have impact factors and scholarships, you have the amount of money they're worth, and different conferences have different scales of influence maybe. But non-traditional, there's no grade scale for it, so they [employers] really wouldn't know how to compare those characteristics between applicants. . . How to put a value on it?*

Overall, students see few models for quantifying value or rewarding NTD behaviour. They expressed ambiguity about 'how' NTD is valued, which leads to uncertainty about 'whether' NTD is valued. This uncertainty was further illustrated in discussions with three students who noted difficulties in reporting NTD on a C.V. According to these students, the C.V. reflects what is considered important to external evaluators. If NTD activities are not requested on a standardized CV, the message is that those activities will not be acknowledged or valued. For example, immunology Student 019L, who is focused on a research career, commented on her challenge of including NTD participation on standardized C.V.s requested from government funding agencies: "*Nowadays a lot of scholarship applications follow a strict template for the C.V. and so a lot of my different volunteer contributions, I don't really know where to put that in their templated C.V. format. I guess that it's just not something they're really looking for. I*

mean they certainly leave space for the papers you've published, the conferences talks you've given, but they certainly wouldn't leave space for a non-traditional contribution". With no dedicated space in the standard C.V. template for NTD activities, the message delivered is that it's not highly valued. In line with this sentiment, Student 016L commented on how the C.V. seems to undermine the value of NTD, "*I could do the same presentation at a research conference and a very similar one to a professional community. But, I feel when you're putting it down on your C.V., I feel like they [NTD] don't hold the same value in a way. I don't know why."* Moreover, even the lack of clarity in how to report NTD on a CV creates uncertainty about its value, "*there's the APA format for a conference presentation and for a journal article. . . It's harder for me to think about how I would write [NTD] on my C.V. . . . [TD] is seen as more credible."*

Funding. In line with building a strong C.V., being competitive for funding appeared to influence students' dissemination activities; usually by encouraging TD and discouraging NTD. Students' stressed the competitiveness of scholarships, and, as Student 016L articulated, there's a feeling of "*intense pressure to be doing all of these extra research-oriented things that can build up that C.V."* to secure funding. For the most part, students believed that TD was the only valued form of dissemination to funding agencies, in part because agencies ask applicants "how do you plan to disseminate", which is interpreted by students as TD (016L), but they "*don't ask about non-traditional dissemination"* (022L). Even when students came across funding applications that do highlight NTD, these students expressed skepticism about the authenticity of these request. For student 05H, when funding agencies have requested KT plans, she commented, "*I don't know that it has ever been presented to me in a way that*

would make me think that I actually need to be planning for non-traditional routes." Similarly, Student 014H commented on the ambiguity of NTD messages in funding applications, "*If [NTD] is required, it's not defined well enough to understand what it is, what they're looking for. So they might say CIHR has a definition of knowledge translation but knowing what that might mean for you and your project and what they would like to see happen, it's something that isn't clear."* Accordingly, students seem to believe that NTD will not contribute to funding competitiveness because agencies either do not request information regarding NTD participation or they do request it but the request appears disingenuous or ambiguous. Overall, the findings revealed that employability was not a strong motivator for NTD participation, that the lack of formal recognition or clarity in how to evaluate NTD acted as a hindrance to participation, and that the perception that funding agencies valued only TD activities served as a guide to direct attention to TD participation.

5.4.3 Theme 3: Normative Behaviours

Normative Behaviour describes students' perceptions about what they perceive to be common behaviour related to NTD and their perception about social pressure to perform or not to perform NTD. In particular, two subthemes were identified, a) supervisor mentorship: the role student supervisors played in either supporting or modelling NTD activities, and b) practice culture: whether NTD is perceived to be practiced in one's environment and discipline.

Supervisor mentorship. Students discussed the significant influence that research supervisors had on their participation in NTD. This influence was driven by a sense of trust in the supervisor's decisions, whether the supervisor participated in NTD,

and the perceived valuation supervisors hold about NTD. Trust was born out of necessity, because of lack of time to explore alternatives, and as a product of the supervisor-trainee model. For example, 015H likened this model to apprenticing for a trade, "*if you're told that no you should not use this tool, or this tool isn't what's recognized or isn't what's appropriate, you're not going to do it."* Related to time and demands, Student 012H confessed, *"You have so much on your plate, students will do whatever their supervisor asks of them",* and similarly, Student 015H pointed out that because of time, energy, and the conflict that could ensue, *"if you don't have a supportive supervisor, it [NTD] just doesn't happen".*

In the same way that a supervisor's support appeared to motivate student participation, supervisors' behaviour was also discussed as influential. A number of students commented on their own NTD involvement paralleling their supervisor's involvement. Student 024L indicated that *"you kind of do what your supervisor does"* and student 013H expressed that her own support for NTD was a product of seeing her supervisor's involvement in NTD. Although NTD modelling was deemed important, comments also revealed that students' perception about why their supervisor participated, impacted their appraisal of NTD's value. For example, 019L perceived her supervisor's NTD involvement as a product of *"pressure from granting agencies to do something like that"* and therefore did not believe these to be valued activities in her lab. Contrast this with Student 012H's understanding of her supervisor's motives: "*she [supervisor] will go to talk to schools and won't tell people about it, she doesn't do it for show, she just does it . . . she doesn't need to do this but she will do it".* Accordingly, students might be more

apt to perceive NTD to be a valued activity if they believe a supervisor's behaviour is within volitional control.

Practice culture. Though the supervisor's role is arguably a central factor in assigning value to NTD, the perceived dissemination behaviour of similar others in the student's environment appeared to serve as a normative benchmark. As Student 012H pointed out, *"it's the context that teaches what they [graduate students] understand to be important";* meaning that the culture of the training program influences the norms and practices. Similarly, Student 024L believed participation in her career would be contingent on whether other colleagues also were involved in NTD. She was uncomfortable with the thought of "*just jumping in without anybody else doing it, without any guidance or anything*:" Student 017L's comments also revealed how the referent group to which students relate is very confined to students in their own program: *"I think I heard of some people in my department, in the applied social program, doing more of that [NTD]. But it didn't seem like something that the clinical people did"* (017L). In other words, the practice culture of graduate students in other programs but within the same department and discipline (e.g., psychology) would not necessarily be considered by a student discerning the behavioural norms relevant to them.

Students often believed there to be a difference in dissemination preferences and pressures between the academic and clinical institutions. Student 016L's comments represented these beliefs well when she described having experience in both contexts. She explained how the graduate school culture applied "*more of a push for the traditional"* dissemination and not NTD. She continued: "*even though I was in a very clinically based program, every presentation I heard of professors doing, it was always*

for a conference or there was this almost pressure from even students in my cohort, 'oh are you going to this conference, or are you going to that conference, and you're not going, why not?' You're just almost expected to be going to all the major research conferences, nobody really has time to do anything else, there's not that same pressure for non-traditional." In contrast, she reported that once she started a clinical internship as part of her graduate training requirements, the expectation for NTD (and not TD) were encouraged: "*now I'm in a more work place setting . . . I never really thought about doing it [NTD], but I was approached about it. It was the first time that it had really dawned on me that I could do that. And now this year there's more talk of doing more presentations [for the public]."* These comments highlight the influence of being encouraged and invited to participate versus initiating these activities. Consistent with this, Students 013H and 015H both commented on how working in community environments broadened their ability to see what NTD can offer others outside of academia. Student 013H indicated that her involvement in NTD was primarily driven by "*the interest that I've seen from the patients"* and 015H commented that, *"when you're working directly with people and community, you start to see more of a value with that [NTD]. Just like if you're working only within an academic context, you don't see much beyond the value of your particular discipline."* These students showcase how compliance with the social norms and needs of your workplace strongly influences motivation.

Evidenced by some of the abovementioned comments, there was a common sentiment among students that community and clinical institutions embraced NTD. Student 019L highlighted this clinical-NTD emphasis:

"There's a huge push for translational research in the medical research world. They're trying to push scientists out of their little science lab bubble and get them more into the public eye and get them thinking more about what the impact of this is on our everyday lives, on our health. So I think hospitals and hospital-associated research institutes have responded to that call much better than solely academic labs from the university. So, yah, I think that's why cancer institutes and hospital research institutes are really taking into consideration the general public and more non-traditional forms of dissemination, whereas academia is still stuck in the traditional, 'must publish in Nature' sort of view."

Though the social norms surrounding NTD appeared to influence students' behaviour, not all students described passively complying with these norms. Two students, with strong NTD ambitions, reported changing committees, supervisors or disciplines to accommodate their NTD interests. In other words, they created an environment that matched their practice preferences. As Student 015H described: "*I switched disciplines at that point to native studies so that I could have hands-on community approach that involved working with people and making sure that knowledge sharing worked both ways [TD and NTD]."* While these students embedded themselves within a culture that corresponded with their views, this adopted environment also appeared to provide more NTD opportunity, thus offering the graduate students with both increased behavioural norms and possibly more perceived control.

5.4.4 Theme 4: Perceived Behavioural Control

This theme addresses the perceived ease or difficulty of performing NTD. Three subthemes were identified: Opportunity, Time limitations, and Self-efficacy. In general,

this theme illustrates the significant obstacles students perceived to be preventing them from engaging in NTD activities.

Opportunity. All students with low NTD intentions discussed the lack of opportunity during their training to participate in NTD. Clinical psychology Student 017L said about getting involved with NTD, *"I didn't really know that I could . . . an opportunity didn't come up for that*". Similarly, immunology Student 019L commented that, "*as a graduate student, you certainly don't get exposed to that [NTD] . . . you definitely don't get as many opportunities*". Students' comments revealed that lack of opportunities and exposure to NTD acted as the first barrier to even considering NTD participation. Even when strong NTD intentions and favorable perceptions about the value of NTD existed, population health Student 05H indicated that NTD involvement was not any easier. She said "*that process is not as readily facilitated"* and added that *"there's not that much opportunity to do it [NTD]."* These comments suggest that lack of opportunity not only created a barrier for considering NTD involvement, it impeded following through with intentions.

Students discussed how the opportunity for NTD involvement develops. Though the vast majority talked about actively creating connections through their research, two students with low intentions, described a more passive approach. Their perception was that NTD opportunities are not something you seek out, but rather, would be invited to do. As Student 022L indicated, "*my understanding was that the media or whoever would do the seeking out and you could choose to respond or not respond to the requests, as opposed to the other way around.*" Student 018LH emphasized the challenges of finding opportunities of students exclusively working within an academic environment:

"If you're just in school doing your research and not having those connections out in the community already forming those relationships, I think it could be a struggle. Like where would you even start, right? Who do you connect with? Depending on what your research is, I could see that being really, really difficult. Especially if someone you're working with, your supervisor, doesn't have those types of connections, or has no suggestions".

She continued by highlighting the importance of research connections in facilitating NTD opportunities. This was a commonly shared belief among the interviewed students. She noted that the opportunities available to her were a catalyst in her NTD endeavors: *"My department is strongly supportive [of NTD] and they're strongly connected with different agencies, I think it comes a little bit differently for me. If you have that support and you're already in the community, I think you're already half the battle. That's kind of the starting point".* According to this student, program support and community connections create the foundation for NTD involvement.

Time limitations. Overall, students spoke about NTD as a non-essential component of their program. Thus, in order to participate, one would be taking on extra work. As Student 024L pointed out, she could not prioritize NTD before her TD efforts: "*You're more encouraged in the traditional [dissemination] and they teach you how to do traditional. You only have so much time, so I'm just focusing on that [traditional]"*. Similarly, Student 018L believed it to be something she would have to do "*above and beyond that which I'm already working madly toward [traditional dissemination]*". In addition to perceiving NTD as an 'extra', some believed it also took longer to accomplish than TD. For Student 015H, who commented on NTD's value in generating "*richer*" and

"*more satisfying*" research, she also stressed the time-related shortcomings of NTD: *"It [NTD] takes a lot more time to do [than TD]. . .is certainly a lot slower. And it means less publications. It means more intense projects".* She continued by pointing out that, if you do not have program/supervisor support to participate in NTD, other program demands essentially prohibit graduate students from involvement: " *'Cause it [NTD] takes a lot of time, a lot of energy, and a lot of fighting if you don't have that support. . .and then you just burn out. There's enough stress being a grad student without arguing to do some of those things [NTD]."*

Even when students acknowledged the personally meaningful allure of NTD (i.e., satisfying, making a difference), many spoke of how program demands and lack of time trumped this personal meaning. Student 024L summarized these sentiments well: *"I've never done it before so I don't really know, maybe it might be intrinsically rewarding. Maybe passing on that information might help other people and be rewarding in that way . . . as a graduate student you're so busy. I don't think I'd want to take on more stuff".* Echoing the time limitations concerns, Student 014H stated: *"I want to do them [NTD activities], it's just that I certainly don't strongly strongly want to do it either. I think that has mostly to do with my time."* Similarly, Student 023L, who anticipates a career as an instructor in the medical sciences, explained that time concerns relate to graduating and subsequently working in a reasonable time frame. She said: *"who has the time? I want to . . . however, if there is no gain with respect to helping me graduate sooner, then I just probably won't be able to swing it".* Lack of opportunity and time were not the only identified barriers to participation. Students' had concerns about their competence, minimal training, and overall self-efficacy in NTD participation.

Self-efficacy. Level of training in NTD appeared to influence confidence in one's ability to participate. This confidence ultimately affected whether students participated or not. All students, except for one, reported that they did not have formal training in NTD. Low intenders highlighted their lack of familiarity with NTD (partly resulting from not receiving any training or exposure to NTD) and their discomfort in considering NTD as a result. Findings from those with past experience in NTD (all high intenders and two low intenders) revealed specific difficulties that contributed to low perceptions of self-efficacy: a recognition of skill deficit, lack of training and no one with whom to consult, difficulty translating knowledge to non-academic audiences. Student 005H summarized these sentiments well when she questioned her ability to produce a meaningful NTD product and described how this produces apprehension about her NTD involvement:

> *"I think, boy, you know if I'm struggling to create a three hundred word lay summary, you know how confident am I or how competent am I to produce something meaningful for a non-academic audience, whether it was a newsletter or a press release. I've had very little opportunity to learn how to do those things in graduate school. . . As I've learned with everything else in graduate school, confidence comes with practice too right, so I have very little practice in disseminating research information to a lay audience. . . I feel as though the exposure has been minimal . . . so I can't say that I now have this great well of confidence to proceed."*

Here the student acknowledges the unique skill required in conducting NTD and the role that lack of modeling and opportunity to practice have contributed to her self-doubt about her competency to engage in NTD.

Students who had attempted NTD generally recognized that NTD necessitated a certain skillset that needed to be developed. As Student 05H, with five years of graduate training, commented on her experience with research dissemination to non-academic audiences: "*I will tell you, I struggled with it. Even when I'm asked to produce a lay summary, that's incredibly difficult."* Though many could recognize the skill deficit, students commented on their frustration with lack of guidance to develop NTD skills. For example, Student 05H continued by pointing out that despite receiving messages "*that you must simplify things for a lay audience"* she is frustrated by the lack of guidance in *"this is HOW we will do it [simplify things]".* Student 015H, with six years of graduate training, has endeavored to learn these skills independently as a result of the lack of training available to her. She pointed out the scarcity of literature and other resources to guide her on her NTD endeavors: *"I find it's not an area where there's a lot written about so you're kind of flying by the seat of your pants with some of the stuff".*

The subject of skill deficit and subsequent discomfort with NTD was reiterated by a number of students as they discussed the particular challenge of translating their knowledge. For example, Student 013H pointed out that attempts to communicate a message to an unfamiliar lay audience can be "*difficult to explain"* when you are "*used to using the terminology and jargon for a scientific audience who knows what you're talking about".* Another student (007L) indicated that *"dissemination differs based on the approach"* (quantitative vs. qualitative) and expressed her lack of confidence in communicating qualitative findings but struggled with finding someone to consult with to guide her in translation efforts. Furthermore, another student (016L) highlighted her apprehension about not being able to meet her audience's needs. She believed her

audiences would likely want "*more practical advice"* than she would be able to offer because, as she said, *"I haven't really worked in that area; I've just done research on it"*. These comments suggest that students do not feel equipped to translate their knowledge or do not feel qualified to share their knowledge.

Overall, students were clear that lack of exposure and minimal pragmatic training in how to communicate with non-academic audiences is common. As a seventh year graduate student (018L) articulated: *"I can say that there's been no training; maybe mentioned in like seminars and stuff . . . but no specifics around getting training, on how to initiate that contact, what types of things you should be saying, how to talk to media, nothing like that"*. For another student, this lack of familiarity with NTD acts as a complete barrier in pursuing NTD involvement: *"[TD] is something that you get training on how to do and I'm really comfortable with it. But non-traditional, I have no idea how you would go about doing that. So I wouldn't feel as comfortable . . . for me right now, there's too many reasons not to do it if you don't know what you're doing"* (024L). Although 14 students highlighted the lack of training and many discussed the implications of skill deficit to their feelings of self-efficacy, two students did not feel this way. Instead, these two students, both with high NTD intentions and past NTD experience, expressed their confidence with NTD involvement. The first student (006H) in health policy, spoke about NTD skills as something you inherently possess or do not. He said:

> *"I've never had any formal training. I think that you would lose something if you had formal training in how to have a casual conversation with people. You can either do it or you can't. A lot of this is about synthesizing information so that*

people want to use it. So some of that is just going and having coffee or having a drink with somebody and talking it out and some of it is writing short reports that people have time to read and that sort of thing . . . I mean our program is very interdisciplinary, it's focused very much on health policy, and interacting with the practitioner community and if you can't go out and shake hands and meet with people and figure out how to convey a message then it's not the right program for you."

The second student (012H), a clinical psychology student, believed her supervisor played an essential role in influencing her NTD involvement, but does not consider formal training a necessity for NTD: *"You don't need special training. Honestly, you don't even need a Master's degree to do a workshop, it's so simple"*.

In summary, this subtheme highlights students' perceptions that NTD requires skill development. Most indicated a lack of training and modelling in order to be more proficient with these skills. The most notable skill deficit reported by students was the ability to translate and communicate their knowledge to a non-academic audience. Though a majority of students endorsed these same sentiments, two students felt differently, proposing that NTD skills should not be taught but instead are inherent skills that you either possess or you do not.

5.5 DISCUSSION

The current study explored the attitudes and beliefs that graduate students hold about participating in the less familiar behaviour of research dissemination to non-academic audiences. Overall, the sentiment around participating in NTD was "I want to but…". Notably, all interviewed graduate students believed NTD to be a worthy endeavor

that significantly contributed to the community. For some, the prospect of making a difference served a role in first propelling them into a research career. However, most participants readily identified barriers to engaging in NTD that often trumped the personally meaningful motivation, relegating NTD activities to "extracurricular" status, as one student called it. The current study identified four themes that contribute to the formation of graduate students' views about participating in NTD: whether it is personally meaningful, professionally meaningful, considered normative behaviour, and under perceived control. Although the data was analyzed inductively, it became apparent that the identified subthemes mapped readily onto major constructs outlined in the TPB; which is a well-documented model that outlines the determinants that explain behaviour (Ajzen, 1991). In the TPB, the proposed determinants that form intentions for behaviour are attitude toward the behaviour (e.g., is this a good idea for me), subjective norm (e.g., do others think this is a good idea), and perceived behaviour control (e.g., do I feel capable of doing the behaviour).

Attitude towards a behaviour is considered a strong predictor of intention and behaviour (Kraus, 1995). Attitude is one's disposition towards evaluating something as favourable or unfavourable and is proposed to develop from accessible beliefs about the behaviour (Ajzen & Gilbert Cote, 2008). In the current study, beliefs about NTD yielded somewhat opposing attitudes regarding how NTD 'affects me personally' (positive attitude) and how it 'affects me professionally' (negative attitude). From the personal perspective, graduate students reflected on *what* they found to be intrinsically motivating aspects of NTD. These were: NTD accomplishes their desires to participate in research that "makes a difference" and complements their values to reciprocate, give back and

demonstrate ethical responsibility. Graduate students shared their observations or predictions, depending on the NTD experience, on *how* these valued goals (e.g., making a difference, giving back) were accomplished with NTD. These were primarily, sharing knowledge in a more accessible and easily interpretable method for intended audiences and by improving public perception of research and the trustworthiness of the researchers. It is worth noting that researcher trustworthiness is not an insignificant goal. For example, evidence suggests that mutual trust between researcher and policy-makers facilitates research uptake and ultimately policy change (Innvaer, Vist, Trommaled, & Oxman, 2002). In the current study, an endeavor such as influencing policy change was described as an intrinsically rewarding experience. Generally, graduate students described these intrinsically rewarding experiences as generating affectively pleasing outcomes, such as personal gratification and satisfaction, ultimately enhancing the personal meaningful of NTD. There is evidence to suggest that attitudes comprise both affective and instrumental evaluation, each separately contributing to the prediction of behavioural intentions (Kraft, Rise, Sutton, & Røysamb, 2005). One might argue that the personally meaningful component of NTD harnesses a favorable *affective* attitude that graduate students' have toward NTD.

The instrumental attitude component might best be reflected by the unfavorable beliefs graduate students had about the contribution of NTD to their professional advancement. Many did not believe NTD assisted with employment prospects and some commented on the potential damage NTD involvement could have by interfering with TD endeavors; activities perceived by graduate students to be influential for employment. According to graduate students, they repeatedly receive the message from academically

affiliated institutions (despite declarations to the contrary), that NTD activities are ultimately not valued activities. This is reportedly demonstrated by a lack of formal recognition for work done and no dedicated space to document this work, such as on templated CVs (from funding agencies) and evaluation processes (academic institutions and programs). Overall, graduate students hold conflicting attitudes about the meaningfulness of NTD. They battle between their favourable positive personal/moral sentiments and the unfavourable professional/achievement beliefs. How these competing attitudes affect graduate student behaviour cannot be discerned from this study, but according to Rosenberg (1960), consistency between affective and cognitive components corresponds to stronger behavioural predictions.

The personal and professional attitude themes highlight the perceived subjective relevance for an individual, in other words, "is this a good idea for me?" The normative behaviour theme, on the other hand, demonstrates the impact of the compelling force to conform to others' expectations. Notably, graduate students described operating in a way that was consistent with their supervisor's values and wishes regarding NTD. A few sought to find supervisors who had similar beliefs about NTD while most grew to adopt their supervisor's orientation toward NTD. For some, the supervisors' values influenced the culture of the lab (e.g., the value orientation and actions of others) to which students were affiliated. The referent group and cultural affiliation that students strived to conform to were often very small groups of people, such as the supervisor's laboratory team or the graduate student's program. For example, one graduate student clarified that, within his psychology department, one program (e.g., applied psychology) was more apt to engage in NTD than another (e.g., clinical psychology), and he associated himself with only one

of those programs and behaved in a way that was consistent with that group alliance. Given this reportedly strong association between supervisor/cultural support and intention to participate, it is not surprising then that those identifying with high intentions also described receiving this support while those with low intentions reported minimal support and practice norms.

Graduate students described different experiences related to supervisor support and cultural practices, but all were quite unanimous in the pragmatic barriers they faced: time, opportunity and perceived competency. In the TPB model, perceived behaviour control has been demonstrated to influence both intention and actual behaviour (Ajzen, 1991). Intuitively this makes sense; if you do not believe you have control, variables like how favorably you perceive the behaviour or how strong your intentions are, are likely to lose their motivational power. Given the graduate student perception that NTD is an extracurricular activity, time and opportunity limitations are sensible deterrents. It would take strong conviction to problem solve those barriers if ultimately NTD participation delivered few rewards. Moreover, feelings of self- efficacy, known as the belief that one is capable of carrying out an action, has demonstrated strong predictive utility in explaining behaviour (Bandura, 1986; Bandura, 1997). Related to self-efficacy, graduate students commented on the lack of NTD training, their struggles with the mechanics of how to translate knowledge, having few models to observe, and the ultimate lack of confidence that generates ambivalence about participating. Although graduate students could readily identify the pragmatic barriers to NTD participation, students with supportive supervisors reported greater ease at overcoming those barriers (particularly in finding opportunities and gaining confidence in ability), suggesting an interconnectedness

between perceived control and supervisory support. Consistent with this emphasis on supervisor support, other research has found that research productivity and positive research experiences during graduate school have been most highly associated with faculty mentorship (Hollingsworth & Fassinger, 2002; Love, Bahner, Jones, & Nilsson, 2007).

The current findings are comparable to a study (Andrews, Weaver, Hanley, Shamatha, & Melton, 2005) that asked graduate students in basic sciences (i.e., chemistry, geology, physics) to rank order facilitators and barriers to participating in outreach activities (e.g., delivering presentations to the community, tutoring high school students). Highest ranked motivators included 'desire to contribute' and 'enjoyment', and top ranked barriers to participation were lack of time, lack of opportunity, and lack of support from advisor. Although the Andrews et al. (2005) study differs in study population (not health-focused graduate students) and target behaviour (not investigating research dissemination specifically), it informs us that trainee populations may share similar behavioural motivators and deterrents when considering knowledge sharing activities to non-academic audiences. That is, they want to participate because of an innate desire to contribute, but are hindered by the pragmatics of including an "extracurricular" activity into their training requirements. It therefore seems reasonable to assume, that if the goal is to encourage more knowledge sharing participation during graduate school, changing the existing perception of NTD as an extracurricular volunteer activity to one that is valued and expected from researchers, would be beneficial.

Also, given the current study findings, one might argue that normative behaviour (and in particular supervisor support) has a strong, possibly mediating role, in graduate

students' intentions to participate in NTD. For example, graduate students had similar dispositions and shared experiences in three of four themes: for personal meaning, the overall consensus was "I want to participate"; for professional meaning, the message students hear is "it's not important"; and for perceived control, the common sentiment is 'I can't do it". Yet for normative behaviour, the overall message was dependent on what they experienced from others (whether NTD was deemed to be important or not). Encouraging normative behaviour (both from the practice culture and supervisor support) appeared to be universally experienced by high intenders, whereas low intenders described discouraging normative behaviour. There was not one example where the reverse was true, such as high intenders experiencing discouraging normative behaviour. Given the strength of association this theme had with high and low intention, further research could elucidate whether normative behaviour (or specifically supervisor support) serves as a mediator for the themes/beliefs of "I want to", "It's not important professionally", and "I can't do it" with intentions to participate.

The current study contributes new knowledge to the minimal existing literature about graduate students' beliefs toward knowledge sharing. The qualitative design offers a richer analysis of the thought processes of graduate students that may have been neglected or misinterpreted in a quantitative design. It is limited, however, by the small sample size, low representation of males, and Canadian only context. Also for anonymity reasons, minimal demographic information was obtained, so information such as racial or ethnic differences are not discernable from this study, thus potentially reducing transferability. The current study is also constrained by common inherent limitations in qualitative designs (Mazzola, Schonfeld, & Spector, 2011); namely, use of a convenience

sample (which may introduce volunteer bias) and the interpretive nature of qualitative analysis. Efforts were made to reduce sample bias by recruiting participants with different belief systems about the study topic (intenders and non-intenders). Attempts were also made to ensure integrity in the analysis with the following strategies: disclosing and accounting for research biases (i.e., using an inductive analytic approach before comparing to the TPB model), maintaining a meticulous record trail in order to review and account for decisions, including verbatim descriptions of participants' accounts to support findings, and engaging with the principal investigator's research supervisor and dissertation committee for expertise (Noble & Smith, 2015).

Overall, the findings from this study suggest that graduate students with a health research focus possess the intrinsic drive to participate in knowledge sharing activities, but are mostly challenged by external obstacles (i.e., supervisor support, lack of formal recognition, lack of training, etc.). If the goal is to improve researcher involvement in KT activities, it would be prudent for academic institutions and influential funding agencies to evaluate how the current training climate is shaping the values, practices, and habits of the future generation of researchers. The current findings provide insight into factors that contribute to graduate students' behaviour (thoughts, feelings and actions), and could inform program initiatives. Future research would be warranted in evaluating the efficacy of those initiatives.

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CHAPTER 6: GENERAL DISCUSSION

6.1 SUMMARY OF RESULTS

There is a well-established research-to-practice divide that has prompted efforts to improve collaborative knowledge mobilization among all relevant stakeholders, and this includes researchers. This dissertation involved a mixed-methods approach to investigate the perceptions of graduate student researchers (the future generation of researchers), towards research dissemination. Specifically, there was a research focus on dissemination to audiences outside the academic community. This form of KT activity was referred throughout the dissertation as non-traditional research dissemination (NTD), to contrast it with the more familiar traditional research dissemination to academic audiences (i.e., peer-reviewed publications and conferences). Four phases generated three papers that addressed the study objectives. Using the TPB as the framework, results from a focus group and small pilot study (phases one and two) led to the development of an online survey (phase three) investigating the intentions of graduate students to participate in NTD. Data from the online survey (n = 419) yielded TPB global constructs (Paper 1) and specific beliefs (Paper 2) that were most predictive of NTD intentions. A sub-sample of graduate students from the online survey (n = 16) participated in semi-structured interviews that further explored graduate students' perceptions of NTD. The overall objective of this dissertation was to comprehensively investigate the correlates that help explain and predict graduate students' intentions to participate in NTD. The rationale for this inquiry was to generate new knowledge that could be used to develop programs and resources that motivate and enable research trainees to participate in KT activities. An illustration of the findings, compared across the three studies, is presented in Table 6.1.

Table 6.1

Constructs and themes found to be associated with intentions to participate in non-traditional research dissemination, compared across three studies, using the same participant sample

Global TPB: Paper 1 Quantitative *n=419*	Theme & Subtheme: Paper 3 Qualitative *n=16*	TPB Beliefs: Paper 2 Quantitative *n=419*
Attitude	Personal Meaning	
	Make a difference *-not tested-*	Make a difference Increase my research impact
	Give Back[b]	*-not tested-*
	Gratification	*-not tested-*[a]
	Professional Meaning	
	Employability	Help achieve career
	Formal Recognition	**(ns)**
Subjective Norm	Practice Culture	Grad. student descriptive norm
	Supervisor mentorship	Supervisor expectations
Moral Norm	Give Back[b]	*-not tested-*[a]
PBC: Self-efficacy	Self-efficacy	*-not tested-*[a]
PBC: Control **(ns)**	Time	**(ns)**
	Opportunity	*-not tested-*
		Research suitability

Note. All constructs/themes are considered significant findings unless noted with (ns). (ns)= not a significant finding.

[a] the construct/theme was analyzed in Paper 1 and therefore not reused for analysis in Paper 2

[b] the subtheme "Give Back" from Paper 3 shares elements of both Attitude ("It helps serve the community") and Moral Norm ("I have a duty")

This dissertation offers the first demonstration of what motivates graduate students to consider NTD. The dissertation hypothesis that the TPB framework would explain graduate students' intentions was supported by the quantitative studies (Papers 1 and 2) and strengthened by the exploratory qualitative interviews (Paper 3), with one exception. Unexpectedly, PBC-CON did not influence participation intentions in the quantitative studies. This dissertation also investigated a comparison of the TPB models between the more familiar and practiced TD (e.g., peer-reviewed publications) and the less familiar NTD. This comparison is a unique addition to the literature and a number of salient findings were observed from this comparison. First, results reported in Paper 1 revealed that PBC-SE and moral norm are predictive of NTD but not TD intentions. Second, past experience and future career dissemination intentions were more strongly predictive of NTD graduate school intention compared to TD. Third, findings reported in Paper 2 indicate that beliefs about making a difference (attitude), that one's supervisor expects participation (subjective norm), and that fellow graduate students participate (descriptive norm), were beliefs that only related to NTD intentions and not to TD. These findings provide insight that can be valuable in identifying what is unique about NTD compared to TD, and thus, can be used to guide interventions to target this distinctiveness.

Furthermore, the mixed-method design of the present research allowed for observation across different analytic approaches. In particular, findings reported in Paper 3 (qualitative interviews) provided further support for the quantitative results. Consistent with results reported in Paper 1 and 2, qualitative interviews revealed that graduate students endorsed the following: favorable attitudes toward the personal benefits and

moral obligations of NTD (e.g., feeling gratification about making a difference), low self-efficacy as a barrier to participation, and the importance of the role of the supervisor and the dissemination practices of others around them as significant contributors to their decision process. However, findings from the qualitative study that were less obvious from the quantitative findings were the following: that an unfavorable attitude exists toward NTD's relevance in the academic professional domain (e.g., no formal credit for participation), and the hindrance created by perceived control variables (such as time and opportunity). In order to further understand and consolidate findings from these three studies, the overriding themes are elaborated upon below.

6.2 ATTITUDE

The dissertation findings indicate that attitude makes a significant contribution to NTD intentions (Paper 1). More specifically, the more positive the attitude toward NTD the more likely graduate students are to endorse intention to participate. Mean scores of the global construct of attitude revealed similarly favorable ratings for both TD and NTD. Further analysis of attitude beliefs (Papers 2 and 3) suggest the favorable evaluation of NTD's benefits are related to the perception that these activities can make a difference, improve the accessibility and impact of the research, and ultimately be more gratifying than TD activities. In fact, 84% of the graduate student sample agreed that their participation in NTD could help make a 'real-world' difference in their area of study (Paper 2). The qualitative interviews were equally compelling with strong statements about how NTD taps into students' original purpose and meaning for scientific inquiry, that is, to make a difference. The interview findings also suggested that the meaningfulness attributed to NTD was affectively oriented (e.g., "I *want* to contribute",

"it would be *fun*"). This is in accordance with evidence from past research that there are two key belief types that underlie attitudes, those that pertain to affective (feelings) and instrumental (achieving an outcome) consequences (see Conner, Godin, Sheeran, & Germain, 2013; Ajzen & Fishbein, 2005).

The qualitative interviews suggested that in addition to the affectively oriented attitude, another attitude theme surrounded the meaning attributed to NTD's role in the professional/academic domain. Most perceived NTD to be more of an extracurricular activity in graduate school; an activity that would not help advance academic standing or career attainment thus lending to an unfavorable instrumental attitude. Not surprisingly, quantitative analysis confirmed that most believed they would not receive program recognition or credit for NTD activities, and rated this significantly less likely than recognition for TD activities. Notably, however, neither recognition nor academic credit predicted intention, suggesting the instrumental attitude type may be less powerful in its influence. In fact, a number of previous studies have demonstrated affective attitudes to be stronger predictors of intentions and action than instrumental (e.g., Lawton, Conner, & McEachan, 2009).

Somewhat inconsistent with the aforementioned perspective and with this notion that instrumental attitude is less influential, was the finding related to the behavioural belief "NTD would help me achieve my desired career". This belief significantly predicted intention (Paper 2). That is, graduate students who held the belief that NTD would help with career attainment were more likely to consider participating and vice versa. This is notable given that a more pessimistic or indifferent sentiment was observed in the interviews; that NTD would not/did not help (or they had not thought about it).

Further exploration of the belief reported in Paper 2 reveals that approximately 50% were not enthusiastic (reported a score of 3 or below on a scale of 1-7) about the benefits of NTD on career achievement and rated it significantly lower than TD's influence on career. Indeed, this less than enthusiastic attitude is in line with the reality of KT participation on career achievement. Jensen et al. (2011) found that public engagement activities, like NTD, have a predominantly neutral impact on career advancement for researchers. Together, the current results suggest that the benefit of NTD for desired career attainment is not a pervasively held belief but is valuable in intention formation. Given that graduate school is a means to an end (i.e., a career) it seems logical that students would be motivated by instrumental attitudes specifically directed at career attainment. Future studies would benefit from uncovering if the type of intended career (e.g., practitioner vs. researcher) moderates the belief (NTD being beneficial to career attainment) to intention relationship.

Given that belief and interview analysis generated both affective and instrumental attitudes, it is not clear why statistical analysis (specifically factor analysis) did not validate a multicomponent attitude construct (as reported in Paper 1), despite efforts to include survey items addressing both types. One hypothesis is that, if affectively oriented attitudes are more salient, respondents may have interpreted attitude survey questions to reflect the personal meaning theme (e.g., make a difference). For example, how one responds to the question 'for me to participate would be harmful/beneficial' could be dependent on whether one is considering it beneficial from a personal perspective (i.e., will make me feel good about making a difference) or professional (i.e., will benefit me

in my academic pursuits). Thus it is possible survey questions did not adequately assess professional attitudes.

6.3 SUBJECTIVE NORM

Subjective norm is the perceived social pressure (injunctive norm) and behaviors (descriptive norm) of important others. As reported in Paper 1, subjective norm (which was only assessed as an injunctive norm for Paper 1) was found to significantly predict NTD intentions. In fact, of the TPB variables, subjective norm had the strongest contribution to intentions. Not surprisingly though, graduate students rated the perceived social pressure to perform NTD as significantly lower than TD. In fact, only 7% of respondents endorsed feeling strong social pressure and expectations to participate in NTD, compared to 64% for TD. This suggests that few graduate students experience social pressure to participate in NTD activities, but nonetheless are highly influenced by these social expectations when they are in effect. These findings were corroborated by the belief analysis (Paper 2) and qualitative interviews (Paper 3). For both studies, the most influential injunctive norm referent individual was the research supervisor. In the qualitative interviews, participants expressed NTD intentions that were consistent with their supervisors' expectations and wishes. Interestingly, however, the supervisors' NTD actions (descriptive norm) were not found to predict intentions (Paper 2). The interview findings offer a possible explanation. According to student comments, supervisor behaviour was not always volitional (e.g., required for funding) and thus not necessarily perceived by the student as a reflection of whether or not a supervisor values NTD activities. Taken together, this would suggest that graduate students aim to comply with a

supervisor's NTD expectations, especially if the behaviour is perceived to be valued by the supervisor.

Supervisors were not the only referent group to influence intentions, however. The descriptive norm, but not the injunctive norm, of fellow graduate students was also important to intention (Paper 2). Notably, among the assessed NTD beliefs, the descriptive norm of fellow graduate students was one of the lowest rated beliefs (M=3.37) and was significantly lower than descriptive norm beliefs of TD (M=6.20), suggesting that a minority believe their fellow graduate students participate in NTD. The interviews (Paper 3) further revealed that this fellow graduate student referent group can be confined to as small a group as one's research lab or sub-discipline within a department. For example, a clinical psychology graduate student may only consider the actions of fellow graduate students within the clinical psychology program and not the associated experimental or applied psychology programs in their department. It is perhaps this very specific and subscribed referent group (i.e., you are either a clinical graduate student or you are not) that steers students to strongly identify as a member of the group. This suggestion is further strengthened by past research that demonstrates the enhanced influence of subjective norm (both injunctive and descriptive) on behavioural decisions-making when a strong identification with a group is reported (Terry & Hogg, 1996). Furthermore, in a study of researchers' intention to participate in public engagement in science activities (Poliakoff & Webb, 2007), descriptive norm, but not the injunctive norm of academic colleagues was also predictive of intentions. As the authors point out, it seems that what 'similar' others actually do is more important than what they think. Yet when considering a supervisory or mentorship role, the reverse is true; what supervisors

are perceived to think about NTD is more important than what they do. To speculate, the perception of what 'similar' others do provides a cultural norm for what might be achievable and expected of graduate students; while, what supervisors expect sets the foundation for the anticipated research activities. Although investigation of the supervisor-graduate student dynamic is scarce, most emphasize the significant impact that research supervisors have on a student's research program (Heath, 2002; Mainhard, van, van Tartwijk, & Wubbels, 2009).

6.4 PERCEIVED BEHAVIOURAL CONTROL

Perceived Behavioral Control (PBC) is meant to represent the extent to which graduate students believe NTD participation is under their control. Analysis confirmed the construct to be multicomponent, reflecting a self-efficacy component (whether one believes one has the necessary abilities to perform the behavior) and a controllability component (whether resources and opportunities are within one's means to successfully perform the behaviour). This is consistent with Ajzen's (2006) recommendations for measuring PBC. In line with the TPB, it was expected that both components would predict NTD intentions; however, only PBC-SE demonstrated predictive value (Paper 1). Similarly, as reported in Paper 2, the majority of specific beliefs reflecting PBC-CON (such academic credit, time or cost) also did not emerge as having influence on NTD intention. Notably, one exception was the belief that one's research was (or was not) suitable for NTD. In other words, if graduate students believed their research to be suitable, they were more likely to engage in NTD, and vice versa. Participants in the Elicitation Study (Chapter 2) identified this 'lack of research suitability' to be an impediment to performance, reflecting a perceived behaviour control concern. However,

further inspection of this belief might suggest it corresponds better with an attitude (an evaluation of the outcome to performing the behaviour) than a perceived behavioural control. That is, perhaps beliefs about research suitability imply concerns about how NTD would be received by others if the research is unsuitable. Indeed, the belief had a stronger significant correlation with the attitude construct (r=.33, $p < .01$) compared to PBC-CON ($r = .18$, $p < .01$).

This still begs the question of why PBC-CON and corresponding beliefs did not influence intention. This is especially surprising considering the results from the interviews (Paper 3) suggest controllability (especially lack of time and opportunity) was a dominant concern impeding intention. Two possibilities are suggested here. One, that PBC-CON does not, in fact, influence graduate student intentions of NTD; and two, that there were methodological flaws in the design and measurement of PBC-CON. To the former point, Poliakoff and Webb (2007) also found the unexpected results that environmental constraints (time and money) did not influence researchers' public engagement intentions. They proposed that these constraints may play more of a role in actualizing the target behaviour instead of intention formation. This is a reasonable proposition given that NTD is a relatively unfamiliar behaviour, with the majority of the sample not having previous experience participating in NTD. Thus, it is possible that when presented with the hypothetical scenario of deciding whether or not to participate, accessibility of beliefs about what resources would be needed to perform the behaviour were not as dominant compared to feelings of self-efficacy (e.g., "I don't know how to do it") and the more current perceptions of what others are expecting and doing now (i.e., subjective norm, "my supervisor wants me to do it"). In support of this assertion, Breslin

et al. (2001) found that PBC-CON did not predict clinicians' intentions to adopt a new intervention but did impact clinician behaviour.

To address the latter point of measurement error, the first challenge presented when the internal reliability of the PBC-CON construct demonstrated less than acceptable scores; consequently, one of the two items was chosen to represent controllability (i.e., "the decision to participate would be entirely up to me"). This one item was weakly correlated to NTD intention, with similar negligible correlations with the other TPB variables measured. It is possible that this item did not adequately assess controllability. Similarly, the specific belief related to time constraints was also not correlated with PBC-CON (or any other TPB variable) as you might expect, suggesting one or both items were not evaluating the intended construct adequately (see Appendix C for an illustration of the regression coefficients for beliefs and corresponding TPB construct). Further inspection of the 'time constraint' item reveals that the wording 'it would take a lot of my time" might not be addressing the same concept as was communicated by participants in the interviews (Paper 3). The interview findings suggested that graduate students felt NTD would take time away from other program requirements, such as TD. However, the survey item appears to be asking if NTD takes a lot of time to do, which in fact may have very little to do with how it impacts other work. A more meaningful question about time might have read, "NTD will take time away from higher priority program-related work". The interviews also revealed that lack of opportunity was another dominant control barrier (along with time). Unfortunately, this was not assessed in the quantitative studies as it did not emerge as a salient belief in the pilot Elicitation Study. Despite findings from the interviews that identified perceived behavioural control barriers as a prevailing

deterrent, the qualitative approach is unable assess which of the communicated determinants of NTD are most important to motivation. Therefore, it is difficult to establish whether PBC-CON was poorly constructed, or indeed, not a motivator to NTD participation. As Ajzen (2014) maintains, future research would benefit from generating additional items to measure PBC, with the aim of improving the reliability and predictive validity of this construct.

Notably, PBC-SE (self-efficacy) was a significant predictor of NTD and not TD. In interviews (Paper 3), it was also highlighted as influential, particularly as a deterrent when self-efficacy was low. These consistent findings suggest that graduate students are less likely to participate if they are not confident with their ability to perform NTD. It has also been found that researchers who have previously participated in KT activities and, interestingly, researchers who teach, are more likely to endorse having the necessary skills and confidence to perform KT (Wellcome Trust, 2000). It is likely that teaching offers experience with skills deemed necessary for KT activities. Further studies could evaluate whether teaching experience similarly improves NTD self-efficacy among graduate students, as this increase in self-efficacy would be expected to bolster intentions according to results from this dissertation.

6.5 AUGMENTED TPB

6.5.1 Moral Norm

Godin, Conner, and Sheeran (2005) refer to moral norm as an expression of the core self, an individual's personal standards of conduct. They highlight that internalized notions of right and wrong can impact behaviour. In the current dissertation, this perception of moral duty was found to be influential in forming intentions to participate

in NTD. Findings reported in Paper 1 revealed that, when included with TPB variables, moral norm significantly predicted NTD intention. Further investigation indicated that moral norm added an additional 2.8% of the variance in intention after controlling for TPB predictors. This finding is consistent with results from Conner and Armitage (1998) who reported that moral norm predicted an additional 4% across the reviewed studies. It also aligns with past studies exploring a range of behaviours (see Manstead, 2000) that support a role for moral norm as a predictor of intention and behaviour (Godin, Conner, & Sheeran, 2005) when TPB variables (attitude, subjective norm and perceived behavioural control) have been taken into account.

Notably, as reported in Paper 1, moral norm was predictive of NTD intentions but not with TD intentions. Godin et al. (2005) offered evidence that the behaviour has to be considered to have moral relevance in order for moral norm to influence decision enactment. Thus, the Paper 1 results might suggest that graduate students do not perceive TD to have the same moral imperative compared to NTD. How an action is deemed to have moral relevance is less clear, however. Godin et al. (2005) contend that, based on philosophical and empirical studies of moral norm, that "moral norms will be stronger the more the action is thought to reflect individuals' liberty and uniqueness (autonomy), the more the action promotes the wellbeing of others and avoids hurt, harm or distress to others (beneficence and nonmaleficence), and the more the action promotes equal or fair distribution of resources (justice)" (p.501). Certainly, graduate students are not alone in their sentiments that NTD has moral relevance, others (e.g., Gøtzsche, 2011) point to the moral imperative of taking NTD action.

If NTD is considered to be more morally aligned than the more familiar TD, it is less clear then why Poliakoff and Webb (2007) did not find moral norm to have predictive value in their study of researchers' intentions to participate in public engagement activities. The authors proposed that perhaps perceived moral obligation influenced attitude rather than intention. Indeed, interview results (Paper 3) suggest there could be a shared impact of moral norm and attitude. Graduate students often spoke of their moral responsibility in the context of giving back to those who supported their research work (e.g., to reciprocate tax-payers' or participants' contributions in their research) but also as a desired responsibility to make a civic contribution. For example, in the same breath, one graduate student offered that NTD participation "comes as a professional responsibility" and also "a commitment to see change". Andrews et al. (2005) pointed out that a desire to contribute to society is often a leading motivator for graduate students to engage in science communication. It is difficult to ascertain whether this desire stems from a feeling of moral responsibility (moral norm) or in response to outcome expectations (attitude), such as to make a difference. Thus, it is very possible that moral norm influences attitude formation, but results reported in Paper 1 along with the abovementioned past empirical evidence suggest that moral norm also offers a unique predictive influence, beyond attitude.

6.5.2 Past Behaviour & Career Dissemination Intention

The augmented TPB framework used in this dissertation included past behaviour as a determinant of intention as past research has demonstrated its strong predictive ability with KT intention and behaviour (e.g., Delli Carpini, Cook, & Jacobs, 2004). Additionally, because graduate students are in training to hold a particular career, it was

hypothesized that what graduate students imagined for NTD practices in their career would similarly reflect their NTD intentions for graduate school. In other words, students would be more motivated to participate in activities that will prepare them for their career. The study findings were consistent with the hypothesis that past behaviour and future career intention significantly influence NTD intention. Moreover, the predictive strength of these variables for NTD intentions surpassed their predictive ability of TD intentions. For example, with NTD intentions, after controlling for the TPB variables, past behaviour and career NTD intention, accounted for an additional 7% and 6% of the variance, respectively, compared to 2% and 3% for the TD model. What this could imply, is that for a less familiar activity like NTD, there are fewer models and resources to help change intention, and so there is a heavier reliance on what has been done in the past or what is envisioned for the future. It is also possible that a consistent endorsement of past, present and future intentions reflect a form of self-identity; an identity of someone who does or does not collaborate with community members or participate in knowledge sharing activities. Rise, Sheeran, and Hukkelberg (2010) found that self-identity accounted for unique variance after TPB variables were controlled. They suggested that, "individuals conform to attitudes for instrumental reasons and to norms for fear of being rejected by significant others (i.e., external sanctions), whereas one acts in accordance with one's self-identity for self-verification reasons…to be consistent with their identity standards" (p.1088). Self-identity can be said to be connected to past behaviour in that people make inferences about what kind of person they are based on their past experience (Bem, 1972). It is possible that the standards enmeshed with self-identity are then reflected to a future view of oneself (e.g., to career intentions).

Past behaviour and career intentions were not formally evaluated in qualitative investigations of this dissertation (Paper 3), and unfortunately did not emerge spontaneously in the interview discussion. Further clarity on the mechanism of action related to these variables could be beneficial. Although past behaviour and future career intentions do not offer explanatory value to intention formation, they nevertheless provide insight into who is more likely to consider and ultimately take part in NTD activities. Interventions to promote NTD might encourage NTD participation early in the graduate training process in order to develop NTD skill and, in turn, foster self-identities of being a participant. Interventions might also benefit from showcasing how NTD can be incorporated into various intended careers so that graduate students can become familiar with the methodological possibilities and rationale for career participation.

6.6 PRACTICAL IMPLICATIONS

The results of these studies have important implications for institutions and agencies that support graduate student training and want to provide interventions designed to increase interest in NTD. Though the TPB was not originally designed to be a theory of behaviour change, Ajzen (2011) proposed that the theory can help identify the beliefs that have to be modified in order to produce change in intentions. To the extent that there is success in changing these salient beliefs, there should be corresponding changes in intentions. Ajzen (2015) highlighted that large changes in beliefs would have to be produced in order to observe an appreciable effect on intention; and for favorable intentions to be enacted, the requisite resources need to be available and potential barriers must be removed. In a meta-analysis (Webb & Sheeran, 2006) investigating the effectiveness of interventions to change intention and behaviour success was determined

by the following: the intervention being based on TPB or protection motivation theory (Rogers, 1983), the use of social encouragement and incentives for remaining in the program, and the program being delivered by a credible source perceived to have expertise.

So how do we create an environment that supports and encourages NTD? Results from this dissertation suggest that a focus on the following might be particularly helpful: a) moral responsibility and civic contribution, b) skill-based training and opportunities for early experience to build self-efficacy, c) supervisory mentorship, and d) messages to increase awareness of fellow graduate students' participation in NTD. By contrast, focusing on structuring a program in order to provide academic credit for NTD activities may result in limited change, at least as it pertains to early intention formation. As well, because a large percentage of graduate students already hold favorable attitudes towards NTD's ability to make a difference, interventions focusing on this belief are likely to see minimal improvement. Ajzen (2015) argued that in order to decide where the intervention should put its major emphasis, an intervention should determine whether the problem is primarily a lack of motivation or a reflection of perceived difficulty in carrying out the intention. Although the low NTD self-efficacy suggests a probable barrier in carrying out the intention, the current study results demonstrate predominantly low motivation to disseminate as it pertains to subjective norm, descriptive norm, and intention itself.

It should be noted that the abovementioned constructs and beliefs were found to influence intention, but how intention will transform to enacted behaviour is less linear and can be affected by a number of events occurring between intention assessment and observation behaviour. Not surprisingly, the beliefs that are accessible in the real

situation can differ from the beliefs that are accessible in the hypothetical (intention) situation (Ajzen, 2012). For example, subjective norm was found in the current study to be a strong predictor of intention. However, normatively controlled intentions tend to have an inferior influence on actual behaviour compared to attitude or moral norm (Sheeran, Abraham, & Orbell, 1999). Godin et al. (2005) suggest that because injunctive norm is derived from social pressure, it has less impact on effort and persistence, compared to attitudinally and morally aligned intentions that derive from an expression of oneself that is inherently more motivating.

With this emphasis on moral norm and its association with behavioural follow-through, and given that just less than 50% reported strong moral duty to participate in NTD, interventions could benefit from strengthening the already felt obligation to act, and improve on those that do not already hold the belief. For example, to improve moral considerations, interventions could highlight others' needs (e.g., patients receiving contra-indicated health care) and increase the understanding that adoption of the target behaviour could relieve others' needs (e.g., make research knowledge more accessible to target audiences). Webb and Sheeran (2006) also recommend forming implementation intentions, that is, the if-then plans that specify when, where, and how to act on positive intentions, in order to help individuals realize their intentions into action.

Some existing programs have been implemented in order to strengthen researcher KT skill capacity and help overcome barriers of scientist-clinician collaboration. For example, Bloom and Tam (2015) described a program offering graduate students experience in conducting scoping reviews for clinicians. Scoping reviews are an annotated compendium of existing empirical literature on a topic requested by the

clinician. According to the program, training with scoping reviews is meant to support secondary research skills (related to evidence based practice) and encourage community-university partnerships. Another example described by Tasca, Grenon, Fortin-Langelier, and Chyurlia (2014), are programs that establish practice networks where "community-based clinical practitioners actively collaborate with researchers to define research questions, design research protocols, and implement studies" (p.201). Other efforts have created resources to guide researchers in the KT process. As an example, Barwick's (2008, 2013) Knowledge Translation Planning Template, encourages early identification of project partnerships and roles along with who the knowledge users will be, in order to clarify the KT strategies, goals, budget and resources necessary. Lastly, some contend that program focus should not be solely on the individual scientist in order to inspire change, but rather institutional responsibilities, such as: including KT activities in quality of research assessments and funding distribution (Palmer & Schibeci, 2014), offering expert facilitators and communicators to assist researchers in the KT process (Zorn, Roper, Weaver, & Rigby, 2012), imposing institutional penalties when institutions fail to deliver (People, Science and Policy, 2009), and demonstrating that KT is valued by funding agencies that support researchers and those who make decisions about researcher career advancement (Besley, 2013).

6.7 STUDY LIMITATIONS

The current study has a number of strengths. These include the use of a mixed-method approach, the use of a large national sample of graduate students in various health-related fields, and the application of a theoretical model to the investigation. However, these strengths need to be balanced against the limitations of this study. First,

there are limitations around demographic variables. Minimal demographic information was collected in order to maintain anonymity, so aside from age and gender, it is unknown if the results are generalizable. Also, both the survey and interviews had an over-representation of females as participants, prohibiting analysis of gender differences, and lending to the possibility that the results are gender-biased. For example, gender differences have been observed in KT where, despite similar attitudes toward KT activities, men report participating more frequently (Von Roten, 2011). Gender differences among graduate students were also observed in a TPB study of intentions to pursue an academic career; men had more favorable attitudes, and were more influenced by subjective norm and self-efficacy than women (Evers & Sieverding, 2015). Furthermore, given the diversity of academic disciplines represented in this dissertation, it could have been valuable to investigate the role of disciplinary field in dissemination intentions; however, these were collected in an open-ended format rendering a synthesis of disciplinary field as challenging and possibly subjective. Though preliminary evidence suggests that disciplinary field is only weakly related to KT activities among researchers (Besley, 2013), further studies are warranted.

Second, the cross-sectional design of the studies in this dissertation prohibits claims of a causal relationship among the TPB predictor variables and intention. In fact, the direction of influence could be reversed or bi-directional, for example, with high intentions impacting favorable attitudes; though it should be noted that this would be inconsistent with the theoretical explanation for the model. Longitudinal and experimental studies, incorporating a theoretically guided investigation, would help elucidate the directional uncertainty (Davies et al., 2010). The cross-sectional design also

did not allow for an assessment of actual NTD behaviour that could further validate the impact of the TPB constructs. While intention has been found to be a valid proxy for actual behaviour and is often considered a necessary predictor of subsequent behaviour (Eccles et al., 2006; Godin, Bélanger-Gravel, Eccles, & Grimshaw, 2008), it nevertheless is not sufficient in accurately predicting behaviour. In particular, there is limited understanding for the 'inclined abstainers', individuals who form an intention and subsequently fail to act (Ajzen, 2015; Sniehotta, Presseau, & Araújo-Soares, 2014). It has been acknowledged that PBC offers moderating strength in bolstering the intention-behaviour relationship (e.g., Armitage & Conner, 2001; Trafimow, Sheeran, Conner, & Finlay, 2002), but still, large changes in intention are necessary to produce moderate changes in behaviour (Webb & Sheeran, 2006). Although the current dissertation cannot predict or answer the question about whether graduate students will follow-through on their intentions, Webb and Sheeran highlight that intentions are likely to be more influential with behaviours that are performed infrequently and are less amenable to habit formation (i.e., situational circumstances of performance, such as time and place, are liable to change), such as NTD. Nonetheless, future studies of actual NTD behaviour would be valuable.

Related to the intention-behaviour gap, the TPB has been criticized for its focus on cognitions and its exclusion of unconscious, external, and organization influences on behaviour (Sheeran, Gollwitzer & Bargh, 2013). Though it is clear that the TPB falls short of capturing every influence on behaviour, it does provide evidence that the identified beliefs and constructs play a predominant enough role to guide behavioural decisions. Ajzen (2015) contends that the TPB makes no assumptions that the identified

beliefs are consistent with reality, and that, regardless of their veracity, beliefs and perceptions about one's environment have a strong impact on behaviour. In line with Ajzen's assertions, this dissertation did not evaluate the accuracy of participants' perceptions (e.g. how much a supervisor participates in NTD) and instead took the approach that participants' beliefs provide insight into how context could or should be modified (i.e. using beliefs to modify organizational policies, program structures, or training resources to influence behaviour change). However, it could be of value to further explore how external context (e.g. training opportunities, a program's KT culture) impacts participants' NTD intentions in addition to their perceptions. It should also be noted that, with the intention-behaviour gap in mind, more recent efforts have been directed at designing an integrative framework to systematically consider a wide range of theoretical approaches to intervention aimed at effectively producing behaviour change. Specifically, the Theoretical Domains Framework (TDF) contains 14 constructs, distilled from related behaviour theories (Cane, O'Connor, & Michie, 2012). The domains that are proposed to have implications for behaviour change and implementation are as follows: 'Knowledge', 'Skills', 'Social/Professional Role and Identity', 'Beliefs about Capabilities', 'Optimism', 'Beliefs about Consequences', 'Reinforcement', 'Intentions', 'Goals', 'Memory, Attention and Decision Processes', 'Environmental Context and Resources', 'Social Influences', 'Emotions', and 'Behavioural Regulation'. The authors contend that the TDF lays the foundation for a theoretically informed intervention by testing a comprehensive coverage of possible influences, and addresses implementation problems by linking theories of behaviour change and techniques of behaviour change. As the framework continues to be refined and tested, it may prove to be a useful

theoretical approach for designing and implementing behaviour change interventions that utilizes the well-established constructs highlighted in the TPB and yet overcomes the intention-to-behaviour disconnect.

Fourth, related to the intention construct, this dissertation examined internal consistency and not test-retest reliability, which should also be assessed in order to determine the stability of the scale over time. Webb and Sheeran (2006) contend that intention stability benefits behaviour change interventions. As might be expected, there is reason to believe that graduate students' intentions to participate in NTD may change over one's academic training as they are exposed to more influences or deterrents. Indeed, the interviews demonstrated that two of the 16 participants had changed their intentions over a four-month period from low to high. One participant speculated that her new high intentions may stem from a recent integration into the community. The other participant indicated "*I didn't have confidence that my study could make a difference politically… and I didn't understand until recently that policy makers are dependent on current evidence in order to inform their choices*". This suggests that within a short period of time (< 4 months) intentions can change dramatically based on exposure to different groups and environments (e.g., community, policy-makers).

Another possibility to the observed intention change is, as described by Wood, Conner, Sandberg, Godin, and Sheeran (2014), that asking questions can change the intention and behaviour. They explain that "asking questions increases the accessibility of attitudes towards the behaviour, which in turn makes it more likely that the person will perform that behaviour" (p.391). Nevertheless, the majority (14 out of 16) of participants in the interviews maintained consistent NTD intentions over a 3-4 month period. Lastly,

the dissertation results relate only to graduate students' motivation to participate in NTD and therefore are not expected to be predictive of currently practicing researchers' intentions. Nor are they expected to explain intentions of other forms of KT, such as integrated collaboration, which involves activities that are woven into the research process from the start (Lomas, 1993). Certainly, to inform interventions aimed at promoting KT, there would be benefit in studying if and how graduate students' intentions and behaviour change over time both within a training program and once they are employed.

6.8 KT CULTURE

It is worth noting that there has been a significant effort to shift the KT landscape over recent years. Funding agencies, university institutions, and private organizations have developed various programs, working groups, and applications in order to address the knowledge to action problem. This evolving landscape has the potential to create a more embracing culture around KT as a form of academic scholarship. For example, KT Canada (http://ktclearinghouse.ca/ktcanada) was developed to generate a network of Canadian KT experts to address common barriers of KT (e.g. to evaluate KT approaches, to develop consensus on KT terminology) as well as provide training programs to engage knowledge users and producers. With this network, KT education is offered to participating universities for both trainees and practicing researchers interested in a KT specialization or simply to advance knowledge through seminars and courses. A KT Program at SickKids Hospital also recognizes the emerging interest in skills based training by offering a two-day Scientist Knowledge Translation Training course intended for health science researchers interested in sharing research knowledge with audiences

beyond the traditional academic community (http://www.sickkids.ca/Learning/AbouttheInstitute/Programs/Knowledge-Translation/).

As well, the SickKids' Knowledge Translation Professional Certificate, which is intended for those with KT experience who desire designation in these specialized skills, highlights that KT is being recognized as valuable and legitimate enough to warrant its own profession. Further continuing education efforts have been observed locally in Nova Scotia with workshop examples like, "An Introduction to Knowledge Translation" (intended for health care providers, administrators, decision-makers, health researchers, and trainees), offered collaboratively through Dalhousie University and Nova Scotia Health Research Foundation (NSHRD), and "End of Grant and Integrated KT Training" offered by a CIHR KT initiative called Maritime SPOR SUPPORT Unit (http://www.spor-maritime-srap.ca/). Moreover, examples of provincial and federal funding opportunities specifically targeting KT practices have become more apparent. For example, the Nova Scotia Health Research Foundation (NSHRF) offers a Knowledge Sharing Support Award that is designed to support "dissemination of completed research that benefits knowledge users and/or decision-makers within the health system" (http://www.nshrf.ca/) and the Canadian Cancer Society provides Knowledge to Action grants that are aimed to address "the gap between what is known from research and what is done with that knowledge in the health care community" (http://www.cancer.ca).

It is also notable that some Canadian institutions are starting to acknowledge translational work as a form of scholarly engagement when considering faculty promotions, as is observed in Dalhousie University's proposed revisions to faculty promotion guidelines in Medicine (http://medicine.dal.ca/for-faculty-staff/faculty-

council/promotion-criteria-revision.html). However, despite a small minority of university institutions beginning to recognize alternative scholarly efforts, the majority continue to primarily reward faculty for peer reviewed publications. A network of Canadian universities was created with the goal of changing university policies and practices in order to support an academic culture of community engaged scholarship. This partnership reports that the "incentives and supports needed for faculty to engage in this way are not in place across the campus… and has not kept pace with changing faculty roles" (http://engagedscholarship.ca/). Together, these observations suggest that that further progress on the favorably evolving KT landscape is promising and needed.

6.9 CONCLUDING REMARKS

In summary, the complement of studies and early pilot work presented here provide evidence that graduate students have lower intentions to participate in NTD (compared to TD) and that the TPB is a reasonable framework for explaining what correlates influence NTD intention. In particular, consideration of the findings across the three studies points to four principal observations. First, most graduate students have a favorable attitude towards the benefits of NTD as a means to contribute and make a difference with their work. Second, low self-efficacy, minimal support from the research supervisor, and believing that other graduate students do not do this work, all serve as barriers to favorable intention formations. Third, even though graduate students report feeling a similar moral responsibility to participate in NTD and TD, this moral perception only influenced NTD intentions. Finally, past experience and future career plans related to NTD participation strongly influences intentions to participate during graduate school. Table 6.2 lists some recommendations based on the study findings. In sum, the findings

from these studies offer new insight into modifiable variables that can be integrated into interventions and resources to promote more KT participation early in the scientist training process.

Table 6.2

Recommendations, based on study findings, for institutions and programs supporting graduate students to consider in promoting KT efforts.

Attitude
Personal Meaning • Reinforce the intrinsically rewarding nature of NTD by regularly demonstrating outcomes that have unfolded from student NTD activities • Encourage creativity when developing NTD • Help reinforce the natural inclination for reciprocity by encouraging students to reflect on where research funding originates from
Professional Meaning • Offer/showcase CV templates that require the inclusion of NTD [e.g. post CV templates on university graduate study websites] • Include/recognize NTD on progress evaluations • Showcase how the skills learned through NTD can benefit various career endeavors (i.e., communicating with a team, learning to synthesize knowledge learned).
Social Influences
• Given the influence supervisors' values have on their students, consider encouraging supervisor NTD activities by offering rewards, training, opportunities, time. [e.g. revise faculty promotion criteria to include NTD] • Advise/train supervisors in making their own KT activities more visible to students and in ways to involve students • Graduate students may be influenced by the behaviour of others in their referent group (often limited to their particular program). Be transparent about and highlight the NTD activities achieved by others in one's referent group (such as fellow graduate students, professors/academics, other supervisors in one's program). [e.g. coordinate graduate student conferences that serve to share trainee NTD efforts].
Perceived Behavioural Control
• Offer training and opportunities to feel mastery and accomplishment • When research results are not suitable for direct knowledge transfer, explore other methods of sharing acquired knowledge that could meet users' needs • Establish program-specific approaches to recognize KT participation

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APPENDIX A: BELIEF ITEMS PRODUCED FROM ELICITATION STUDY

Behavioural beliefs *(strongly disagree - strongly agree)*

I believe that participating in *[traditional/non-traditional]* research dissemination during graduate school would....

- increase the impact (i.e., recognition, influence) of my research
- be positively recognized by my graduate program:
- help me to achieve my desired career:
- be an important part of the research process
- help make a real-world difference (to my area of study)
- help me to acquire research funding:

Belief weights (not at all important - extremely important)

- doing work that will increase the impact (i.e., recognition, influence) of my research is:
- doing work that will be positively recognized by my degree program is:
- doing work that will help me achieve my desired career is:
- sharing my research findings is:
- doing work that will help make a difference in my area of study is:
- doing work that will help me to acquire research funding is:

Normative beliefs *(strongly disagree - strongly agree)*

When it comes to participating in *[traditional/non-traditional]* research dissemination during graduate school...

- my primary research supervisor(s) thinks I should
- my graduate program thinks I should

Belief weights (not important – extremely important)

- doing what my supervisor thinks I should do, is:
- doing what my graduate program thinks I should do, is:

Moral Norm beliefs *(strongly disagree - strongly agree)*

- I feel morally obligated to take part (e.g., because taxpayers' money funds research)
- I feel I have a duty as a researcher to take part

Appendix A Continued

Descriptive Norm: beliefs *(untrue - true)*

- Most professionals in my discipline, involved in research, participate in [traditional/non-traditional] research dissemination:
- Most graduate students in my graduate program participate in [traditional/non-traditional] research dissemination:
- My primary research supervisor participates in [traditional/non-traditional] research dissemination:

Belief weights (not important - extremely important)

- ...doing what others in my discipline do, is…
- ...doing what my fellow graduate students do, is...

PBC: control beliefs *(Strongly disagree - Strongly Agree)*

If I participate in *[traditional/non-traditional]* research dissemination during graduate school, even if I really wanted to...

- I would not receive any type of academic recognition for my participation (reverse scored)
- It would take a lot of my time:
- It would be costly ($) to do:
- I would not receive training or mentorship in how to conduct this type of dissemination (reverse scored)
- I would be concerned with the protection of my intellectual property (i.e., others stealing my ideas):
- My research would not be suitable (e.g., generalizable, of interest to others) for this type of dissemination. (reverse scored)

Belief weights (less likely - more likely to participate)

- If I do not receive academic recognition, I am... (reverse scored)
- If financial support is required to participate, I am....
- Without mentorship and training in this area, I am..... (reverse scored)
- If I am concerned about others stealing my ideas, I am...

APPENDIX B: NATIONAL ONLINE SURVEY

MAY-JULY 2012

Thank you for your interest in the study; you are eligible to participate. Please proceed with the survey.

A little bit about you….

1. How old are you?

2. Your gender
   - ○ Female
   - ○ Male
   - ○ Other

3. What degree are you currently enrolled in?
   - ○ Master's degree (e.g. MA/MSc)
   - ○ Master's + PhD combined
   - ○ PhD
   - ○ Other

4. What field are you currently studying (i.e. nursing, psychology, biology)?

5. How many years of graduate level training have you had in total (in the current degree and others)? *[Include the current in progress year as 1 year]*

6. What type of research most closely aligns with your thesis/dissertation research?
   - ○ Biomedical research *(e.g. research at the molecular, cellular, organ and whole body levels, including development of health devices)*
   - ○ Clinical research *(e.g. research on the diagnosis, treatment, and rehabilitation of patients)*
   - ○ Health services research *(e.g. research on the practice and policy of of health professionals and the health care system)*
   - ○ Population health research *(e.g. research on the Canadian population, or of defined sub-populations)*
   - ○ Other (please specify):

7. Are you (or will you be) involved in other research projects besides your thesis/dissertation during your program?
   - ○ Yes
   - ○ No
   - ○ Undecided

8. Please indicate what you anticipate will be the PRIMARY focus in your intended career:
   - ○ Researcher

8. Please indicate what you anticipate will be the PRIMARY focus in your intended career:

- ○ Researcher
- ◉ Practitioner
- ○ Administrator
- ○ Instructor/ Educator
- ○ Clinician-scientist
- ○ Public servant (i.e. working in government)
- ○ Knowledge broker (i.e. intermediary between researchers and evidence users)
- ○ Business
- ○ Other (please specify): [ ]

9. How many years do you estimate it will be before you are employed in your intended career:

	0	1	2	3	4	5	6	7	8	9	10	
currently employed in intended career	○	○	○	○	○	○	○	○	○	○	○	+ years

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A little about your training...

To clarify, here are two terms we will be referring to:

Traditional dissemination = scientific communication (usually peer-reviewed publications & conferences) about research that engages the academic community (i.e. researchers, professors, etc.)

Non-traditional dissemination = any communication about research that engages audiences outside of academia (i.e. clinicians, patients, the public, policy-makers, etc.). Specific examples are: workshops for clinicians on the research evidence behind managing a particular condition, educational talks for the public, patient education material, newsletter articles, interviews with the media, etc.

10. In what geographic location is your current graduate program?

- ○ Mountains and the West (British Columbia; Alberta)
- ○ Central Canada (Ontario; Quebec)
- ○ The Prairies (Saskatchewan; Manitoba)
- ○ East Coast (New Brunswick; Prince Edward Island; Nova Scotia; Newfoundland & Labrador)
- ○ Northern Canada (Yukon Territory; Northwest Territories; Nunavut)

11. How research-focused do you consider your program:

	1	2	3	4	5	6	7	8	9	10	
No research focus	○	○	○	○	○	○	○	○	○	○	Extremely research focused

12. As a graduate student, have you participated in (helped in the development or delivery of) the following forms of research dissemination:

	Yes	No
TRADITIONAL (i.e. publication, conference presentations or posters)	○	○
NON-TRADITIONAL (e.g. talks for the public, workshops for clinicians, media articles, etc.)	○	○

13. Approximately how many research dissemination activities have you taken part in (helped in the development or delivery of) during graduate school:

	0	1	2-5	6-10	11-15	16-20	21+
TRADITIONAL *(focused on an academic audience)*	○	○	○	○	○	○	○
NON-TRADITIONAL *(focused on an audience outside of the academic community)*	○	○	○	○	○	○	○

14. On a scale of 1-5, how much training or mentorship have you received in the following forms of research dissemination (during your time as a graduate student):

	None 1	2	*About Right* 3	4	*Far Too Much* 5
TRADITIONAL	○	○	○	○	○
NON-TRADITIONAL	○	○	○	○	○

15. What **grade** would you give yourself in your knowledge of (e.g. delivering/producing/familiarity with, etc.) the following forms of research dissemination:

	A+	A	B	C	D	F
TRADITIONAL	○	○	○	○	○	○
NON-TRADITIONAL	○	○	○	○	○	○

16. Have you heard of the term "Knowledge Translation" before?

- ○ Yes
- ○ No

Now about your thoughts...

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Survey definition

> *PARTICIPATE* = to assist in the development or delivery of ...[a research dissemination activity]
> (note: for purposes of this survey, being in the audience or on the receiving end of disseminated information does NOT qualify as "participation")

In your CAREER...

17. I **intend** to participate in *[traditional/non-traditional]** research dissemination during my <u>career</u>:

	Strongly Disagree **1**	**2**	**3**	**4**	**5**	**6**	*Strongly Agree* **7**
TRADITIONAL *(e.g. peer-reviewed publications, conference presentations)*	○	○	○	○	○	○	○
NON-TRADITIONAL *(for audiences outside academic community)*	○	○	○	○	○	○	○

In GRADUATE SCHOOL...

18.I **intend** to participate in *[traditional/non-traditional]** research dissemination during graduate school:

	Strongly Disagree						*Strongly Agree*
	1	**2**	**3**	**4**	**5**	**6**	**7**
TRADITIONAL	○	○	○	○	○	○	○
NON-TRADITIONAL	○	○	○	○	○	○	○

19.I **expect** to participate in *[traditional/non-traditional]** research dissemination during graduate school:

	Strongly Disagree						*Strongly Agree*
	1	**2**	**3**	**4**	**5**	**6**	**7**
TRADITIONAL	○	○	○	○	○	○	○
NON-TRADITIONAL	○	○	○	○	○	○	○

20.I **want to** participate in *[traditional/non-traditional]** research dissemination during graduate school:

	Strongly Disagree						*Strongly Agree*
	1	**2**	**3**	**4**	**5**	**6**	**7**
TRADITIONAL	○	○	○	○	○	○	○
NON-TRADITIONAL	○	○	○	○	○	○	○

21.I **will try** to participate in *[traditional/non-traditional]** research dissemination during graduate school:

	Strongly Disagree						*Strongly Agree*
	1	**2**	**3**	**4**	**5**	**6**	**7**
TRADITIONAL	○	○	○	○	○	○	○
NON-TRADITIONAL	○	○	○	○	○	○	○

**As a reminder:*
Traditional dissemination = scientific communication (usuallypeer-reviewed publications & conferences) about research that engages the academic community (i.e. researchers, professors, etc.)

Non-traditional dissemination = any communication about research that engages audiences outside of academia (i.e. clinicians, patients, the public,policy-makers, etc.). Specific examples are: workshops for clinicians on the research evidence behind managing a particular condition, educational talks for the public, patient education material, newsletter articles, interviews with the media, etc.

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22.For me to participate in **TRADITIONAL** research dissemination during graduate school would be…
(please answer each row, a-f)

	1	**2**	**3**	**4**	**5**	**6**	**7**	
a) Worthless	○	○	○	○	○	○	○	Useful
b) Good	○	○	○	○	○	○	○	Bad
c) Harmful	○	○	○	○	○	○	○	Beneficial
d) Enjoyable	○	○	○	○	○	○	○	Unenjoyable
e) Dull	○	○	○	○	○	○	○	Interesting
f) Satisfying	○	○	○	○	○	○	○	Unsatisfying

23. For me to participate in **NON-TRADITIONAL** research dissemination during graduate school would be…
(please answer each row, a-f)

	1	2	3	4	5	6	7	
a) Worthless	○	○	○	○	○	○	○	Useful
b) Good	○	○	○	○	○	○	○	Bad
c) Harmful	○	○	○	○	○	○	○	Beneficial
d) Enjoyable	○	○	○	○	○	○	○	Unenjoyable
e) Dull	○	○	○	○	○	○	○	Interesting
f) Satisfying	○	○	○	○	○	○	○	Unsatisfying

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I believe that participating in *[traditional/non-traditional]* research dissemination during graduate school would....

24.....increase the impact (i.e. recognition, influence) of my research:

	Strongly Disagree 1	2	3	4	5	6	*Strongly Agree* 7
TRADITIONAL	○	○	○	○	○	○	○
NON-TRADITIONAL	○	○	○	○	○	○	○

25....be positively recognized by my graduate program:

	Strongly Disagree 1	2	3	4	5	6	*Strongly Agree* 7
TRADITIONAL	○	○	○	○	○	○	○
NON-TRADITIONAL	○	○	○	○	○	○	○

26....help me to achieve my desired career:

	Strongly Disagree 1	2	3	4	5	6	*Strongly Agree* 7
TRADITIONAL	○	○	○	○	○	○	○
NON-TRADITIONAL	○	○	○	○	○	○	○

27....be an important part of the research process:

	Strongly Disagree 1	2	3	4	5	6	*Strongly Agree* 7
TRADITIONAL	○	○	○	○	○	○	○
NON-TRADITIONAL	○	○	○	○	○	○	○

28....help make a real-world difference (to my area of study):

	Strongly Disagree 1	2	3	4	5	6	*Strongly Agree* 7
TRADITIONAL	○	○	○	○	○	○	○
NON-TRADITIONAL	○	○	○	○	○	○	○

29....help me to acquire research funding:

	Strongly Disagree 1	2	3	4	5	6	*Strongly Agree* 7
TRADITIONAL	○	○	○	○	○	○	○

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When it comes to my graduate studies, to me…

30....doing work that will increase the impact (i.e. recognition, influence) of my research is:

	1	2	3	4	5	6	7	
Not at all important	○	○	○	○	○	○	○	Extremely important

31....doing work that will be positively recognized by my degree program is:

	1	2	3	4	5	6	7	
Not at all important	○	○	○	○	○	○	○	Extremely important

32....doing work that will help me achieve my desired career is:

	1	2	3	4	5	6	7	
Not at all important	○	○	○	○	○	○	○	Extremely important

33....sharing my research findings is:

	1	2	3	4	5	6	7	
Not at all important	○	○	○	○	○	○	○	Extremely important

34....doing work that will help make a difference in my area of study is:

	1	2	3	4	5	6	7	
Not at all important	○	○	○	○	○	○	○	Extremely important

35....doing work that will help me to acquire research funding is:

	1	2	3	4	5	6	7	
Not at all important	○	○	○	○	○	○	○	Extremely important

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When it comes to participating in *[traditional/non-traditional]* research dissemination during graduate school...

36....I believe it is expected of me:

	Strongly Disagree						*Strongly Agree*	
	1	**2**	**3**	**4**	**5**	**6**	**7**	
TRADITIONAL	○	○	○	○	○	○	○	
NON-TRADITIONAL	○	○	○	○	○	○	○	

37....I believe most people whose opinions I value (personally or professionally) think I should:

	Strongly Disagree						*Strongly Agree*	
	1	**2**	**3**	**4**	**5**	**6**	**7**	
TRADITIONAL	○	○	○	○	○	○	○	
NON-TRADITIONAL	○	○	○	○	○	○	○	

38....I feel under social pressure to do so:

	Strongly Disagree						*Strongly Agree*	
	1	**2**	**3**	**4**	**5**	**6**	**7**	
TRADITIONAL	○	○	○	○	○	○	○	
NON-TRADITIONAL	○	○	○	○	○	○	○	

39....I feel morally obligated to take part (e.g. because taxpayers' money funds research):

	Strongly Disagree	*Strongly Agree*

40....I feel I have a duty as a researcher to take part:

	Strongly Disagree 1	2	3	4	5	6	*Strongly Agree* 7
TRADITIONAL	○	○	○	○	○	○	○
NON-TRADITIONAL	○	○	○	○	○	○	○

41....I believe my primary research supervisor(s) thinks I should:

	Strongly Disagree 1	2	3	4	5	6	*Strongly Agree* 7
TRADITIONAL	○	○	○	○	○	○	○
NON-TRADITIONAL	○	○	○	○	○	○	○

42....I believe my graduate program thinks I should:

	Strongly Disagree 1	2	3	4	5	6	*Strongly Agree* 7
TRADITIONAL	○	○	○	○	○	○	○
NON-TRADITIONAL	○	○	○	○	○	○	○

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What others do….

43.My primary research supervisor participates in *[traditional/non-traditional]* research dissemination:

	Untrue 1	2	3	4	5	6	*True* 7
TRADITIONAL	○	○	○	○	○	○	○
NON-TRADITIONAL	○	○	○	○	○	○	○

44.Most professionals in my discipline, involved in research, participate in *[traditional/non-traditional]* research dissemination:

	Untrue 1	2	3	4	5	6	*True* 7
TRADITIONAL	○	○	○	○	○	○	○
NON-TRADITIONAL	○	○	○	○	○	○	○

45.Most graduate students in my graduate program participate in *[traditional/non-traditional]* research dissemination:

	Untrue 1	2	3	4	5	6	*True* 7
TRADITIONAL	○	○	○	○	○	○	○
NON-TRADITIONAL	○	○	○	○	○	○	○

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If I am being completely honest with myself, I believe that when it comes to participating in research dissemination (of any form)...

46....doing what my supervisor thinks I should (or should not) do, is.....

	1	2	3	4	5	6	7	
Not important	○	○	○	○	○	○	○	Extremely important

47....doing what my graduate program thinks I should (or should not) do, is...

	1	2	3	4	5	6	7	
Not important	○	○	○	○	○	○	○	Extremely important

48....doing what my fellow graduate students do, is...

	1	2	3	4	5	6	7	
Not important	○	○	○	○	○	○	○	Extremely important

49....doing what others in my discipline do, is…

	1	2	3	4	5	6	7	
Not important	○	○	○	○	○	○	○	Extremely important

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If I wanted to participate in *[traditional/non-traditional]* research dissemination during graduate school...

50.I am confident that I could participate:

	Strongly Disagree						*Strongly Agree*
	1	**2**	**3**	**4**	**5**	**6**	**7**
TRADITIONAL	○	○	○	○	○	○	○
NON-TRADITIONAL	○	○	○	○	○	○	○

51.It would be easy for me to participate:

	Strongly Disagree						*Strongly Agree*
	1	**2**	**3**	**4**	**5**	**6**	**7**
TRADITIONAL	○	○	○	○	○	○	○
NON-TRADITIONAL	○	○	○	○	○	○	○

52.The decision to participate would be beyond my control:

	Strongly Disagree						*Strongly Agree*
	1	**2**	**3**	**4**	**5**	**6**	**7**
TRADITIONAL	○	○	○	○	○	○	○
NON-TRADITIONAL	○	○	○	○	○	○	○

53.The decision to participate would be entirely up to me:

	Strongly Disagree						*Strongly Agree*
	1	**2**	**3**	**4**	**5**	**6**	**7**
TRADITIONAL	○	○	○	○	○	○	○
NON-TRADITIONAL	○	○	○	○	○	○	○

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If I participate in *[traditional/non-traditional]* research dissemination during graduate school, even if I really wanted to, ...

54.I would not receive any type of academic recognition for my participation:

	Strongly Disagree						*Strongly Agree*
	1	**2**	**3**	**4**	**5**	**6**	**7**
TRADITIONAL	○	○	○	○	○	○	○
NON-TRADITIONAL	○	○	○	○	○	○	○

55.It would take a lot of my time:

	Strongly Disagree 1	2	3	4	5	6	*Strongly Agree* 7
TRADITIONAL							
NON-TRADITIONAL							

56.It would be costly ($) to do:

	Strongly Disagree 1	2	3	4	5	6	*Strongly Agree* 7
TRADITIONAL							
NON-TRADITIONAL							

57.I would not receive training or mentorship in how to conduct this type of dissemination:

	Strongly Disagree 1	2	3	4	5	6	*Strongly Agree* 7
TRADITIONAL							
NON-TRADITIONAL							

58.I would be concerned about protection of my intellectual property (i.e. others stealing my ideas):

	Strongly Disagree 1	2	3	4	5	6	*Strongly Agree* 7
TRADITIONAL							
NON-TRADITIONAL							

59.My research would not be suitable (e.g. generalizable, of interest to others) for this type of dissemination:

	Strongly Disagree 1	2	3	4	5	6	*Strongly Agree* 7
TRADITIONAL							
NON-TRADITIONAL							

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With regard to participating in research dissemination (of any form) during graduate school ...

60.If I do not receive academic recognition for my work, I am...

	1	2	3	4	5	6	7	
Less Likely								More Likely ...to participate

61.If financial support is required to participate, I am....

	1	2	3	4	5	6	7	
Less Likely								More Likely ...to participate

62.Without mentorship and training in this area, I am.....

	1	2	3	4	5	6	7	
Less Likely								More Likely ...to participate

63.If I am concerned about others stealing my ideas, I am...

1 2 3 4 5 6 7

APPENDIX C: ILLUSTRATION OF TPB RESULTS

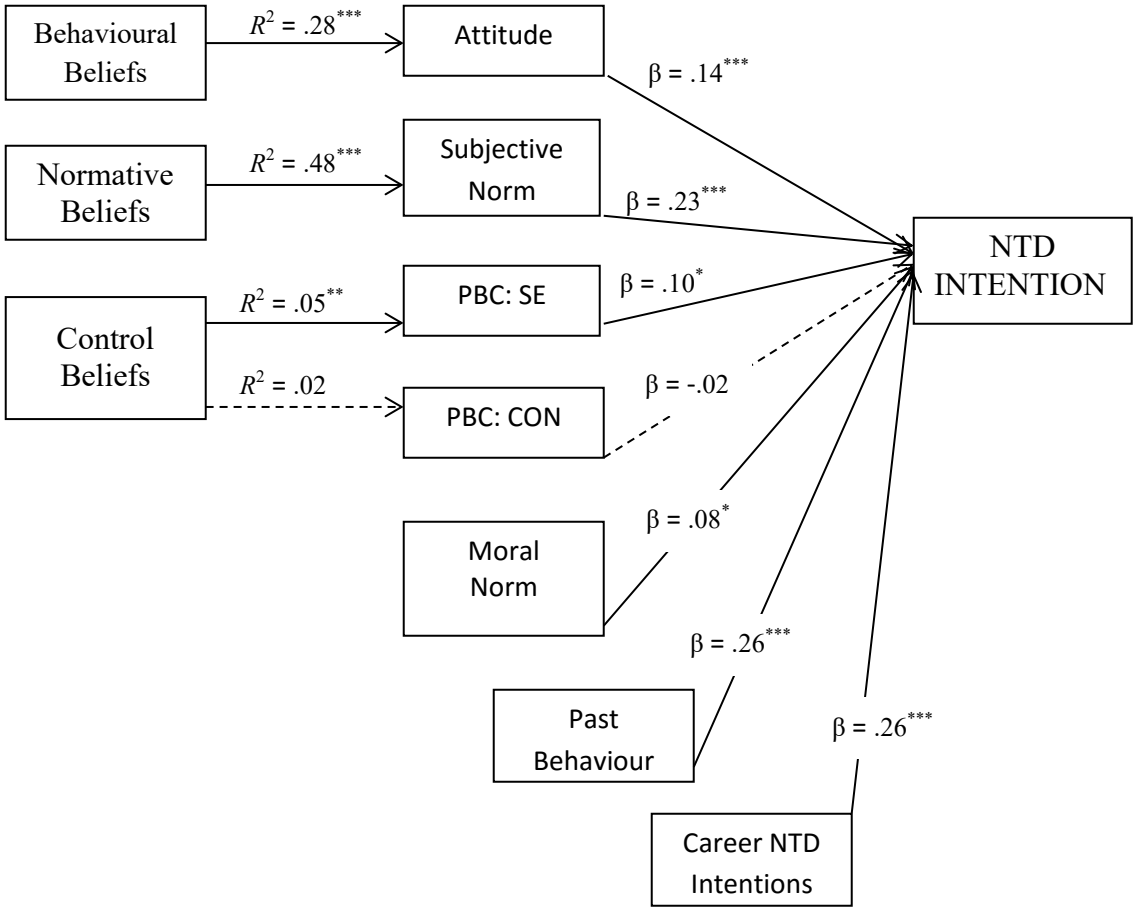

Figure. Summary of the standardized betas of the global constructs and the multiple correlation (R^2) of the accessible beliefs for the theory of planned behaviour hierarchical regression analyses predicting non-traditional dissemination intention (NTD). *$p < .05$. **$p < .01$. ***$p < .001$. PBC, perceived behavioural control.

APPENDIX D: TELEPHONE SEMI-STRUCTURED INTERVIEW

Participant ID: _____

Step 1. Ask to speak to the person who scheduled the interview.
Hi, may I speak to [student's name], please?

Step 2. Introduce yourself.
Hi, this is Nicolle Vincent. As you may recall from our email correspondence, I'm a graduate student at Dalhousie University, working on a project looking at graduate students' perceptions on research dissemination.

Step 3. Introduce the purpose of the call.
As scheduled in the email, this was a good time to conduct the interview for this study. Is this still a good time for you?

☐ **YES** ⇨ Continue to step 4
☐ **NO**⇨ When would be a good time to call back? Date: _____ Time

(If the participant is no longer interested, thank them for their time and end call)

Step 4. Reconfirm Informed Consent.
I received your consent form, thank you. Although you've already consented in the form, I just want to reconfirm three items:

1. *That you are still ok with participating in the telephone interview*
   YES/NO
   (If the participant is no longer interested, thank them for their time and end call)

2. *That you agree to being audio-recorded*
   YES/NO
   (If no, thank the participant for their time, but indicate that the interview cannot proceed without recording and end call)

3. That you agree to the possibility of your responses being quoted – no identifying information will be attached to these quotes.
   YES/NO
   (If no, make a note of this. Continue with interview)

Before we get started with the interview items, do you have any questions?

☐ **YES** ⇨ (Listen to questions and respond if possible.)
☐ **NO** ⇨ Continue to Semi-Structured Interview

Step 5. Semi-Structured Interview
Ok, so now let's move onto the interview. As you know, I'm a psychology graduate student, interested in this topic of research dissemination. I would like to learn more about how other graduate students feel about being involved in research dissemination – that is, sharing research findings with others. I will be asking about both traditional and non-traditional research dissemination.

Traditional- being research communication that engages the scientific community, often involving a peer-reviewed processes.

Non-traditional – being research communication that engages audiences outside the scientific community, like clinicians, patients, policy-makers, and so on. Like delivering workshops, public talks, newsletters, interviews with the media, etc.

Question 1: So first, for purposes of discussion, I'd like to ask you two of the same questions you answered for the online survey.

On a scale of 1-7, with 1 being strongly disagree, and 7 being strongly agree…

1. Do you **intend** to participate in [insert] research dissemination during graduate school?

a)	traditional	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
b)	non-traditional	Strongly disagree	1	2	3	4	5	6	7	Strongly agree

2. Do you **want** to participate in [insert] research dissemination during graduate school?

a)	traditional	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
b)	non-traditional	Strongly disagree	1	2	3	4	5	6	7	Strongly agree

Ok, thank you!

Question 2: So moving forward, could you share with me what kinds of things you were thinking about in answering those questions about your intentions?

Probes:

a) I'm curious, what factors play into your intentions to participate in research dissemination?
   - You rated your intentions for <u>non-traditional</u> dissemination as fairly *[high/low];* can you tell me more about that?

b) *[if there's a difference in "**intention**" &" **want**"]*. When thinking about <u>non-traditional</u> research dissemination, you indicated a [high/low] intention to participate but a [high/low] desire/"want" to participate. Can you tell me more about what your thoughts are on that?

c) I've heard from students some factors that can influence their intentions to participate in <u>non-traditional</u> research dissemination. I'm going to list them and perhaps you can tell me if you think these are true for you?
   - would not help with employability
   - would not have the access or opportunities to arrange it

-
- it's a quick method of sharing knowledge & would reach a wider more diverse audience
- would help with networking and building new contacts for future research
- would benefit my audience (e.g. through professional development, advancing knowledge and awareness, etc.)
- would help me build experience and confidence in communicating research to non-academics
- would help me learn new perspectives from my audience that can improve my research
- would allow me to engage with the potential users of my research and the community I am researching
- would be more satisfying than traditional forms

Question 3: Can you tell me how or if your intentions to participate in research dissemination have changed since you first started your degree?

b) *[if changed]* In your opinion, what factors have contributed to the change?
c) *[if stable]* In your opinion, what factors have helped you maintain those same intentions?

[If a large discrepancy exists between Question 1: intentions above compared to Survey intentions, ask Quest 4]

Question 4 *(if applicable):* I notice that today you indicated your intentions to participate in <u>non-traditional</u> research dissemination to be [low/high] which is different from what you answered on the survey a couple weeks ago – which was [low/high] . Is this a real change in your intentions, and if so, what do you think changed your plans?

Conclusion

Wonderful, thank you! That concludes our interview. Is there anything else you'd like to add?

As a token of appreciation, you are eligible to win 1 of 2 Chapters gift certificates worth $50. Are you interested in being entered into this draw?

Yes/No

[If yes] Which email address can I use? I anticipate that you will hear via email around _[date]__

Perfect! Thank you again for your time.

[end call]