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# An Analysis of the Ecological Theory of Research Participation Applied to a Sample of Young Adult Males

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**ABSTRACT:** Longitudinal research studies are consistently affected by attrition, which can undermine the validity and quality of the study results. Current practice has been to accept and compensate for participants' failure to complete the study, as opposed to making efforts to prevent such drop off prior to the study. The Ecological Theory of Research Participation (ETRP) describes factors within a study that contribute to attrition. Further, the model presents a participant-centered approach, composed of four layers, which provide strategies to incorporate into a study's design as preventative measures against attrition. This model prepares researchers to anticipate the reasons why attrition occurs and to take action to limit it and its effects. In this study the ETRP of previous research conducted by the authors is evaluated in regard to its explanatory efficacy. While promising in its current state, the model can be further developed to produce a more effective method of managing attrition.

**KEYWORDS:** attrition, Ecological Theory of Research Participation, testicular self-examination, behavioral studies

..... *Republication not permitted without written consent of the author.* .....

## INTRODUCTION

Participant enrollment does not guarantee completion of a study; therefore, researchers must be keenly aware of the methodological concerns that attrition introduces to their studies. Reasons for attrition may vary based on the nature of the research study and criteria (inclusion/exclusion) as defined by the principle investigator; however, most, if not all, longitudinal studies using human subjects experience some degree of attrition.

The degree of participant loss depends on multiple factors, including demographic variables, personalities, temperaments, and other personal characteristics. Marcellus (2004) suggests that attrition rates range anywhere from 5% to 70%, with concern typically arising when a rate is 20% or greater. Further, researchers may underreport attrition. Amico (2009) states that less than a quarter of studies provide proper data and description of participant attrition. Marcellus challenges the notion of unavoidable attrition by stating that researchers can take measures to limit attrition. She offers the Ecological Theory of Research Participation (ETRP) with selective sampling methodologies to limit, and possibly avoid, attrition.

This study employs the ETRP through a conducted original longitudinal study on testicular self-examination (TSE) performance. Our goals are to discuss the observed attrition in the TSE study, to examine causal factors, and to describe our attempts to remedy the issue through a retrospective lens of the ETRP. Model effectiveness will be discussed and evaluated. Lastly, recommendations will be given on the application of the ETRP for future behavioral studies using college-age males.

## BACKGROUND

### *Problem Statement*

Longitudinal studies are of significant value in interventional, evaluational, and developmental studies, and are also one of the stronger sources of evidence for suggesting causal relationships (Marcellus, 2004). However, these studies are costly and are particularly vulnerable to attrition. The systematic introduction of bias and error (specifically non-response and refusal bias) into the study poses challenges to its internal, external, and statistical validity (comprehensive validity) (Marcellus, 2004). Such challenges to comprehensive validity arise because of character differences between

participants who drop out of the study and those who do not, which in turn leads to sample bias through the misrepresentation of the targeted population (Marcellus, 2004). Additionally, the possibility of a reduction in statistical weight arises when the sample size experiences significant loss (Marcellus, 2004). Unfortunately, limited attention is given to this topic despite the aforementioned hindrances on the quality of information obtained from longitudinal research.

### *Causes of Attrition*

Ribisl et al. (1996) and Marcellus (2004) recognize participant, researcher, and contextual reasons as primary sources of attrition. In health promotion research, factors under the “participant-related” category (e.g., gender, ethnicity, etc.) are largely responsible for loss to follow up. Vanable et al. (2002) observed that participants who complete a study are typically among the older age range of the targeted demographic than those who do not complete the study. This is attributed to young individuals’ self-perception of their assumed healthiness; therefore, younger people may perceive health concerns as of limited relevance to their lives.

Ethnicity has also been observed as a contributing factor to attrition. Dolinsky, Armstrong, and Ostbye (2012) found non-white/non-Hispanic children were more likely to drop out of a study than white non-Hispanic or Hispanic children. Hui et al. (2013) found similar patterns in their study with oncology patients, although Hispanics were shown to have a higher drop-out rate. Considerations from both studies suggest minority races in general exhibit higher attrition than whites. Reasons behind this remain largely unknown, but socioeconomic and/or cultural value variables may be related.

Additional participant related reasons for attrition include gender and school performance. Mein et al. (2012) examined higher attrition rates among males than females. Further, Fröjd et al. (2011) indicated that lower school performance strongly correlates with attrition, particularly in a study targeting an adolescent population for a mental health cohort. The author noted that a higher GPA resulted in a lower incidence of attrition.

“Researcher-related” attrition refers to a situation in which the primary investigator forms a role that is perceived as paternalistic or “too authoritative,” which creates a barrier between researcher and participant(s) (Gross and Fogg, 2001). Focusing on the researcher’s needs to

obtain data, as opposed to the needs of the participant, can contribute to disengagement from the study. One must take caution not to elicit feelings of inferiority in partakers but instead to incorporate an element of active participation (Marcellus, 2004). Developing a “horizontal” relationship, in which participants feel equal to the researchers, eliminates participants’ perceptions that they are test subjects while also increasing assurance in their significance to the study.

Finally, “contextual reasons” contribute to a study’s attrition rate. According to Barry (2005), collecting data deemed sensitive in nature can result in participants’ refusal to adhere to study requirements such as questionnaires or surveys. Participants may feel uncomfortable disclosing private information, particularly in regard to sexual health. This may lead to tailored answers or complete withdrawal from the study. Moreover, setbacks frequently emerge when face-to-face contact is limited. Methods that decrease participant-researcher interaction result in loss of interest and engagement. Booker et al. (2011) found that face-to-face interviews increase retention rates by 24 percent. The authors of this article suggest this may be because alternative locations and methods of data collection were offered. Therefore, one must consider how the target audience perceives the study itself: it must not be overly taxing for participants, while still carrying out the necessary agenda of the study.

Other contextual reasons focus on time commitment and perceived effort for the participant. While it may be essential for some researchers to meet participants in person, studies that make such interactions too time consuming or demanding may cause participants to become irritated with the perceived rigors of the study. This problem may be amplified if subjects are required to use excessive cognitive ability or time when filling in data, such as in a lengthy questionnaire (Fröjd et al., 2011). If individuals in the study feel they are doing “too much work,” one runs the risk of compromising data from their hasty responses. Additionally, it is imperative that all study materials are developed in such a way that no individual be excluded or at a disadvantage due to his/her cognitive ability.

#### **OBSERVATIONS IN A TESTICULAR SELF-EXAMINATION TEXT STUDY**

We conducted a study to showcase the effectiveness of text messaging promoting TSE among men. Using Steadman and Quine’s (2004) implementation intentions

research on the effectiveness of reminder systems and TSE adherence, as well as Rovito et al.’s (2011) assertion that men prefer private communication (i.e., texting to mobile phone) on TSE promotion rather than public, private messages were used as the reminder system and were designed based on Witte’s (1992) Extended Parallel Process Model. Using Witte’s (1992) model, the text messages were designed to rouse a perception of threat for the receiver while also providing high efficacy in the form of a recommended action to induce danger control as opposed to fear. Further, we hypothesized that the use of text messaging would increase TSE adherence among men. This private, recurring reminder system would encourage men to conduct the procedure according to the recommendation of once-a-month performance, at minimum.

This study was negatively influenced by an attrition rate of 71%. Most participants refused to respond to communication pertaining to the study after initial enrollment and contact verification. We hypothesize that contacts were disregarded. It was also noted that 30 of the original 35 participants in the 18-19 age group dropped out of the study, resulting in an attrition rate of 85% for that age group and 57% of the overall observed attrition. Vanable et al. (2002) found that older participants in a study’s groups generally completed the study, which could explain why our youngest age group experienced the most attrition.

One of our concerns of using a diverse mix of men enrolled in college courses was Fröjd’s (2011) finding suggesting lower GPAs resulted in a higher incidence of attrition. We are unsure what the cohort’s GPAs were and thus unsure of whether they were lower or higher than the mean GPAs of similar universities. If lower, this may contribute to the inflated attrition rate.

#### **ECOLOGICAL THEORY OF RESEARCH**

Marcellus’s (2004) Ecological Theory of Research Participation (ETRP) describes a multi-faceted principle behind individual participation in a study. Four levels exist in this model: participant, researcher, study, and environment (see Figure 1 taken from Marcellus). Marcellus (2004) notes a transactional effect among the levels, suggesting that all levels in the model affect one another. This, in turn, indicates the need to account for all levels of the model, thus resulting in a participant-centered approach to studies. Marcellus further proposes that understanding and applying this model allows

researchers to identify and account for situation-specific barriers for retaining participants. This aids the investigator in developing strategies to address any difficulties that may be encountered within the different layers of the model, thus minimizing attrition.

### APPLICATION OF THE ETRP IN THE TSE TEXT STUDY

#### *Participant*

Strategies associated with the participant level of the model (see Figure 2) include: providing a clear definition of the sampling population; forming a participant advisory group; ensuring convenience of activities; and providing population-appropriate incentives. In the TSE study, participants received a full description of the experiment in the form of a consent agreement. For participants in the intervention arms (three-quarters of the study population), face-to-face confirmation was utilized so that participants understood the agreement and had an opportunity for questions and clarifications. For the true control group, comprising one quarter of the population, this was not possible, although they were given contact information to reach the investigators should they have questions or concerns. While a participant advisory group was not facilitated, adequate contact information was provided to all participants for support. Moreover, convenience and accessibility were at the forefront in the development of study-related activities. The use of text messaging and electronic based surveys was implemented to allow maximum freedom to participants. A lack of funds limited the ability to compensate the population. As demonstrated by the model, funds assist a study by providing incentives to the participants, which keep them interested in the study. Nonetheless, food and a grand prize drawing were offered as incentives to all participants completing the study.

#### *Researcher*

At the researcher level of the model, several strategies address researcher-related reasons for attrition. For example, favorable presentation of the study and discussion of its social usefulness should be provided prior to the initiation of the study. In the TSE study, we implemented an informational session for participants. It included a presentation on the topic through the use of visual aids, a thorough review of the consent form, and the opportunity to address any questions or concerns. As suggested, we established a meaningful network with an agency as a point of communication for participants.

The researchers were responsible for choosing the network, the Institutional Review Board (IRB), which was considered important to participants because of the committee's commitment to ethical principles and the implementation of such behaviors. Multiple contact options were provided and available to participants, with both the research team and the university through the local IRB office. Marcellus (2004) also advises that data collectors be trained prior to the beginning stages of the study. CITI training on proper data collection techniques, as well as trainings on testicular cancer and self-examinations, were utilized as preparatory measures to enhance communication between participants and the research team, and to establish a sense of professionalism, which we theorized would foster trust and compliance among the participants.

Additional strategies for researchers address ways to encourage participants to prioritize the study, to communicate with data collectors, and to complete the study. Participants' bond with the study was encouraged through materials such as pamphlets, which created an identity for the study. In doing so, credibility was established. A significant theme found in the TSE study was communication, particularly between participants and the research team. This was defined as any contact between the participants and team, including e-mails, texts, and phone or in-person conversations. An open line of communication was a priority for meeting participants' needs and assuring participants of their significance. While this was of utmost importance to the researchers, participants did not readily initiate communication on their own. Although a high volume of communication was expected from participants due to the nature of the research design and message delivery system, the result was weaker than expected because communication became increasingly unidirectional as the study progressed. Lastly, the model also endorses expressing gratitude to participants throughout the study. In the TSE study, all opportunities to praise participants for their willingness to contribute were fully taken advantage of through periodic emails and texts during the study, as well as a final "thank you" email.

#### *Study*

Strategies associated with the study include recruitment methods, retention strategies, informed consent procedures, tracking techniques, participant needs, measurement strategies, and equal opportunities to participate. Recruitment methods should be tailored



to the characteristics of the anticipated population. Methods used to recruit male students at UCF for the TSE study consisted of advertisements in appropriate locations, solicitations in public spaces, and arranged enlistments through campus fraternities. However, the challenges remained in employing retention strategies sufficient per the ETRP.

The researchers attempted to sustain a balance between keeping the study convenient for the participants and maintaining participation by insuring the study was not forgotten. Text messages were used to maintain this balance and were utilized to make the study as convenient as possible for participants. As noted previously, an informed consent procedure was implemented during an informational seminar presented to all participants. Realistic expectations of the study were clearly outlined, as the ETRP suggests.

Tracking techniques were not up to standards with the ETRP as only one method of tracking was used in the form of a study ID. This identification number was cross-referenced with all study-related materials received from participants. Problems arose when participants failed to use the correct number, which led to untraceable surveys, and therefore, unusable data.

Participant needs were addressed in the TSE study. For example, text messages and e-mail correspondence safeguarded the participants' privacy and convenience. Seminars were held at the fraternities during prearranged meeting times so members did not face the burden of finding the time to attend. Measurement strategies were tailored to the accessibility of participants with surveys completed either during the seminars or via e-mail, which guaranteed availability to all partakers.

Marcellus (2004) highlights the importance of offering equal opportunity for all eligible candidates to participate in a study. The targeted population of the TSE study was only limited by their ability to receive text messages through a mobile device. Other barriers (perceived and real) were limited because the study was conducted electronically. Further, computers and reliable Internet services were readily available on campus. Therefore, any college male age eighteen to thirty-five without a history of testicular cancer could participate in the study.

### *Environment*

Environment is the last of the four levels in the ETRP. It consists of strategies to assess environmental factors, to strengthen outreach retention methods, and to monitor external influences in relation to the population of interest. The environmental factor addresses transportation needs, which was not an issue in the TSE study, and community perception of research.

The topic of the TSE study is difficult because of the personal and sensitive nature of the subject. External influences are limited in the TSE study because the topic is not one that is readily discussed and is perhaps the reason behind a lack of interest among the study's participants. Had there been a media intensive event drawing attention to the topic, more interest may have developed. For example, if this study had taken place during the time Lance Armstrong, a prominent sports figure, was diagnosed with testicular cancer, more college-aged men would be aware of the research topic (see Trumbo, 2004).

### **RECOMMENDATIONS BASED ON APPLYING THE ECOLOGICAL THEORY**

In the past, attrition has been accounted for through the use of oversampling to anticipate an expected drop-out rate of thirty percent (Ribisl et al, 1996). Statistical methods, such as Intention to Treat Analysis, can recover some missing data (Marcellus, 2004). The aforementioned strategies anticipate attrition will occur and therefore attempt to address it. On the other hand, the ETRP provides strategies for preventing attrition altogether. Observations concerning the effectiveness of the ETRP will be elaborated on.

Marcellus's model endorses participant convenience as a major theme to prevent attrition. Observations from the TSE study contradict this strategy. The central focus of the TSE study revolved around convenience for all participants. However, we believe this contributed to the problem. While convenience should be considered, structure should be superior. An overabundance of ease opens the door to non-response attrition. Technology that decreases face-to-face interactions added to this deficiency in structure. Our recommendation to minimize this issue is to add structure in the form of periodical face-to-face meeting requirements.

Per the ETRP recommendation, part of the structured system should include incentives at multiple phases in the study. These incentives should encourage participants to remain in the study to receive additional enticements. Providing a reward enhances participants' desire to complete the study.

Relatedly, the ETRP also supports participant recognition and appreciation from research teams. We believe this to be one of the most important aspects in retaining participants. By making participants aware of their contribution to the study, one may increase the likelihood of follow-through and completion. However, Marcellus does not account for studies that are limited in funding, as was the TSE study. If funding is not readily available through grants, we urge investigators to raise their own funds because inadequate incentives can be detrimental. We would not recommend incentivizing through a single grand prize, as this excludes all other participants. In addition, incentives should not be given prior to the performance of the desired activity. Rather, incentives should be given after receiving the required documentation of activity completion.

We are concerned that continuance of behavior will cease once incentives have stopped, which is problematic, as we are attempting to alter long-term behaviors. Therefore, on the one hand, incentives increase likelihood of participation in the study but, on the other hand, it decreases the likelihood of adherence post-study after they are no longer offered. This is to say, the incentive to perform the behavior will lose its monetary value and is to be wholly defined by increased wellness and probable longevity. This may be a hard sell to younger participants.

Finally, the social environment of participants should be assessed and taken into account. The ETRP model fails to take this into account, but it can be a major influence on attrition, as was evident in the TSE study. For instance, we believe the social environment in college life to be particularly influential, especially when coupled with a sensitive topic. Stereotypes of masculinity are especially prominent in college environments. Furthermore, within this environment, the pressures of being in a club, such as with fraternities, may increase the resistance to this type of study. The problem therefore lies outside of the researcher's direct control. We recommend the social environment not be ignored; it should be accounted for on a case-by-case basis.

#### *Consideration for Future Studies*

The problem of attrition is not one to be overlooked or simply accepted and compensated for, but rather, it should be anticipated and prevented whenever possible. Additionally, it is imperative that any observed attrition be reported to assist future researchers and to raise awareness of the issue. In the TSE study, much of the ETRP was applied (specifically, the study and researcher levels). Even so, difficulties arose due to the inadequate application of the participant and environment levels. It is crucial that all four layers be equally utilized, as this balance will result in the ideal participant centered approach, which is key to preventing attrition.

APPENDIX

Figure 1. An Ecological Theory of Attrition (Marcellus, 2004)

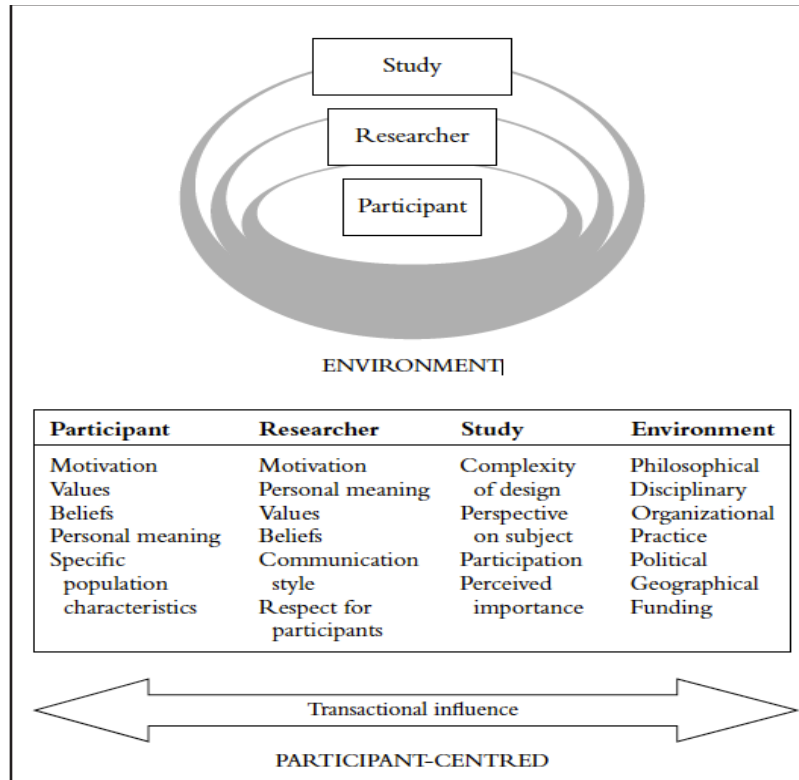
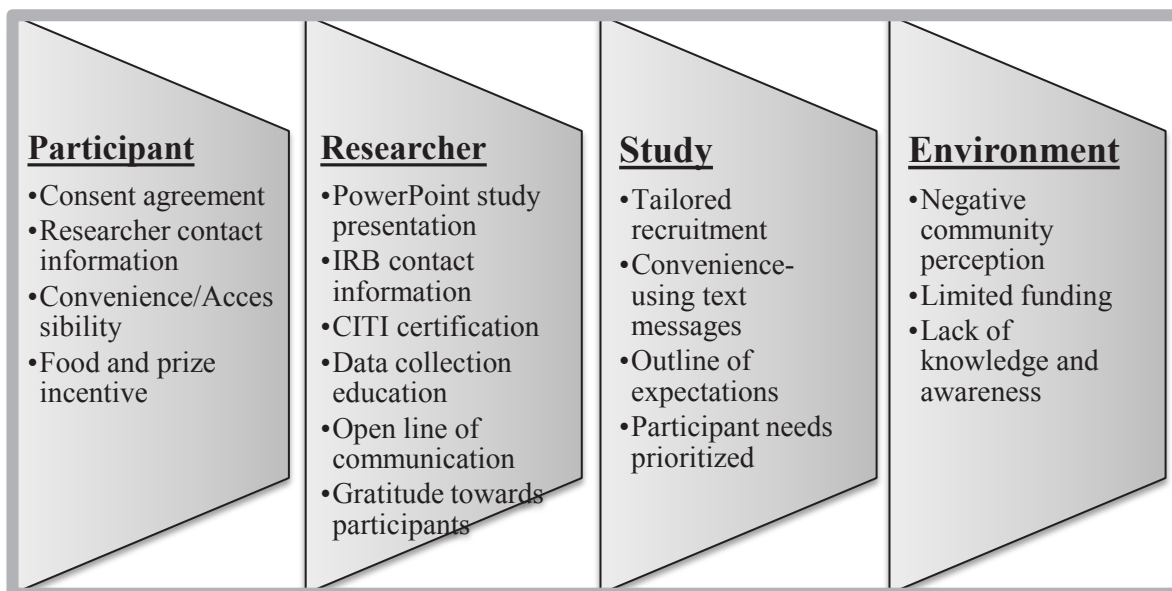


Figure 2. ETPA Application to TSE Study (Marcellus, 2004)





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