Does Causality Orientation Moderate the Relationship between Assignment Choice and Academic Achievement in Air Force Officers Performing the Nuclear Mission?

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Abstract

United States Air Force Officers are not often given the choice of career fields when they enter active duty. This may have some impact on performance on an academic measure in the assigned field. In addition to choice, levels of two causality orientations were assessed using Deci and Ryan's 1985 General Causality Orientation Scale, 12-Vignette version. Causality orientations are posited to exist in varying degrees in every individual and, for the purposes of this study, are tested to determine their association with academic achievement in a situation of limited choice. The overall aim of this study is to determine whether choice and/or causality orientation predict academic achievement in missileers, and if a moderation model represents the relationship between the predictors and academic achievement. Missileers at Minot Air Force Base, the 91st Missile Wing, were surveyed and data regarding choice, a single month's aggregate academic scores and causality orientation were collected. Neither choice nor causality orientation alone predicted monthly test scores. Causality orientation moderated the relationship between choice and monthly test scores. Those respondents who reported that they had received their assignment of choice had higher monthly test scores when they also had high levels of autonomy relative to controlled orientation. In the group which reported they had not received their assignment of choice, there were no associations between choice, causality orientation and monthly test scores.

Dedication

This dissertation is dedicated to my beautiful wife, Missy. There were times I had to give my doctoral work priority and your unfailing support made it possible to balance the demands of family, work and school. You are my heart's inspiration.

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The views expressed in this paper are those of the author and do not reflect the official policy or position of the United States Air Force, Department of Defense, or the United States government.

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CHAPTER 1. INTRODUCTION

Background of the Study

Causality orientations are trait variables which are conceptualized in this study as related to levels of intrinsic and extrinsic motivation (Akin-Little, Eckert, & Little, 2004; Brennan & Glover, 1980; Cordova & Lepper, 1996; Deci & Ryan, 1985a; Lepper, Corpus, & Iyengar, 2005; Miller & Hom, 1990). It is uncertain how choice of assignment, causality orientations and academic achievement are related in officers conducting the nuclear deterrent mission. Furthermore, the relationship between causality orientation and achievement may be affected when a career path is forced upon an Air Force officer rather than freely chosen.

In the Intercontinental Ballistic Missile (ICBM) career field, an officer-specific line of work operating under the Air Force Global Strike Major Command, officers perform cognitively demanding duties every day. These officers are entrusted with the United States' nuclear arsenal, our gravest and most powerful national security asset, yet they are not offered the opportunity to choose whether or not to perform these duties.

There are three main accession paths for Air Force officers referred to as commissioning sources. When an officer graduates from their commissioning source, be it the Reserve Officer Training Corps at an accredited, civilian institution, Officer Training School at Maxwell Air Force Base (AFB) in Montgomery, Alabama or the Air Force Academy in Colorado Springs, Colorado, they may be matriculated in training to operate our nuclear deterrent. The Space and Missile career field is split between core nuclear officers and core space officers. The core space

officers typically perform satellite command and control, missile warning, space surveillance and space launch operations. Those officers designated as missile operators have a more restrictive career path, lacking mission diversity and varied operating locations.

Once an officer has been selected to undergo Undergraduate Missile Training, they must complete a rigorous course of technical education at the 392d Training Squadron at Vandenberg AFB in Santa Barbara County, California. An officer must graduate this training with a ninety percent average, or above, on all tests and a "Highly Qualified" rating on an end-of-course evaluation in a simulator. After graduation, the officer is moved to one of the three operational Missile Wings (MW) in the northern tier. These are the 90th MW at Francis E. Warren AFB, Wyoming, the 341st MW at Malmstrom AFB, Montana and the 91st MW at Minot AFB, North Dakota. Once assigned, the ICBM Combat Crewmember is required to pass three monthly examinations with greater than a ninety percent, in addition to performing alert duties.

Motivational style has been studied, in some detail, for decades (Deci, 1972a). Some of the earliest studies are of a "manipulation drive," as in Harlow, Harlow, and Meyer's (1950) study that involved allowing primates to work on a puzzle for no reason other than the pleasure derived from the activity (p. 106). That drive was described as intrinsic motivation (Harlow, Harlow & Meyer, 1950). Of the extant studies, Burton, Lydon, D'Alessandro, and Koestner review theories of intrinsic motivation and its relationship to performance in their 2006 article, as does Lepper et al. (2005) and Bandura (1989). Lepper et al. explored the role of intrinsic and extrinsic motivational orientations in an academic context.

This study draws heavily from texts that examine causality orientations while using the framework of self-determination theory. Examining the strength of causality orientations in Air Force officers performing the nuclear mission may shed some light on academic achievement in

the nuclear enterprise. The General Causality Orientations Scale (GCOS) measures levels of causality orientations (Deci & Ryan, 1985b). This study is intended to measure the relationship between choice and the two trait variables autonomy orientation and controlled orientation, which are believed to exist in relatively stable form in every individual, in prediction of academic performance.

Academic measures are ubiquitous in the ICBM career field. Missile Combat Crewmembers are given three monthly academic classes and take three tests to validate their education and proficiency in the Minuteman III ICBM weapon system and related concepts. There is one test each for codes, weapon system and Emergency War Orders (EWO). These officers are also obliged to undergo yearly practical evaluations, in addition to any evaluations that occur as part of higher headquarters inspections. These evaluations measure the extent to which a two person crew has achieved the skills necessary to perform their duties in a highly-realistic, simulated wartime environment. These tests and evaluations directly relate to the duties that the officers are trained to perform routinely, and are therefore an excellent measure of achievement of educational objectives.

This research focuses on the academic outcomes derived from performance measures. This study will measure the moderating effect that autonomy and controlled causality orientations have on the relationship between career choice and monthly test scores.

Statement of the Problem

There has been considerable research performed on academic success in a military training environment, however, research to determine the effect that choice and causality orientation have on academic performance in a military setting is lacking. Causality orientations are an area of study that has not yet been applied to military populations. Officers do not have a

choice in assignment to the nuclear mission. They are required to pass high-stakes tests monthly in autonomy-controlling situations (Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004), which has the tendency to be deleterious to intrinsic motivation (Patall, Cooper, & Robinson, 2008). Research which would assist in filling the literature gap involving the study of causality orientations in a military environment may provide constitutive evidence in support of a fundamental change in the nuclear career path assignment process.

Purpose of the Study

This research is being conducted to determine if levels of causality orientations moderate the relationship between assignment choice and achievement of educational objectives for Air Force missileers training for the nuclear mission. An understanding of how choice is moderated by causality orientations in prediction of monthly academic performance scores will provide useful information for personnel selection and training.

While a more refined assignment process may be beneficial to the military, a study of causality orientation and academic performance in mandatory testing outcomes has not been conducted. This study could provide data to open a previously unexplored arena for the field of educational psychology. Focusing research efforts on educational outcomes and determining their relationship to causality orientations provides an opportunity to better understand variables related to the proficiency and credibility of training for the operation of our nuclear deterrent, thus enhancing our national security in the process.

Significance of the Study

The Air Force stands to benefit from this study through better understanding of how officers are motivated and how that motivation is related to educational outcomes. If a relationship can be shown to exist between assignment preference, motivation and performance

outcomes measured by academic achievement, then a better system for nuclear assignment selection could be considered to limit the number of disaffected personnel.

If officers' scores on the measures of autonomy or controlled causality orientations are correlated with academic outcomes, it may suggest dispositional variables which could identify those better suited for the nuclear mission. Individuals with higher levels of controlled orientation are often more unstable with regard to affect and behavioral consistency (Koestner, Bernieri, & Zuckerman, 1992) whereas the opposite is true of individuals with high levels of autonomy orientation (Koestner et al., 1992).

Personnel in high-pressure environments are more likely to react to those environments with negative behavior, "[focusing] on pressure, tension, and aggressive achievement" (Wong, 2000). Were the nuclear career path redesigned in such a way as to appeal to personnel whose dispositions match the demands, then a better public relations image could be forged, promulgating respect for our nuclear deterrent and the forces who provide it (Burton, Lydon, D'Alessandro, & Koestner, 2006; Cameron, Pierce, Banko, & Gear, 2005; Cordova & Lepper, 1996; Deci & Ryan, 1985a).

Studying causality orientations in a military population serves to extend the field in a way that would be beneficial to both psychology and the Department of Defense. Relating causality orientations to choice and academic achievement outcomes provides a framework for further research, offering data relevant to the assignment process or leading to hypotheses about how choice might be an important variable in the design of officer training regimens.

Research Design

This study will use a quantitative research design methodology to explore whether the relationship between performance on educational measures and assignment choice is moderated by strength of causality orientation. A quantitative design, specifically a non-experimental (Johnson, 2001), ex-post facto design does not involve manipulation of the variables for one of two main reasons. It is either not possible or it would be unethical.

The assignment choice groups in this study are already formed, and the individual differences constructs being measured are assumed to be more like traits than states. The sample is taken from Air Force missileers who serve at Minot AFB. The participants have shared experiences and training, so there is no experimental manipulation of the variables possible. Should results of this line of research provide evidence of associations between the predictors and academic performance, future researchers may be able to manipulate assignment choice to better understand predictable consequences of intervention.

Research Question and Hypotheses

Research Question 1: Do autonomy and controlled causality orientations moderate the relationship between assignment choice and educational performance in training for the nuclear mission?

Sub Question 1: Are monthly test scores predicted by assignment choice?

Sub Question 2: After controlling for assignment choice, are monthly test scores predicted by levels of causality orientation?

Sub Question 3: Is the relationship between choice and monthly test scores moderated by levels of causality orientation?

Assumptions and Limitations

Assumptions

Motivation will be studied using the lens of the GCOS and the definitions implied by the autonomy and controlled orientation scales. Since there have been different treatments and definitions of motivation, it is assumed motivation shares a substantial amount of variance with causality orientation as measured by the GCOS. There will not be a behavioral measure, which Deci, Koestner and Ryan (1999a) have identified as a potential flaw in some designs.

There are three missile bases in Air Force Global Strike Command. It is assumed that the sample, selected from missileers at Minot AFB, will be representative of the overall population of Air Force Missileers. There is some question as to whether, after acclimating over time, an officer who received his or her choice of assignment will have higher or lower scores. Time spent at the assignment may continue to affect test scores, in essence ruling out any cognitive dissonance that may have been active in the intervening years. Some testing maturation is assumed to occur since participants take similar tests monthly. It is assumed since the tests are so similar in format, but unique in content, that maturation effects will not impede the results of the study excessively. It is further assumed participants range from only a few months testing in the environment at the missile base, to several years testing, that the statistical results will effectively average out any maturation effects. Using a self-report measure can lead to erroneous or false data, therefore the expectation of valid reporting is also an assumption of the study.

It is assumed that there were no extenuating circumstances during the month of test data collection that would significantly affect the outcome and that one month's worth of test scores is a sufficiently comprehensive measure of academic performance. The benefit of using a single month's test scores is that training for all participants is stable during the month in which study

data is collected; each participant will have had the same instructor for the lessons prior to the test, the same lesson plans will have been taught and the time of year will be stable. The time of year is particularly important in the northern tier due to the substantial variations in mean temperature and precipitation. When a test is taken in December, aside from the potential for year-end and holiday stress, the temperature can be over 100 degrees cooler than one taken in July. This may have an effect on either the measurement of the psychological trait or the academic test scores.

Limitations

In an ex-post facto, non-experimental design, the researcher is limited in what can be concluded from the results. Though the data may indicate a statistically significant and strong relationship, the fact that the data were collected in a non-experimental fashion, after-the-fact, means that causal inferences cannot be drawn from them.

If significant results are found in the study, it may be possible to conduct a true experiment at a later time. Without the option of causal inferences, it is still possible to bring awareness to the idea that motivation and choice play a role in retention and academic performance in military settings, especially in situations of limited choice.

The use of self-report data is always suspect since researchers are constrained to accept the data collected are valid and reliable. Using a simple yes or no question for assignment choice and using the GCOS, which has evidence of validity and reliability, to measure the psychological variable will increase the validity and reliability of the self-report data collection. Self-report measures are often subject to systematic reporting biases that, in this study, may include acquiescence or retrospective reconstruction of prior events due to the data collection time lapse (Patall et al., 2008).

Definitions of Terms

Important terms used in this study are defined in this section.

Missileer

A missileer is a man or woman who, after having graduated from a commissioning source as an Air Force officer, is designated a Space and Missile Operations officer. After Undergraduate Missile Training at Vandenberg AFB, missileers travel to one of three northern tier missile bases and become combat certified to perform duties as active operators of the Minuteman III weapon system. Missileers are required to take three monthly tests and perform in a monthly evaluative simulation. They are evaluated annually on their proficiency in the conduct of their wartime mission in a simulated nuclear operations environment by specially trained personnel.

Self-Determination Theory

Though self-determination theory (SDT) will be covered in greater detail in the literature review, it is crucial to lay a foundation for the theory prior to discussion of the instrument derived from it. SDT was initially defined by E.L. Deci and R.M. Ryan (1985a). There are three main tenets of SDT:

> (a) people are inherently motivated to internalize the regulation of uninteresting though important activities; (b) there are two different processes through which such internalization can occur, resulting in qualitatively different styles of self regulation; and (c) the social context influences which internalization process and regulatory style occur. (Deci, Eghrari, Patrick, & Leone, 1994)

General Causality Orientation Scale

Translating the construct of motivational orientation into variables will involve measurement on a rating scale designed to assess levels of autonomy orientation and controlled

orientation. The levels of these two causality orientations will be measured using the General Causality Orientation Scale (GCOS) developed by Deci and Ryan (1985b). The GCOS is a 12-vignette, 36-item questionnaire that provides responses on a 7-point Likert-type scale. The GCOS measures three causality orientations, with 12 Likert ratings for each of the three causality orientation scales. The three scales are the autonomy, controlled and impersonal orientations. Only the autonomy orientation score and the controlled orientation score will be used in this study.

Autonomy Orientation

Having an autonomy orientation is herein defined using an understanding of intrinsic motivation. High levels of autonomy orientation approach true intrinsic motivation, with several definitive regulatory phases along a continuum (Ryan & Deci, 2000). Intrinsic motivation is defined by Reeve and Deci (1996) as an organismic-dialectical process that recognizes the need for competence and self-determination. It is the endpoint of the self-determination process. Intrinsic motivation involves performing an action because it is of interest, for its own sake (Burton et al., 2006; Cameron et al., 2005; Cordova & Lepper, 1996; Deci, 1972a; Deci & Ryan, 1985b).

Deci and Ryan (1985b) define autonomy orientation as how much a person is oriented toward an environment where intrinsic motivation is valued, the task is optimally challenging and where support in the form of feedback is provided. Individuals who score high in autonomy orientation are more persistent, especially in academic work (Vallerand & Bissonnette, 1992; Baker, 2004) in comparison with more controlled individuals.

Controlled Orientation

Controlled orientation is conceptualized as extrinsic motivation, which deals with how much a person is oriented toward external contingencies and like rewards and punishments (Deci & Ryan, 1985b). “External regulation corresponds to extrinsic motivation as it generally appears in the literature” (Thibert & Karsenti, 1996, p. 4). The motivational constructs are conceptualized as being independent and orthogonal which means they are not mutually exclusive. That is, a person can have high levels of both autonomy and controlled orientation, or can have any combination thereof.

Assignment Choice

Officers who chose the nuclear career path and were subsequently assigned to the nuclear career path are considered to have received their assignment of choice. Officers who chose anything other than what they were assigned are considered to have not received their assignment of choice. Assignment choice will be a self-reported dichotomous variable indicating whether or not the duty assignment was, at the time of assignment, the officer's first career choice.

Monthly test scores

Monthly test scores are the educational measure of academic training in the Minuteman III weapon system. Educational performance will be measured using scores from a compilation of three test scores, taken in one month, designed by the military to assess the officers' ability to perform the tasks for which they are trained. It is an academic measure of achievement of training objectives. The educational outcome measure will be a single “snapshot” month of test performance. Each participant is required to take three tests per month. Each test

contains the same number of items, so the total number of questions answered correctly, or average scores, will constitute the outcome data.

Expected Findings

In examining the relationship between choice, causality orientations and academic achievement, it is expected that those officers who chose their career field will have higher intrinsic motivation, as measured on the autonomy orientation scale. Similarly, it is expected that those officers who received their assignment of choice will have higher scores on the academic measure than those who were not afforded a choice in career. It is also expected that autonomy orientation will be compatible with tasks which the participant chose to perform, leading to higher achievement among those officers who both chose their assigned field and have high autonomy orientation. Conversely, it is expected that when the participant is forced to accept an assignment which is not the participant's choice, controlled orientation will be more conducive to achievement. This leads to the hypothesis that causality orientations will moderate the extent to which choice predicts achievement. Those officers who are higher in autonomy orientation and who chose their field are expected to have higher achievement, while those who did not choose their assignment will have higher achievement if they have higher controlled orientation. When autonomy orientation is high and the assignment was forced, lower achievement is expected, as well as when the field was chosen and controlled orientation is dominant. These expected findings found parallels in a meta-analysis performed by Patall et al. (2008) and have been echoed in the summary article by Deci and Ryan (2008). The effect for studies which fit the meta-analytical criteria was such that in the most controlling forms of no-choice scenarios, the effect of choice on intrinsic motivation and related outcomes was greater than in scenarios where the choice was less consequential or the alternatives were not as dire.

Organization of the Remainder of the Study

The remainder of the study is organized into chapters two through five. Chapter two provides a review of literature relevant to self-determination theory (SDT), theories regarding choice and the relatedness of motivational types to SDT and choice. The statistical methodology used to analyze the data for this study is discussed in Chapter three. Chapter four is dedicated to the presentation and analysis of data. Chapter five is the last section and contains a presentation of conclusions and recommendations for future research based on the results presented in chapter four. A list of references concludes this research.

CHAPTER 2. LITERATURE REVIEW

Introduction to the Literature Review

Theories of motivation have permeated psychological literature for decades (Burton, 2006; Lepper & Greene, 1978; Nicholls, 1979). One of the more compelling and comprehensive theories with regard to personal growth is self-determination theory (Ryan, 1995; Ryan & Deci, 2000). An holistic approach, self-determination theory (SDT) posits that people tend to naturally progress along a self-determination continuum (Ryan & Deci, 2000) toward more intrinsically motivated, or self-regulated behavior of their own volition (Markland, Ryan, Tobin, & Rollnick, 2005; Ryan & Deci, 2000).

Choice is related to motivation in many ways (Becker, 1997; Cordova & Lepper, 1996; Patall et al., 2008), but there is some debate over the positive effect of choice on motivation (Flowerday & Schraw, 2003; Reeve, Nix, & Hamm, 2003). It has been long assumed that in situations where a person has choice, they will be more motivated to perform an activity (Lewin, 1952), but this assertion is not always the case (Patall et al., 2008). Under certain circumstances, choice may have a deleterious effect on intrinsic motivation (Reeve, Nix, & Hamm, 2003) or related constructs (Flowerday, Schraw, & Stevens, 2004).

Theoretical Orientation for the Study

Self-determination theory provides the theoretical, psychological basis for this study (Ryan, 1995; Ryan & Deci, 2000). Although the initial work establishing SDT began in the 1970s, the first comprehensive description of SDT appeared in the 1980s (Deci, 1980; Deci & Ryan, 1985a). SDT is a personality development theory wherein individuals initiate self-

motivated behavior change. Intrinsic motivation can be understood as the goal in the continuum of self-determination; it is participating in an activity for the satisfaction and pleasure derived from performing the task (Deci, 1975). SDT was initially conceived based on observations and field experiments that studied the effects of rewards, praise or directives on intrinsic motivation (Deci & Ryan, 1980). Deci and Ryan (2008) define the different types of motivation contained in SDT:

> The most central distinction in SDT is between autonomous motivation and controlled motivation. *Autonomous motivation* comprises both intrinsic motivation and the types of extrinsic motivation in which people have identified with an activity's value and ideally will have integrated it into their sense of self. When people are autonomously motivated, they experience volition, or a self-endorsement of their actions. *Controlled motivation*, in contrast, consists of both external regulation, in which one's behavior is a function of external contingencies of reward or punishment, and introjected regulation, in which the regulation of action has been partially internalized and is energized by factors such as an approval motive, avoidance of shame, contingent self-esteem, and ego-involvements. When people are controlled, they experience pressure to think, feel, or behave in particular ways. Both autonomous and controlled motivation energize and direct behavior. (p. 182)

The self-determination continuum

Progress toward intrinsic motivation requires continuous movement along a self-determination continuum. A person achieves higher levels of autonomy through the self-regulatory processes of self-determination reflecting the extent to which a person is committed to what they are doing and for whom they are doing it. Ultimately, a greater level of autonomy is desirable, especially in the academic arena since higher levels of intrinsic motivation have been shown to promote higher test scores in previous studies (Lepper et al., 2005). A moment of epiphany is not necessary to initiate the self-determination process; rather, continual intentional living promotes greater autonomy. Important events are not the only cause of intrinsically motivated regulatory behavior. The actions associated with everyday life incrementally