A Dyadic Approach to Leadership Emergence

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ABSTRACT

Leadership emergence is best conceptualized as a complex, multi-level process arising from the dynamic interplay of all elements in the process: group members, relations, and context (Day, 2014). This study seeks to simultaneously examine to the role of each in the leadership emergence process by assessing leader and follower traits, their trait similarity, task, behaviors, and the network itself. Using a rotation design, 99 cadets in groups of three completed four tasks with alternating partners and subsequently provided sociometric ratings of each of their group members. Data was analyzed using Exponential Random Graph Modeling, which controls for endogenous group effects. In general, there was a tendency toward nominating others as leaders. High scores on dominance and intelligence predicted leadership emergence, and low scores on dominance predicted follower emergence. The type of task did not affect leadership emergence. Perceived leader behavior unexpectedly reduced the likelihood of nominating another as a leader. Results from this study highlight the importance of studying all components of leadership process and are once step closer toward doing so completely and accurately.

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1.0- Introduction

Since its inception, leadership research has been predominantly leader-centric (Uhl-Bien, Riggio, Lowe & Carsten, 2013). That is, the main focus has been how qualities and behaviors of leaders relate to particular outcomes or effectiveness (e.g. Burk, Stagl, Klein, Goodwin, Salas & Halpin, 2006). Due to the exclusive emphasis on the leader, the leader-centric approach generally neglects the other contributing forces involved in the leadership system. Recently, however, there has been increased attention to leadership as a process (Bono & Judge, 2003; Day, 2014; Lord & Brown, 2001; Uhl-Bien, Marion & McKelvey, 2007). The process view conceptualizes leadership as a socially-constructed, complex phenomenon, emerging as a result of the dynamic interplay of all group members and relations within a given social context (Day, 2014). In this way, the study of leadership is not solely focused on the "leader" and his/her influence; followers, peers, the group and the situation are all considered active, interacting components from which leadership emerges (Avolio, Walumba, & Weber, 2009).

Much of the research within the leadership realm has typically focused on only one of these domains: the leader (e.g. Bono & Judge, 2004), the follower (e.g. Felfe & Schyns, 2010; Meindl, 1995; Sy, 2010) the leader-follower relationship (e. g. Graen & Uhl-Bien, 1995), the network of relationships within the group (e. g. Bono & Anderson, 2005) or the situational context (e.g. Yukl, 1981); however, no known study to date has simultaneously examined how all of these parts combine to produce the emergence of leadership while also controlling for endogenous dyadic dependence. Thus, in order to truly to understand how the process of leadership unfolds, researchers need to examine together the relationships between each of these contributing, intertwined factors.

Leadership Emergence

Emergent leaders, in contrast to formal leaders, are those individuals who are identified as being "leaderlike" in a group of individuals where there is no designated leader (Hogan, Curphy, & Hogan, 1994). More specifically, this identification process involves one or more individuals perceiving leaderlike qualities in one or more others (Lord et al., 1986). So, at its most decomposed level, leadership emergence is inherently dyadic because it involves a relation between two individuals. In addition, the process of leadership emergence includes many interacting parts at multiple levels: individuals' cognitions are nested within dyads and dyads are nested within larger groups. As such, leadership emergence may be best conceptualized as a network of interdependent dyadic relationships embedded within a larger social sphere (Emery, 2012). However, most research involving informal leadership has not been conducted and analyzed at the dyadic level, nor has it simultaneously included the many components of the leadership process in one statistical model. Misalignment in the level of construct, measurement, and/or analysis may result in biased estimates of results (Kozlowski & Klein, 2000), and the exclusion of important elements of the process can lead to an underspecified or misspecified model of leadership emergence (Antonakis, Bendahan, Jacquart, Lalive, 2010). This study aligns the dyadic theory, measurement, and analysis of leadership emergence within a multilevel framework by using a social network technique not traditionally used in I/O Psychology: Exponential Random Graph Modeling (ERGM).

Exponential Random Graph Modeling

ERGM tests how particular factors impact the formation of relational phenomena, or "ties," between individuals in groups. It is unique in its ability to simultaneously examine the effect of 1) individual differences (e.g. personality attributes), 2) other dyadic relationships in the

group (e.g. friendship), and 3) the natural patterning of network relationships (e.g. the clustering of leadership nominations) on the development of dyadic phenomena (e.g. leadership emergence) over and above each other. In addition, ERGM can be used to test if similarity or dissimilarity in characteristics of the dyad members predicts the formation of such dyadic phenomena. Thus, in studying leadership emergence, ERGM is capable of simultaneously measuring the unique role of each dyad member, the other group members, their preexisting and current relationships, and the social context in the formation of dyadic relationships, while accounting for the natural, endogenous formation of relationships. Since numerous components of the leadership process, not solely the leader, are tested together, ERGM grants one the capability to better model and make statistical inferences of the *process* by which leaders and followers emerge in a group (Kalish, 2013).

Current Study

The current study tests if particular individual attributes and peer-rated behaviors increase or decrease the chances of one emerging as a leader or a follower, as well as if individuals tend to perceive similar or dissimilar others as leaders, all while controlling for the interdependence of nested relationships. Specifically, I examine the role of 1) intelligence, 2) self-monitoring, 3) self-efficacy, 4) dominance, 5) individual perceptions of leader behavior, and 6) dyadic trait similarity and dissimilarity in predicting leadership emergence while controlling for the natural structural patterns of group ties. Although previous studies have independently found relationships between the aforementioned variables and leadership emergence (e.g. Foti & Hauenstein, 2007; Judge, Piccolo & Kosalka, 2009; Judge, Colbert & Ilies, 2004; Smith & Foti, 1998; Zaccaro, Foti, Kenny, 1991) no study to date has *simultaneously* tested how each of them contributes to the leadership emergence process over and above all the others, mainly because

there has been no statistical method before ERGM capable of such modeling. Thus, the present study contributes to the extant literature in two main ways: 1) it is the first to determine the probability that each of the above-listed characteristics lead to the emergence of leadership in a particular leadership network given all of the included factors in the process, and 2) it is one of the very first studies to apply ERGM to the study of leadership emergence, allowing for statistical inferences to be made about the *underlying forces driving the formation of leadership relationships* within a network. Together, these two contributions represent a move in the right direction toward more accurately and completely studying leadership as a process.

2.0- Literature review

2.1- Leadership Emergence

Kaiser, Hogan and Craig (2008) define leadership emergence as "standing out in the crowd" (p. 98), which captures one of the key elements of the construct: the group in its entirety. In order for one to stand out in a group, the others in the group must first recognize that an individual exerts influence, or has the capacity to do so (Kaiser et al., 2008; Tagar, Hacket & Saha, 1999). This recognition is, in essence, a perception of one individual by another within a larger social context (i.e. group, team, organization, etc.). Thus, the perception of one as a leader is, in and of itself, a dyadic construct, yet the process of leadership emergence may span multiple levels, such as individual personality traits, dyadic relationships, situational context or endogenous social patterning (Wang, Zhou & Lui, 2014).

Historically, leadership emergence has been assessed through peer evaluations of leadership in groups with no formal leader. In such cases, participants are placed in groups, required to complete an activity (e.g., task or a group discussion) and subsequently assessed on leadership (e.g. Albright, Kenny, and Malloy, 1988; Lord et al., 1986; Taggar et al., 1999). Examples of such assessment of leadership potential include peer nominations of one or more leaders, peer or observer ratings of leadership behaviors, or individual participation rate in activity (Kaiser et al., 2008). Typically, personal characteristics or behaviors are measured to determine which individual constructs predict who emerges as a leader (Day, 2014). Analysis of these studies is typically approached from one of three different viewpoints: leader-centered, approach, the follower-centered approach or the dyadic-level approach (Day, 2014), the first of which dominates leadership emergence literature. From the perspective of the leader-centered approach, leadership exists in the individual who exerts influence (i.e., the leader). Although this

approach acknowledges the existence of followers in leadership (Uhl-Bien et al, 2014), it is the individual differences and behaviors of the *leader* that are predictive of emergence. The follower-centered perspective, however, focuses the *perceiver's* contribution to the construction of leadership (Uhl-Bien et al, 2014). For example, within the realm of leadership emergence, the followership approach might examine how individual differences in perceivers' perceptions impact the process of leadership. The third approach to leadership, the dyadic, or relational approach, emphasizes the *relationship* between the leader and follower in the process. It is most commonly used to study Leader-Member Exchange (LMX) and the outcomes that result from particular leader-follower relationships (Day, 2014). The LMX literature is relatively unique in that research often examines the dyadic similarity and dissimilarity between a leader and follower. This is an important contributor to the process of leadership emergence but can only be analyzed using a dyadic approach. Although leadership emergence is inherently a relational phenomenon (Uhl-Bien, 2006), it is rarely studied from a dyadic point of view; it is most commonly assessed using individual level analyses, or non-dyadic multilevel analyses (a term borrowed from Krasikova & Lebreton, 2012).

There have, however, been attempts to conduct leadership emergence research at the dyadic level using the Social Relations Model (SRM; e.g., Foti & Hauenstein, 2007; Kenny, 1988; Kenny, Mohr, & Levesque, 2001, Zaccaro et al., 1991). For example, the round robin rotation design, in which individuals rotate groups so that each person works with every other person once, allows for the partitioning of variance at each level: rater/ratee, dyad, and higher group levels (Kenny & Hallmark, 1992). SRM is particularly useful because it not only operationalizes leadership emergence as a relational construct, but it also considers the embedded nature of relationships: individuals are nested within dyads and dyads are nested

within groups. Thus, the SRM accounts for contextual, multilevel components of the leadership emergence process while aligning the dyadic level of the measurement with that of the construct.

Social network analysis is another, relatively new way to study leadership that looks at larger, more global patterns of social groups. In this way, individuals are conceptualized as "nodes" within the network, and the dyadic relationships between individuals (i.e. leadership) are conceptualized as "ties." Social network analysis is able to examine phenomena that other types of analyses, including the SRM, do not. This is the well-known tendency for the ties within networks to cluster into a pattern of local structures (Robins, Pattison, Kalish, & Lusher, 2007). Lusher & Robins describe these patterns as "endogenous effects" because they "arise solely from the internal processes of the system of network ties" (2013, p. 23). That is, the force driving tie formation is merely their embeddedness in each other. The relationships are interdependent in that the formation of every tie is conditionally reliant on the existence of other ties within the network. Thus, the combination of these local patterns can capture how lower-level relational patterns give rise to higher-level patterns. There exists several different names for the endogenous structural effects, but for the purpose of this study, they will be referred to as "structural characteristics."

Although researchers have identified over 50 different types of structural characteristics, but the most commonly studied ones are at the dyad and triad level (see Table 1 for visual representations). For example in leadership: reciprocity represents the tendency for two dyad members to each nominate the other as a leader; in-star(k) represents the tendency for individuals to receive multiple leader nominations from k number of other individuals; out-star(k) represents the tendency for individuals to nominate k number of individuals as leaders; mixed 2-star represents the tendency to receive a leader nomination and send one to a different person; and

finally, transitivity represents the tendency for an individual to nominate as a leader a person who was nominated by his/her selections (i.e. "leaders of my leaders are also my leaders"), or hierarchical leadership (Slaughter, 2008).

It is important to note that these configurations are mere descriptions of topological patterns in social structure and do not capture the underlying causes of the patterning. More specifically, network reciprocity should be distinguished from the "Norm of Reciprocity" prevalent in social psychology (Gouldner, 1960). The latter refers to "the act of giving benefits to another in return for benefits received" (Molm, Schaefer & Collett, 2007, p. 200) and is fundamentally based on positive (or negative) exchanges between dyads. Network reciprocity is a more general concept that can be applied to many different relationship-based contexts. For example, although reciprocity in helping behaviors might reflect the "Norm of Reciprocity," reciprocal relationships can be applied to relationship ties outside of this domain, such as in communication, friendship, advice, information sharing, and in this case, leadership.

Social network analysis has shown that these structural characteristics, alone, are related to leader emergence (Balkundi & Kilduff, 2006). That is, without considering individual characteristics of the people, or nodes, in the network, there exists a correlation between structural patterning of relationships in a group and leadership emergence. Although very useful in its ability to model structural effects, social network analysis does not typically examine causation. It is most commonly used to describe the structure and patterns of networks, not what causes such formations. For example, researchers typically equate an individual's centrality (how many ties he/she has) in a network with leadership emergence and subsequently measure the individual difference of those most central within the networks (Balkundi & Kilduff, 2006; Bono & Anderson, 2005; Bartol & Zhang, 2007; Klien, Lim, Satz, Mayer, 2004; Mehra, Dixon,

Brass, & Robertson, 2006). Despite the descriptive nature of social network analysis, it is useful in that it demonstrates that the structural dependencies of relationships in networks are a crucial - and too often unaccounted for- factor in the leadership process.

In sum, all the above approaches have advanced the study of leadership emergence by examining its relationship with particular characteristics of the individual (micro) and social context (macro). However, each approach has its shortcomings in terms of modeling the process of leadership emergence. Specifically, the leader-centric and follower-centric approaches are lacking in that they attempt to study a dyadic level construct from an individual level perspective. The typical dyadic approach, although it solves the misalignment issue, is lacking in its inability to examine the influence of dyadic similarity/dissimilarity and other dyadic relationships (e.g. friendship or communication tendencies) while also accounting for endogenous structural characteristics/dependencies in leader or leadership emergence. Finally, social network analysis is almost always descriptive, which prevents the ability to make statistical inferences about the antecedents of leadership emergence. Thus, in order to properly model the process of leadership emergence, there is a need for a method that can simultaneously incorporate all of the approaches together to overcome each of their pitfalls. One relatively new technique that holds promise for doing so is called Exponential Random Graph Modeling (ERGM).

2.2 Exponential Random Graph Modeling

ERGM is a network modeling technique that (with regard to leadership) calculates the probability that a leadership relationship, or tie, forms between two individuals, conditional on the other leadership relationships and parameters included in the model. It offers several advantages relative to other analysis techniques. First, since the unit of analysis is the leadership

relationship, ERGM is fundamentally dyadic, aligning analysis with theory. Second, by operationalizing leaders as those who receive leadership nominations and followers as those who send leadership nominations, this technique simultaneously examines the factors predictive of the emergence of leaders and of followers. Furthermore, ERGM measures the effect of similarity and/or dissimilarity of dyadic partners on the probability of tie formation. Other dyadic data analysis techniques can examine both leader and follower effects (e.g. SRM; Kenny et al, 2001), but they cannot measure the predictive power of similarity/dissimilarity on tie formation. Third, preexisting dyadic relationships, as well as contextual variables are able to be included as covariate predictors or controls in the model. Although each of the aforementioned predictors can and have been previously studied, no other form of analysis has the ability to include them parsimoniously in one model, thus more accurately capturing the components in the *process*. Fourth, ERGM uses a statistical approach, as opposed to the more typical descriptive approach, to networks. That is, instead of simply collecting summary measures of network patterns, ERGM allows researchers to make statistical inferences as to how micro level processes (i.e. individual attributes and dyadic relationships) result in macro level processes (i.e. leadership emergence). Finally, ERGM accounts for dependence in leadership relationships, which reduces endogeneity bias in relationship estimations and produces more accurate standard errors for the estimations. Research has shown that the formation of dyadic relationships, such as leadership nominations, is dependent on the presence or absence of other relationships in the network and, as a result, form into patterns of local structures (Robins, Pattison, Kalish, & Lusher, 2007). When examining the effect of individual differences, for example, on leadership emergence, such dyadic dependences must be accounted for so as to not produce biased results. Analyses using ERGM allow for this, which helps to produce more accurate parameter estimates and standard

errors of the effect of predictors on the formation of leadership ties because the effect an endogenous variable (i.e. network characteristic) is removed (Antonakis et al. 2010). Antonakis et al. (2010) believe endogeneity bias is one of the most pervasive yet ignored problems currently plaguing I/O and management research because its presence may produce biased results where the true estimation could "be higher, lower, or of a different sign than the actual causal relation" (Antonakis, Bastardoz, Liu, Shriesheim, 2014). Since ERGM accounts for omitted variables with the inclusion of controls for endogenous network effects, the endogeneity bias for each of the included covariates is lowered, thus enabling better inferences to be made from the estimates.

ERGM uses Markov Chain Monte Carlo sampling with Maximum Likelihood Estimation to produce parameter estimates and standard errors for each of the predictors and controls in the study. Parameter estimates reflect if a particular characteristic significantly increases or decreases the chances that a leadership relationship is formed, while holding all other predictors in the model constant. An estimate approximately two times the size of its standard error is considered significant. Inferences can then be made as to whether that particular characteristic underlies the leadership emergence process.

Since no dyadic method to date has been able to jointly study the unique predictive ability of 1) individual differences between dyad members, 2) similarities and differences between the dyad members, 3) other relationships between dyads members, and 4) structural self-organization of dyadic relationships each contribute over and above each other, it is likely that previous conclusions of their relationship to leadership emergence are overestimated. Thus, the purpose of the present study is to reanalyze the each of these variables previously found to be

predictive of leadership emergence using ERGM, a method which presumably produces more accurate and unbiased estimates.

2.3 Individual Differences in Leaders and Followers

Research has shown that individuals are naturally inclined to classify people as leaders and/or followers (Epitropki, Sy, Martin, Tram, & Topekas, 2013), and they classify others based on the degree to which the characteristics he/she perceives of the other person resemble those included in his/her pre-existing cognitive schema of a leader or a follower. This schema is called an implicit theory (Lord, Foti, & Philips, 1982; Sy, 2010) and is part of humans' environmental "sensemaking processes" that guide how we perceive and categorize others (Lord, 2005). Implicit Leadership Theory (ILT; Phillips & Lord, 1981) and Implicit Followership Theory (IFT; Sy, 2010) state that individuals have their own schematic representation of a leader and follower, which they hold in memory. People then naturally categorize others as leaders or followers based on the degree to which individual attributes others possess match those in their own leader or follower prototype. ILT states that if the characteristics people perceive in others match those in their implicit theory of a leader, then the perceiver will perceive the person(s) possessing such characteristics as leaders, or leaderlike. IFT claims the same for perceptions of followers (Shondrick & Lord, 2010). Identifying the perceived and perceivers' attributes is important for the emergence of leaders, as past research has consistently found relationships between the personality traits and intelligence and leadership emergence (Lord et al., 2002; Lord et al., 2004).

2.4 Leader Attributes

Intelligence. High levels of intelligence and cognitive ability have consistently been shown to be related to leadership and particularly leadership emergence, as demonstrated by two meta-analyses examining the relationship between intelligence and leadership emergence. An

early meta-analysis by Lord, DeVader and Alliger (1986) found the correlation between intelligence and leadership perceptions to be .52, after correcting for attenuation. More recently, a Judge et al. (2004) meta-analysis also found significant correlations between leader emergence and both perceived intelligence (r=.60, corrected) and paper and pencil intelligence (r= .19, corrected). In addition, in a 13-week longitudinal study of 94 leaderless autonomous work teams, Taggar, Hackett and Saha (1999), examined the relationship between individual differences (i.e. *g*, or general intelligence, and the Big Five personality traits) in predicting peer ratings of leadership. Results indicated not only that *g* was significantly correlated (r = .44, corrected) with peer ratings of leadership, but also that when all six predictors were included in a simultaneous regression with leadership perceptions, *g* "contributed most to explaining team member leadership," relative to all others in the model (*B*= .32*)*. This finding is not surprising, considering leadership emergence is fundamentally an individual's perception, and intelligence has shown to be a salient dimension of people's implicit theory of leadership (Lord et al, 1986; Epitropaki et al, 2013). Accordingly, I hypothesize:

Hypothesis 1: There is a positive relationship between intelligence and the emergence of leaders.

Self-monitoring. Self-monitoring refers to the extent to which individuals ''strategically cultivate public appearances'' (Gangestad & Snyder, 2000). High self-monitors tend to adjust their behavior in accordance with what they believe is most socially appropriate in a given situation, whereas low self-monitors tend to be more driven to reflect their true affective selves in a given social situation (Day & Schleicher, 2006). Studies have shown there exists a positive relationship between leadership emergence and self-monitoring (Day, Schleicher, Unkless & Hiller, 2002; Dobins, Long, Dedrick, & Clemons, 1990). For example, Zaccaro et al. (1991)

found a significant correlation (r = .22) between high self-monitors and peer rankings of leadership in a rotation design. Similarly, using a network perspective, Mehra, Kilduff & Brass (2001) found that high self-monitors tend to occupy more central positions in social networks. Thus, there is an evident relationship between self-monitoring and leadership emergence. This is most likely because high self-monitors manage their impressions so that they match followers' prototypes of leaders (Day & Schleicher, 2006). Therefore, I hypothesize:

Hypothesis 2: There is a positive relationship between self-monitoring and the emergence of leaders.

Self-efficacy. Albert Bandura (1997) described self-efficacy as one's own self-conceptions as to his/her abilities to succeed in a task. As such, self-efficacy can be viewed as an overall stable individual difference in cognition, akin to a trait, or as a domain-specific belief in oneself (Chen, Gully & Eden, 2001). The former, or generalized/general self-efficacy, is defined as "individuals' perceptions of their ability to perform across a variety of situations" (Judge, Erez, & Bono, 1998, p. 170). This construct captures one's belief in his/her capabilities across all situations and contexts. As such, it is highly related to other self-evaluative concepts, such as self-esteem, locus of control, emotional stability (Judge et al, 1998), and self-confidence (Bass, 1990). Studies have shown there is a significant relationship between general self-efficacy and work-related performance, as demonstrated in a meta-analysis by Stajkovic & Luthens (1998). More specifically, within the leadership emergence domain, high levels of individual self-confidence have been found to be related to peer ratings of leader emergence (Kolb, 1999). Given self-efficacy's resemblance to self-confidence, it is likely there is also a similar relationship between leadership emergence and generalized self-efficacy.

The second conceptualization of self-efficacy is as situation or task-specific. In this way, it is one's judgment of his/her abilities pertaining to ability to succeed within specific domain. (Chen et al, 2001). Leadership self-efficacy is a self-perception of *leadership* abilities (Chemers, Watson, & May, 2000). Research has found an association between leadership self-efficacy and leadership effectiveness (e.g. Ng, Ang, & Chan, 2008). With regard to leadership emergence, a study by Chemers, Watson, and May (2000) examined the relationship between leader emergence and performance in a group of military cadets and individual leadership self-efficacy. Results showed leadership self-efficacy predicted ratings of cadet leadership potential by the cadets' instructors (B=.40) and peers (B=.54).

Thus, it seems that both general self-efficacy and leadership self-efficacy affect leadership perceptions in groups. However, it has been theorized that general self-efficacy and task-specific self-efficacy are correlated due to the "spill-over" effect of the former on the latter (Chen et al, 2001). In this way, high general self-efficacy predicts task-specific self-efficacy across situational domains. Accordingly, in an attempt to avoid redundancy, I make predictions on general self-efficacy only:

Hypothesis 3 There is a positive relationship between self-efficacy and the emergence of leaders.

Dominance. Another characteristic first found to be related to leadership over 50 years ago is dominance (Mann, 1959). As measured by the California Psychological Inventory (CPI), dominance reflects an individual's "prosocial interpersonal dominance, strength of will and perseverance in pursuit of goals" (Gough & Bradley, 2005, p. 6). It is also considered to be one of the two main facets of the Big Five's Extraversion dimension, which is argued to be the most important predictor of leader emergence (Judge et al. 2002). Several meta-studies have found a

direct correlation between dominance and the emergence of leaders in groups (Judge et al. 2002; Lord et al., 1986). For example, using SRM, Anderson and Kilduff (2009) showed that more dominant individuals in a group scored higher on "influence in the group," as rated by their peer group members and by outside observers. Furthermore, they found this effect was partially mediated by ratings of the individuals' competence (i.e. ability to perform well on the task), which remained after controlling for their actual competence. These findings suggest that over and above people's skills and abilities, it is their dominance that allows them to be perceived as influential by others, which leads to my fourth hypothesis.

Hypothesis 4: There is a positive relationship between dominance and the emergence of leaders.

2.5 Follower Attributes

Although examining individual differences in leaders is undoubtedly crucial for understanding who emerges as a leader, arguably equally as important in leadership is understanding the individual differences of followers. According to Shamir (2007), the leadership process is as much influenced by the follower as the leader; thus, in order to best understand leadership, just as much emphasis should be placed on understanding the follower as the leader. Even though there has been increased attention to the study of followership in recent years (Felfe & Shyns, 2010; Schyns & Felfe, 2006, Sy, 2010), much of the focus has been on leader-follower outcomes (e.g. Howell & Shamir, 2005), behaviors (e.g. DeRue & Ashford, 2010), or role orientations (e.g. Carsten & Uhl-Bien, 2012). Few studies have examined which individual attributes predict general tendencies to select one or more others as leaders. Studies have shown that extraversion (Felfe and Schyns, 2010) and agreeableness (Schyns & Felfe, 2006) impact followers' perception of transformational leadership. If there are specific attributes

predisposing one to perceive transformational leadership, it is likely there are also specific attributes predisposing one to generally perceive others as leaders (i.e. to be followers).

Self-efficacy. Individuals scoring low on generalized self-efficacy, by definition, are overall less confident in their abilities to complete tasks successfully. This notion was supported in a study examining how Navy petty officers dealt with subordinate supervisory problems. Results showed officers were significantly more likely to refer the subordinate to a superior and not hold "diagnostic talks" with the subordinate if the officers possessed low levels of leadership self-confidence than if they possessed high levels (Kipnis & Lane, 1962). These results suggest individuals low on leadership self-confidence (or leadership self-efficacy) are likely to defer to others within the group to take the leadership initiative, thereby selecting others as leaders. Although this study examined leadership self-confidence, not generalized self-confidence, leadership self-efficacy is related to generalized self-efficacy (Ng, et al., 2008), as discussed above. Given this relationship and given the similarity between self-efficacy and self-confidence, I predict the following:

Hypothesis 5: There is a negative relationship between generalized self-efficacy and the emergence of followers.

Dominance. According to McAllister (1996), individuals with low levels of dominance are "likely to be passive and nonassertive." The follower role, as stated by Hoption, Christie, & Barling (2012) "reflects passivity obedience, and submission," which, fitting with McAllister's belief, reflects low levels of dominance (p. 222). This notion was further echoed by followers, themselves, in a recent qualitative study examining how followers view the followership role (Carsten, Uhl-Bien, West, Patera, & McGregor, 2010). Thus, based on general conceptualizations of followers, it appears they are associated with low levels of dominance.

This association is possibly made more apparent when one defines followers as those who are non-leaders (Hollander, 1974). Hoption et al. (2012) state, "an alternative to directly labeling followers as passive and obedient is to make a distinction between followers and leaders, thus implying that followers are what leaders are *not*" (p. 222). Given the extensive findings discussed above that individuals who score high on dominance typically emerge as leaders, and given followers can be conceptualized as those who are not leaders, it is logical that those who are not dominant are also likely to be those who are not leaders (i.e. followers). This was exemplified in an early study conducted by Edwin Megargee (1969), who showed that when high-dominant males were paired with low-dominant males to complete a gender-neutral task, the low-dominant males more frequently assumed the follower role than did the high-dominant males. Hence:

Hypothesis 6: There is a negative relationship between dominance and the emergence of followers.

2.6 Leader-Follower Similarity and Dissimilarity

The literature reviewed thus far has focused on how individual attributes influence the propensity for one to emerge as a leader or a follower. However, since leadership perceptions are fundamentally dyadic, it is also necessary to examine how dyadic similarity and dissimilarity on individual attributes are potentially related to relational emergence. Although it is rare for dyadic similarity and dissimilarity to appear in leadership emergence research, it is not uncommon to see it present in the person-environment (P-E) fit literature. In studying leadership, this field encompasses person-supervisor (P-S) fit, similar to leader-follower fit. Within this domain, there exists a dichotomy in beliefs as to what leads to better relationships: supplementary fit vs. complementary fit (Muchinsky & Monahan, 1987). The former is rooted

in the similarity-attraction hypothesis (Bryne, 1971), stating that a person fits with a particular other because he/she possesses characteristics similar to the other person (Muchinsky & Monahan, 1987). Research supporting this theory shows that pairing of similar leaders and followers results in positive work-related outcomes (e.g. Deluga, 1998). On the other hand is the complementary fit hypothesis, which states that dyadic P-S fit occurs because an individual possesses the characteristics required for, or missing from, the other dyadic partner. The complementary fit theory is based on the dominance-complementary theory, which claims groups and dyads get along better when levels of dominance are balanced as opposed to equivalent (Kiesler, 1983), which, in turn results in positive work-related outcomes. In a direct test of these competing theories, Saltz (2004) examined whether leader follower similarity or dissimilarity in extraversion, consciousness, and emotional stability of 778 dyads influenced follower satisfaction with the leader and/or follower commitment to the organization. Results indicated that neither leader-follower similarity nor dissimilarity affected either of the two outcomes. Thus, it appears the verdict is still out as to whether supplementary or complementary fit lead to better work-related outcomes.

There appears to be a similar lack of consensus in the roles of similarity and dissimilarity in the process of leadership emergence. To the author's knowledge, only two studies have analyzed similarity and dissimilarity of leaders' and followers' personal attributes as predictive leadership emergence, both of which use EGRM for analysis. The first is a study by Kalish (2013), examining informal leadership in a group of military recruits using a network approach. In addition to analyzing the social structure of the groups, the author tested whether recruits tended to nominate as leaders others with intelligence levels, or *g*, that were similar or dissimilar to their own (also known in the social network domain as homophily and heterophily,

respectively). Results revealed that neither dyadic similarity nor dissimilarity on *g* significantly increased or decreased the probably of a leadership nomination. However, Emery, Calvard, and Pierce (2013) did, in fact, find support for similarity and dissimilarity as predictive of leadership emergence using a different set of personal attributes. In their longitudinal study of leaderless groups, the authors assessed 1) whether individuals' levels on the Big Five affected task-oriented and relationship-oriented leader and follower emergence, and 2) whether participants tended to follow others with similar or dissimilar levels of the Big Five. The researchers found support that individual standing on specific components of the Big Five are predictive of task and relationship leader and follower emergence in the group. In addition, they found dyadic similarity on openness to experience and dyadic dissimilarity on agreeableness were predictive of leadership nominations. That is, for both task and relationship nominations, individuals tended to follow others similar to them in terms of openness to experience and dissimilar to them in terms of agreeableness.

The variable pattern of findings in the Kalish (2013) and Emery et al (2013) studies signifies that, similar to the P-S literature, there still remains no general consensus on whether dyadic similarity or dissimilarity in personal attributes predicts informal leadership or followership. It is possible, given the discrepancy in findings for different individual characteristics, the similarity and dissimilarity effect vary by attribute and/or by context. The present study attempts to shed more light on the similarity/dissimilarity debate by analyzing two attributes not examined in either of the studies just reviewed: dominance and self-monitoring.

Dominance. As previously discussed, there is significant evidence to suggest people high on dominance emerge as leaders. Yet most of this research has not also considered whether the dominance levels of the followers had any effect on the nomination of leaders. It is possible that

not all people favor dominant others (as leaders). Dominance Complementary Theory (Kiesler, 1983) certainly suggests they do not. A study of 42 female students by Dryer and Harowitz (1997) also supports the Dominance Complementary Theory. In this study, individuals were first measured on dominance and then instructed to complete a task with a confederate partner, whose dominance level was manipulated by the experimenter. Upon completion of the task, participants were asked to rate their satisfaction with the interaction. Results showed dominant individuals interacting with non-dominant confederates and non-dominant participants interacting with dominant confederates reported significantly higher satisfaction with the interaction than did homogenous dyads. A similar pattern is found at the group level with extraversion, of which dominance is a core facet. In a study of 64 teams, individuals reported higher attraction to their team when the average level of team extraversion was dissimilar to their own (Kristof-Brown, Barrick & Steven, 2005). This is aligned with Barrick, Stewart, Neubert, and Mount's (1998) finding that within group variance in extraversion was positively correlated with group cohesion.

A similar phenomenon is also seen with regard to employee leadership. For example, Grant, Gino and Hofman (2011) showed that pizza store teams perform better if the team leader was high on extraversion and the team was passive and when the team leader was low on extraversion and the team was proactive than in high-proactive and low-passive groups. Similarly, in a study including 96 supervisor-subordinate dyads within an assisted-living healthcare organization, Glomb and Welsh (2005) examined the relationship between supervisor and subordinate control, as measured by the CPI dominance scale, and work-related outcomes. Results revealed subordinates were more satisfied with their supervisor when the supervisors and subordinates were heterogeneous in their levels of dominance. Specifically, subordinates were

most content when their supervisor's level of control was significantly higher than their own. Research stemming from the followership research suggests the opposite pattern also holds. Kelley (1988) proposed four different types of followers, one of which is referred to as the "exemplary" or "star" follower. These types of followers tend to "exercise control and independence and to work without close supervision" (Kelley, 1988, p. 144). They are they not afraid to challenge their leaders and provide suggestions, criticism or advice (Kelley, 1992). These qualities, along with their commitment and focused determination, resemble those of highly dominant people (Gough & Bradley, 2005). Research by Foti & Coyle (2015) revealed that exemplary followers most frequently held an ILT pattern of a "prototypical" leader, or a leader who was sensitive and dedicated and non-tyrannical (i.e. "not domineering," "pushy" or "manipulative"). Since ILT states individuals will select as leaders those who match their own implicit leadership schema, Foti & Coyle's work would suggest individuals high on dominance would nominate others low on dominance as leaders. This is consistent with theory by Bjugstad, Thach, Thompson, and Morris (2006), maintaining that exemplary followers fit best with "delegating" leaders (Hersey & Blancard, 1982), characterized by the tendency to grant decision-making and implementation responsibilities to the follower.

Parker and Wu (2013) propose this dissimilarity effect occurs because "complementarity of dominance avoids confusion and chaos" (p. 396). Considering individuals are attracted to, hold schemas of, are satisfied with, and perform better with others, including leaders, that are dissimilar from them on levels of dominance, it is likely they will also nominate as leaders those dissimilar to them in dominance. Thus I predict:

Hypothesis 7: Dissimilar levels of dominance will be related to the emergence of leaders.

Self-monitoring. In contrast to dominance, there is reason to believe the similarity hypothesis holds when it comes to self-monitoring. Although there is very little empirical research examining the match in self-monitoring between people, it makes logical sense that people prefer others with similar levels of self-monitoring. In a theoretical article, Day and Kilduff (2003) examine the potential effects of high and low self-monitors building relationships with other high or low self-monitors. The authors argue that since high self-monitors tend to occupy advantageous positions in social networks (Mehra et al, 2001) and tend to be driven toward elevating their own social rank, they will likely seek other high self-monitors in order to climb the social ladder. Low self-monitors, on the other hand, tend to show their true selves and are motivated to build relationships based on trust and honestly, as opposed to social rank. As such, according to Day and Kilduff, low self-monitors are likely to seek others who also appear to be genuine and sincere.

In circumstances where a high self-monitor is paired with a low self-monitor, there are advantages in that both parties can gain and learn from the other, but there is also a high risk of the formation of negative affective judgments toward the other. "A risk of high self-monitors is that they will come across as disingenuous because of potential inconsistencies in their opinions and behavior," whereas "low-self monitors may appear dogmatic and inflexible to high-self monitors" (Day & Kilduff, 2003, p. 220). Accordingly, it is probable that low self-monitors find high self-monitors untrustworthy and high self-monitors will find low self-monitors unlikeable (Day & Schleicher, 2006). Given likeability and trustworthiness are found to be important factors in making work-related leadership decisions (Hogan et al. 1994), it is unlikely high self-monitors will select low-self monitors as leaders and visa-versa. As a result:

Hypothesis 8: Similar levels of self-monitoring will be related to the emergence of leaders.

2.7 Leader Behavior

The research discussed up to this point has focused on the particular attributes that leaders and followers possess as predictive of emergence of the dyadic leader-follower relationship. The behavioral approach to leadership, however, focuses less on what leaders have and more on what leaders do that sets them apart from followers (Day, 2012). In addition to attributes, there has been extensive research focusing on the role of behavior in leadership (Burke et al, 2006), yet there has been less research incorporating the two approaches. In their meta-analysis, Judge, Piccolo, and Ilies (2004) advocated for the need for leadership researchers to better integrate the myriad leadership theories both within and across the trait and behavioral leadership theories. Similarly, DeRue, Nahrgang, Wellman & Humphery (2011) state there is a need to better understand, "how leader traits and behaviors complement or supplement each other, and how they can be incorporated into a more integrative model of leadership effectiveness" (p.11). Accordingly, in this study, we attempt to examine not only the effects of individual attributes on leadership emergence, but also perceptions of leadership behaviors on leadership emergence, each while controlling for the other. This allows for the measurement of how attributes and behaviors uniquely contribute to the leadership process, thus enabling a better understanding of the attribute-behavior interplay.

Beginning with the early Ohio State University (Stogdill, 1950) and the University of Michigan leadership behavior studies (Bowers & Seashore, 1966), researchers have attempted to develop taxonomies of leadership behaviors. The result of this research has led to the uncovering of two general factors of leadership behaviors: those that focus on the task (i.e.

"initiating structure" and "task-oriented") and those that focus on people (i.e. "consideration" and "relationship-oriented") (Halpin & Winer, 1957; Stogdill, 1950), which have attracted much research attention (Judge et al., 2004). Examples of task behaviors are organizing, planning short-range activities, clarifying roles and expectations, and developing means to reach goals. People behaviors are actions related to supporting, encouraging, uniting and inspiring other group members though personal relationship-building (Yukl, 2002).

Using meta-analysis Judge et al. (2004) demonstrated the importance of these two behavioral factors in leadership outcomes. Specifically, task-related and person-related behaviors were significantly correlated with follower job satisfaction ($r = .19$; $r = .40$, respectively), follower satisfaction with the leader ($r = .27$; $r = .68$, respectively), leader job performance ($r = .24$; $r = .25$, respectively), leader effectiveness ($r = .28$; $r = .39$, respectively) and team performance ($r = .23$, $r = .23$, respectively). Thus, leadership behaviors are an important component of the leadership process, yet most behavioral leadership research has tended to examine the effect of leader behaviors on work-related outcomes and "to focus primarily on formal team leadership structures (i.e., hierarchical, formally appointed leaders)," (Morgeson, Derue, Karam, 2010, p. 6), as opposed to informal, emergent leadership. Consequently, there is a lack of research examining which leadership behaviors are important for the emergence of leadership and in which circumstances.

Research has shown that the appropriateness of different types of leadership behaviors are contingent on the type of situation, and that leaders display behaviors that are most functional in a particular situation (Zaccaro et al., 1991). Accordingly, the same pattern should also hold for the emergence of leadership, such that some leadership behaviors will result in the perception of leadership in particular situations, while not in others. A study by Marta, Leritz, and

Mumford (2005) showed support for this by examining the role of behaviors in leader emergence across 55 teams instructed to solve business problems of varying complexity. Results indicated that for the more complex problems requiring planning and structure, individuals who exercised task-oriented behaviors over consideration-oriented behaviors emerged as leaders. These findings suggest individuals who display task-oriented behaviors in situations in need of planning and structure are likely to be perceived as leaders over those exhibiting relationship or people-oriented behaviors.

Morgeson et al. (2010) also reflected this idea in their analysis of team leadership functions, or behaviors. They first identified four potential sources of leadership in teams: internal (leadership originating from within the team) and external (leadership originating from outside of the team), and formal (leadership from one with a designated leader role) and informal (leadership from one without a designated leadership role). In this way, emergent leadership is conceptualized as informal, internal leadership. Using a set of 15 different leadership functional behaviors, the authors then analyze the degree to which each of the four sources of leadership (informal-internal, informal-external, formal-internal, and formal-external) were best suited to perform each function. Their findings indicated that emergent leaders, or informal-internal leaders, are "best" positioned to "structure and plan," "perform team task," "solve problems," "provide feedback," and "support social climate." They are "better" positioned to "define mission," "establish expectations/goals," and "monitor team." In contrast, emergent leaders are not as well positioned to "encourage team self-management," participate in "sensemaking," "train and develop team," "manage team boundaries," "provide resources," and "challenge team." Taken together, the "best" and "better" behaviors are generally task-related behaviors, whereas the remaining behaviors include more personal-related behaviors (p. 10).

Since in the current proposed study, teams' objectives are to complete the tasks assigned to the best of their ability in the little amount of time specified, requiring both planning and structure, and since the source of leadership is informal-internal, I make the following prediction:

Hypothesis 9: There is a positive relationship between perceived task-oriented leadership behavior and the emergence of leaders.

3.0 Method

3.1 Data Source

Data for this study was acquired from an archival data set from a previous study conducted on behalf of the Army Research Institute (Foti & Hauenstein, 2007). By comparing variable-oriented and pattern-oriented approaches, Foti and Hauentsein (2007) examined the relationships between (patterns of) intelligence, self-efficacy, self-monitoring, and dominance and the outcomes of leadership emergence and effectiveness. The authors implemented a rotation design, in which participants alternate groups so that each member works with every other person only once, thus allowing for the assumption of independence of observations to be met. Analysis was conducted using Kenny's (1988) social relations model, partitioning variance between the actor, the partner, and the relationship. The present study adds to Foti and Hauenstein's work in the following ways: the current study 1) examines attributes characteristic of those who tend to nominate others, or followers in addition to leaders; 2) test the role of similarity/dissimilarity of dyadic partners' attributes as predictors; 3) includes peers' perceptions of leader behavior as predictors; 4) implements a procedure that accounts for the interdependence of embedded relationships; and 5) applies inherently multi-level network analysis to study the combination of micro-level components of a macro-level process.

3.2 Participant Sample and Design

The participants in the study were 99 male first-year undergraduate students, who were members of the Virginia Tech Corps of Cadets (the Corps). The Corps is a structured university military organization, open to all students on campus. The use of freshman cadets was necessary so as to avoid biases resulting from established perceptions of leadership in peers. In exchange for their participation in the study cadets were each compensated $20. Design of the this study was a rotation design: nine subjects rotated through four leadership tasks in groups of three, with the other two in the group being those with whom he had not previously worked. Thus, each person in the group worked with every other person once, yielding eleven groups of nine individuals. Since ERGM is a dyadic analysis that examines the relationships, or ties, between individuals, sample size is best represented as number of ties within the network of participants. Within each group of nine, there are 72 (9 X 8) ties, which yield a total of 792 possible ties across all eleven groups.

3.3 Tasks

It is generally believed that the situation is an important component in the leadership process (Day, 2014). Accordingly, participants rotated though four different tasks, two initiating structure exercises and two consensus/team building exercises. The intention of this strategy was to prevent cadets from participating in the same task twice. The initiating structure exercises consisted of a tower-building task and a manufacturing game, and the consensus/team building exercises consisted of a student college admissions task and the "Lost on the Moon" task.

Initiating structure tasks: The initiating structure exercise was a manufacture game, which resembled one used by Zaccaro, Foti, and Kenny (1991). Teams purchased resources to assemble a toy and subsequently sold it back to a research assistant, or "buyer," for the largest

profit possible. The entire task took approximately 45 minutes and consisted of two planning phases and two assembly phases.

The second type of initiating structure task was the tower building exercise (adapted from Hughes, Ginnett, & Curphy, 1993). The goal of this exercise was for teams to build the highest possible tower of tinker toys with only one piece touching the table. Similar to the manufacture game, the exercise consisted of planning and assembly stages. Twenty minutes were awarded for planning the assembly, and 40 seconds were allotted for the building phase.

Consensus/Team-building tasks: Consensus/team-building tasks focused on facilitating teamwork and group agreement. In the first task, cadets acted as a business school admission committee. They were provided with 8 student application profiles, consisting of demographic information, high school GPA, test scores, work experience, and other personal information. Initially participants were allotted 10 minutes to individually examine the applications and rank order the applicants. Afterwards, groups were given 25 minutes to collectively discuss the applicants and to reach an agreement on the rank ordering of all the applicants.

In the second consensus-building task was the "Lost on the Moon" task. Cadets were told to pretend their spacecraft crashed on the moon and they had to travel to the other side of the moon in order to reach their mother ship. Only 15 items survived the accident, and each cadet was to rank order all items in terms of importance of taking with them on the trek. Similar to the other two team-building tasks, they each had 10 minutes to rank-order the items individually and 25 minutes to collectively decide upon a rank-ordered list.

3.4 Measures

Intelligence. Cadets' scores on the verbal and quantitative portions of the Scholastic Achievement Test (SAT), acquired from college applications, were used to measure intelligence.

This operationalization is consistent with measures of cognitive ability used in other psychological research studies (e.g. Bell & Kozlowski, 2008; DeShon, Kozlowski, Schmidt, Milder, Wiechmann, 2004). In addition, Frey & Detterman (2004) demonstrated there was a significantly high correlation between SAT and general intelligence, as measured by the Armed Services Vocational Aptitude Battery (ASVAB, r=.82, corrected).

Self-monitoring. The Lennox and Wolfe (1984) self-monitoring scale measured participants' self-monitoring. This is a 13-item scale widely used in psychological research and found to be a reliable measure of self-monitoring (α= .83; Foti & Hauenstein, 2007). The scale contains seven items measuring "ability to modify self-expression," such as "I have the ability to control the way I come across to people, depending on the impression I wish to give them," and six items measuring "sensitivity to expressive behavior of others," such as, "I am often able to read people's true emotions correctly through their eyes." The response scale for this measure ranges from 1 (*certainly, always false*) to 6 (*certainly, always true*).

Generalized Self-efficacy. General self-efficacy was measured using the 17-item Generalized Self-Efficacy Scale (Sherer, Maddux, Mercadante, Prentice-Dunn, Jacobs. & Rogers, 1982), which is found to be reliable (α= .85; Foti & Hauenstein, 2007). The measure includes questions related to one's general self-perceptions of ability, such as "I feel insecure about my ability to do things," with possible responses on a 5 point scale, ranging from *strongly disagree* to *strongly agree.*

Dominance. The dominance subscale of the California Psychological Inventory (CPI, Gough, 1990), which measures "pro-social interpersonal dominance, strength of will, and perseverance in pursuit of goals" (Gough & Bradley, 2005, p.6) assessed participants' levels of dominance. It is a reliable measure (α= .88; Foti & Hauenstein, 2007) that includes 46 true/false

items such as, “I like to give orders and get things moving” or “Taking charge comes easy to me.”

Perceptions of Leadership Behaviors. Following each task, cadets evaluated every other peer in the group on 12 behavioral items, similar to those used by Gatewood, Thorton, and Hennesy (1990), which included three dimensions: 1. two items clarifying the situation; 2. five items developing ideas and 3. five items influencing action. Participants were asked to rate on a five-point scale, ranging from *always* to *never* the frequently that each other group member exhibited each behavior. Examples of items were, “Attempted to influence other group members,” and, “Described alternative courses of action.” The scale is included in Appendix A.

Leadership Emergence. Also upon completing all the tasks, each group member assessed every other group member on leadership using the five-item General Leadership Impression scale (GLI, Lord, Foti & DeVader, 1984), which has been found to be highly reliable (α=.93; Foti & Hauenstein, 2007). This assessment measures the degree to which others manifest leadership with a 5-point response scale ranging from *nothing* to *extreme amount*. An example question is, “How much leadership did this member exhibit?” Since ERGM requires that the dependent variable be dichotomous, the responses from this scale was dichotomized based on the distribution of response scores. The GLI scale used in this study is included in Appendix B.

3.5 Procedure

In the fall semester of their first year, cadets were recruited for participation in the study from the Corps’ rosters and assigned to groups of nine. Individuals from different divisions of the Corps, or “companies,” were grouped together in order to reduce the likelihood of previous relational perceptions of leadership. Upon arriving at the laboratory, cadets filled out informed

consent forms and completed the self-monitoring, self-efficacy, and dominance assessments. In groups of three, participants completed each task, rated behaviors of leadership and perceptions of each other group member before rotating on to the next task. Groups were designed so that no individual worked with any other group member more than once throughout the process. Once the entire rotation procedure was finished, participants were debriefed and dismissed. Although in the initial study, this entire procedure was repeated several weeks later, relevant data for this analysis came only from the initial rotation set. After completion of the study, cadets were paid for their participation.

3.6 Data Analysis

In this study, data analysis was conducted using Exponential Random Graph Modeling. This approach regards the entire set of collected data as a network of dyadic leadership perceptions ("observed network"), each represented by a "tie" between "actors," or individuals in the network. Since ERGM assumes that the pattern of leadership ties existing in the observed network results from a set of underlying stochastic, social forces (Robins et al, 2007), the goal using this technique was to uncover those forces driving the pattern of leadership perceptions in the observed network. As such, ERGM tests and models the factors leading to the emergence of leadership as a relational phenomenon. In addition, further justification of using ERGM lies in its unique comprehensive ability to simultaneously examine and account for the role of endogenous network characteristics, other dyadic relationships, and individual actor attributes in the formation of patterns of leadership ties, thus producing more precise standard error estimates than traditional regression analyses (Lusher & Robins, 2013).

ERGM works by simulating network data and using Markov Chain Monte Carlo simulation with Maximum Likelihood Estimation to examine the probability that the observed

network came from a distribution of networks with a specified set of parameters. Once the model converges, the result is as set of parameter estimates and standard errors for each of the predictors in the study. Significant parameter estimates indicate the particular characteristic underlies the leadership emergence process, and positive parameter estimates indicate that the existence of the effect increases the likelihood that a leadership tie is formed, holding all other predictors in the model constant, while negative parameter estimates indicate that the existence of the effect decreases the likelihood that a leadership tie is formed, holding all other predictors in the model constant (Robins et al., 2007).

Data analysis consisted of examining two different models. Model 1 consisted of only the structural characteristics, or controls, included in Table 2: reciprocity, out-star, in-star, and two-path, which were discussed above, and arc. Arc, represents the estimate for the total number of leadership nominations in the network, or the density. It is a normalizing parameter, similar to the intercept in a logistic regression. Initial proposed analyses also included transitivity; however, inclusion of this parameter prevented model convergence, so it was ultimately excluded from both models.

Included in Model 2 were the substantive tests of predictions, comprised of the individual and dyadic covariates (see Table 2) as well as structural controls from Model 1 and an additional control for task type. As discussed above, participants performed two different types of exercises (initiating structure and team-building). Given the research indicating leadership emergence varies by the situation (Day, 2014), it is important to control for differences due to such situational variables. Individual covariate effects reflect whether or not the individual attributes measured increased the likelihood that a leadership tie was formed. This study examined three different types of individual covariate effects: receiver (of the leadership

nomination), sender (of the leadership nomination), and sender-receiver similarity/dissimilarity (or homophily/heterophily) effects. Receiver effects reflected whether scoring high a particular attribute significantly increased or decreased the chance of *receiving* a leadership nomination. High scores on intelligence, self-monitoring, generalized self-efficacy, and dominance were all predicted to increase the likelihood that one would be nominated as a leader, and by default, low scores on them were predicted to reduce the likelihood that one would be nominated as a leader. This positive relationship is represented by a positive and significant parameter estimate for receiver effects. Sender effects, on the other hand reflected whether scoring high a particular attribute significantly increased or decreased the chance of *sending* a leadership nomination. High scores on generalized self-efficacy and dominance were predicted to decrease the likelihood that one would nominate others as leaders, and by defaults, low scores on them were predicted to increase the likelihood that one would nominate others as leaders. This negative relationship is represented by a negative and significant parameter estimate for sender effect. Similarity effects measure whether similar attribute levels between dyad members increase the chances of a leadership tie formation. Self-monitoring was expected to result in a positive similarity effect (or a homophily effect), and dominance was expected to result in a negative similarity effect (or a heterophily /positive dissimilarity effect). Finally, dyadic covariates test if the presence of a separate dyadic relationship explain the formation if a leadership tie (Lusher & Robins, 2013). In this study, this dyadic relationship was the perception of task-oriented leadership behavior. It was proposed that the presence of a perception of task-oriented leadership behaviors between two individuals would result in a positive effect, or an increase in leadership tie formation.

4.0 Results

4.1 Data Structure

In order to conduct analyses using EGRM, data was coded and organized into five different data files. The first file was the attribute file, where rows represented the 99 participants and the columns reflected each of the participants' scores on the four individual attributes: overall SAT (sum of verbal and quantitative scores), dominance, self-efficacy, and self-monitoring. The original data file included 10 missing data cases for SAT; seven missing data cases for self-monitoring; and seven missing data cases for dominance. Since the analyses failed to run when the attribute file with the missing data was included, all missing data cases were replaced with the average value for each attribute.

The second file was leadership emergence criterion data, measured using the GLI scale, which produces scores ranging from 5 to 25. Since the output data using ERGM must be binary (Cranmer & Desmarais, 2010), this data was dichotomized such that "0" represented a "non-leader" and "1" represented a "leader." In order to determine how to dichotomize the data, analysis of normality were conducted (Table 3 and Figure 1). Results indicated that GLI data was normally distributed (mean = 17.96; median = 18.0; range = 5-25), justifying a mean split at 17.5. Thus, GLI leadership ratings of 17 or below were coded as "0", and those of 18 or above were coded as "1". The resulting data file was a 99 X 99 adjacency "mega-matrix," where the 99 rows and column represent the 99 participants. Along the diagonal of this matrix were 11 9X9 "mini-matrices" representing leadership nominations for all nine teams. Each cell represented whether ("1") or not ("0") person A perceived person B as a leader. All remaining cells were filled with a "0." Figure 2 represents an abridged version of the mega-matrix leadership file, representing the first two teams and 18 participants.

The third file was the task file, which exactly resembled the criterion mega-matrix, except that each cell in the diagonal blocks represented the type of task performed by each pair of partners. A "1" was placed in the cell if the pair of individual performed one of the two initiating structure tasks and a "0" was placed in the cell if the pair performed one of the consensus/team-building tasks. Figure 3 represents an abridged version of the task matrix file, representing the first two teams and 18 participants.

The fourth file, the behavior file, was also in a matrix format similar to the task and leadership files. However, since ERGM can handle continuous data for the predictors, each cell on the diagonal blocks represented the sociometric perceptions of leadership behavior scores for each directed dyad. That is, the numbers represented the amount of leadership behaviors person A perceived from person B. The archived behavioral data in the current study was aggregated, so that perceived task-oriented behaviors could not be separated from perceived relationship-oriented behaviors. Thus, though hypothesis 9 proposed *task-oriented* behaviors would be predictive of leadership emergence, the specific type of behavior was not able to be tested in this study. Thus, I studied only the role of all overall perceived behaviors in the leadership emergence process. Figure 4 represents an abridged version of the behavior matrix file, representing the first two teams and 18 participants.

Finally, the fifth file was the structural zero matrix. This matrix was also a 99 X 99 matrix, but each of the 9 X 9 diagonal blocks consisted complexly of "0"s, and all other cells consisted of "1"s. Including this file in the model affixed "0" to the 11 diagonal blocks in the criterion mega-matrix, essentially instructing the model to only consider the relationships affixed with 0's and ignore all the others in the non-diagonal (Kalish & Luria, 2013). Figure 5

represents an abridged version of the structural zero matrix file, representing the first two teams and 18 participants.

In accordance with the proposed analysis, ERGM was used to examine the probability of leadership and followership emergence. Using the ERGM package in the statistical program, R, two final models were run. The first attempted model included the structural characteristics of arc, in-star, out-star, two-path and transitivity, in addition to the structural zero matrix. This model, however, failed to converge due to the inclusion of transitivity. Thus, the final first model included all structural controls aside from transitivity. The second model also included the same structural controls, as well as remaining controls, covariates, and similarity effects listed in Table 2.

4.2 Descriptive Statistics

Included in Table 4 are the means, standard deviations, and correlation statistics of the four individual covariates. As indicated by these results, self-monitoring, self-efficacy, and dominance are all correlated at a level greater than 0.40. Table 5 includes the correlation statistics for GLI, both raw and dichotomized, and leader behaviors. All intercorrelations were relatively high, with the correlation between the raw and dichotomized GLI being the highest ($r = .82$).

4.3 Effects of Structural Characteristics

Model 1 included only the effects of the structural characteristics. The model converged after five iterations using a MCMC sample size of 70,000, a burn-in of 2,000, and interval size of 50. As Table 6 shows, there was a significant effect for "arc" (parameter = -0.978, SE = 0.423, $p < 0.05$) and a significant effect for "out-star" (parameter = 0.220, SE = 0.055, $p < 0.01$). The negative arc parameter indicates that when considering the other structural characteristics,

leadership nominations are less than would be expected in a randomly selected network with the same number of people. The positive out-star parameter signifies that in this network, there is a general tendency for individuals to send leadership nominations to multiple others. Arc and out-star parameters describe the patterning in the network, and the predictors included in the models were hypothesized to underlie the patterns observed.

4.4 Hypothesis testing

Included in Model 2 were all the structural characteristics included in Model 1 with an additional control for tasks, the individual attributes, and the dyadic covariates of peers' perceptions of leadership behavior. Including all elements in this model at once allows for test of the relative effect of each of the hypothesized predictors over and above each other while simultaneously controlling for endogenous network effects through the inclusion of Model 1's structural characteristics. Table 6 includes Model 1 and Model 2 estimates for all the parameters, along with corresponding standard errors and significance. Similar to the results from Model 1, Model 2 included a significant effect for arc (parameter = -2.713, SE = 0.002, $p < 0.01$) and out-star (parameter = 0.205, SE = 0.054, $p < 0.01$). Results for task revealed no significant effect (parameter = 0.087, SE = 0.172, $p > 0.05$), suggesting leadership nominations are not dependent on the type of task (initiating structure or consideration).

The first four hypotheses focused on receiver effects, or attributes associated with the likelihood to receive leadership nominations. Hypothesis 1 predicted that individuals scoring high on intelligence, as measured by SAT scores, would emerge as leaders. Results revealed a significant main receiver effect for intelligence, such that individuals scoring high on intelligence were more likely to be nominated, and thus emerge, as leaders ((parameter = 0.001, SE = 0.001, $p < 0.01$). This finding supports Hypothesis 1. Hypotheses 2 and 3 proposed that one's level of

self-monitoring and self-efficacy, respectively, positively predict leadership emergence. As shown in Table 7, neither the estimates for self-monitoring (parameter = 0.005, SE = 0.010, $p > 0.05$) nor those for generalized self-efficacy (parameter = -0.006, SE = 0.008, $p > 0.05$) reached significance. Thus, no support was found for Hypotheses 2 and 3. Hypothesis 4 predicted a positive relationship between dominance and leadership emergence. Results were consistent with this prediction, revealing that individuals with high dominance levels were more likely selected as leaders (parameter = 0.038, SE = 0.015, $p < 0.01$).

Hypotheses 5 and 6 focused on understanding which attributes characterized individuals likely to send leadership nominations or, in other words, to be followers. Since it was predicted that individuals with low self-efficacy (Hypotheses 5) and low dominance (Hypothesis 6) would emerge as followers, it was expected that parameter estimates for these for sender effects would be negative. The resulting parameter estimate for sender self-efficacy was non-significant (parameter = 0.010, SE = 0.007, $p > 0.05$), yielding no support for Hypotheses 5. However, the sender effect for dominance was, as predicted, negative and significant (parameter = -0.025, SE = 0.013, $p < 0.05$). Thus, Hypothesis 6 was supported, suggesting that individuals low on dominance tended to nominate others as leaders (i.e. be followers).

To examine interaction effects for individual attributes, or whether or not individuals tended to nominate similar or dissimilar others as leaders, Hypotheses 7 and 8 were tested using the ERGM test for heterophily. Hypothesis 7 predicted individuals would select others with dissimilar levels of dominance as leaders, whereas Hypothesis 8 proposed individuals would select others with similar levels of self-monitoring as leaders. EGRM results produced non-significant heterophily parameter estimates for both dominance (parameter = -0.014, SE = 0.014,

$p > 0.05$) and for self-monitoring (parameter = 0.015, SE = 0.012, $p > 0.05$), failing to support Hypotheses 7 and 8.

The final hypothesis, Hypothesis 9, reflected the expectation that the dyadic covariate of perceived peer task-oriented leader behavior would be predictive of leadership emergence, such that individuals would be more likely to nominate as leaders those whom they perceived to exhibit more talk-oriented leadership behaviors. Since the disaggregation of task-oriented and relationship-oriented leadership behavior perceptions was not possible, I tested the relationship between overall leadership behavior perceptions and leadership emergence. The perceived leader behavior was significant and thus predictive of leadership nominations, but the parameter estimate was unexpectedly negative (parameter = -0.716, SE = 0.002, $p < 0.01$). The negative parameter estimate signifies that individuals were *less* likely to nominate those from whom they perceived more leadership behaviors.

4.5 Model Goodness of Fit Tests

The proposed analysis specified that nested model testing would be implemented to compare the goodness of fit between Model 1 and Model 2. In the output for both models, the parameter estimate for the structural zero matrix was –infinity and the standard errors and p value was "NA." This prevented the model from producing overall residual deviance, AIC, and BIC values for the models, so there was not enough information make overall relative model fit comparisons between Model 1 and Model 2. However, since Model 2 contains all the substantive predicted effects in addition to the structural effects, it is a more comprehensive and complete model. Using ERGM, another way to determine goodness of fit is to examine how well the produced model represented the observed data in this study. Table 7 includes goodness of fit test statistic estimates for the parameters included in the model. Non-significant p values mean

that the there is no significant difference between the estimated model and the observed model. Since Table 7 shows no estimated parameter statistics were significantly different from the observed, it was concluded that the produced model fit the observed data well.

5.0 Discussion

5.1 Discussion of Findings

The overarching goal of this study was to better understand leadership emergence as a process. The benefit of using a social network modeling technique to do so is leader *and* follower characteristics, their similarity, and leader behavior can all simultaneously be modeled into one parsimonious model, all while controlling for context (task) and network patterning of interdependencies in the data. In addition, though the level of analysis was at the dyad level, this study operated in a multi-level framework, showing how macro-level leadership emerges from individual and dyadic patterns. Accordingly, the present study is a step in the right direction of obtaining a more complete picture of the entire leadership process. The findings contribute to research in many subdomains of leadership emergence, including those related to group leadership structure, leaders traits, follower traits, relational trait fit, behaviors, and the situation.

A major advantage of using ERGM to study leadership emergence was that patterns of leadership nominations could first be identified in Model 1 and subsequently controlled for in Model 2. One goal in doing so was to attempt to identify the variables responsible for the observed relational patterns. For example, in this study, there was a general tendency for people to nominate as leaders, or follow, multiple others as opposed to simply one person (out-star). If the effect for the out-star parameter evident in Model 1 had disappeared when the hypothesized predictors were added in Model 2, it could be inferred that one or more of the predictors included in Model 2 was responsible for the observed out-star tendency. Such was not the case in this

study; rather, the out-star parameter remained significant even after it was included as a control in Model 2. So, more research is needed to understand why people tend to follow many. Despite the recent surge in studies comparing outcomes of shared vs. hierarchical leadership, there is very little research examining the selection of multiple vs. one leader. Research by Spillane, Diamond and Jita (2003) suggests that, at least within the education sector, some functions are best suited for multiple leaders, whereas others are best accomplished by one leader. Thus, the function of a job/task may determine whether or not people select one or many others as leaders, yet individual characteristics or of those included in this study or interaction time may also predict nomination tendencies. For example, if somebody has a high propensity to trust (Mayer, Davis & Schoorman, 1995), he/she is more likely to view others as reliable. Given the importance of trust in leadership (e.g. Small & Rentsch, 2010), perhaps those more likely to trust others will also be more likely to nominate multiple instead of just one. In addition, it would be interesting to measure if the out-star tendency persisted over time. Given leadership is a dynamic process, it is reasonable to consider that leadership perceptions might also be dynamic. Perhaps people typically choose multiple leaders early on as a means to explore fit but then settle on one leader who they see as their primary leader. A related point for consideration with regard to structural patterning and model predictors is the "chicken or the egg" dilemma. That is, are the leadership structural characteristics in this network a result of individuals' attributes and behaviors, or are the latter a result of the former? ERGM theory claims that network characteristics arise from endogenous dependencies (Robins et al., 2007), yet it also possible that exogenous also drive the patterns otherwise presumed to be endogenous.

As for contributions to the study of leader traits, results reveal that dominance and intelligence were positively predictive of leadership emergence, while self-efficacy and self-

monitoring were not predictive of leadership emergence. The relative importance of the former two is not surprising given that extraversion, which includes dominance, and intelligence have been found to be two of the strongest and most reliable predictors of leader emergence (Judge et al. 2002, Judge et al., 2004; Lord et al., 1986; Tagar et al, 1999). In addition, findings from the previous study using this data, Foti & Hauenstein (2007), were similar. However, when comparing findings from both studies, what is particularly interesting is how small (yet still significant) the parameter estimates were from the present study relative to Foti and Hauenstein's. The likely cause of this discrepancy is that the current study included many more leadership process predictors than the former study (i.e. two follower predictors and two similarity/dissimilarity predictors). In general, the more predictors included in a model, the smaller the parameter estimates. So, when including the other components of the leadership process in one model with leader traits, the relative strength of the relationship appears to be affected. Past research has integrated the role of traits and behaviors in leadership, yet future research should investigate, perhaps through simulation, the stability of relationship effects when more process elements (e.g. followers, structure, context) are simultaneously competing for predictive variance. Such exploration will yield insight into the relative importance of each of the elements' contribution in the process. Another reason for possible differences between regression and ERGM results might be that ERGM accounts for dyadic dependencies, or relationship clustering in the networks, yielding more accurate standard error estimates. Since standard error estimates are used to calculate which predictors are significant, ERGM analyses might yield results with differences in predictor significance. However, since the variables significantly correlated with GLI scores in Foti and Hauenstein's work also emerged as

significant in this study, differences in estimates was more likely due to the addition of predictors.

The lack of support for the role of self-monitoring in leadership emergence is aligned with the finding by Zaccaro and colleagues (1991), who also found no relationship between self-monitoring and peer ratings of GLI leadership behaviors. One idea underlying these two findings might be self-monitoring is an important attribute for a specific type of leadership. In a longitudinal study of predictors of leadership emergence, Emery (2010) found self-monitoring to be a significant predictor of the emergence of people-oriented leaders over time but not a significant predictor of the emergence of task-oriented leaders. Since the present study was a task-driven one, perhaps self-monitoring is not as important in this case as it might be for other leader types. For example, Pearce and Sims (2002) identified five different types of leadership, one of which being "empowering leadership" (p. 173). Empowering leadership includes behaviors such as encouraging others, setting group goals, working in teams, and facilitating self-development, all of which are person-oriented behaviors. Thus, further research might investigate if self-monitoring is a significant predictor of empowering leadership emergence.

Generalized self-efficacy was not related to leadership emergence. One possible explanation might relate to the distinction between generalized self-efficacy and leadership self-efficacy. Research has found an empirical difference between generalized self-efficacy and leadership self-efficacy (Chen et al. 2001; Eden & Kinnar, 2001), but the two constructs are confounded. In order to avoid this, Eden (1988) advocated for including both measures for task-specific and general self-efficacy in research design. In doing so, Chemers et al. (2000) found a significant relationship between leadership self-efficacy and perceptions of leadership, but not general self-esteem and leadership perceptions, which is consistent with Bandura's (1997) theory

that task-specific self-efficacy should be more predictive of task performance than generalized self-efficacy. Thus, it is possible that *leadership* self-efficacy is more predictive of leadership and followership emergence than *generalized* self-efficacy, and in this sample, the latter relationship did not materialize. Replication of this study using both measures of generalized and leadership self-efficacy may help to isolate the unique role of each of the constructs in the leadership emergence process.

The present study not only uncovers emergent leaders' attributes, but it also seeks to uncover attributes of those who nominate one or more others as leaders. Assuming individuals follow those they nominate, nominators in the present study were defined as followers. As evidenced from the results, a defining characteristic of followers in the sample studied was low levels of dominance. It is important to consider this result along with the prevailing stereotype that followers are "passive, deferent, and subordinate" (Uhl-Bien et al, 2014, p.94) and with the results from Carsten et al.'s (2010) qualitative research showing that followers often see themselves as so. According to Heckscher (1994), followers may follow simply because past roles and experiences have conditioned them as so. If followership roles carry stereotypes of non-dominance and people conform to their roles, it is very possible that societal role stereotypes have driven followers to be low on dominance. Trait theorists, on the other hand, argue attributes are stable across life and would likely claim followers are so because they are innately low on dominance (e.g. Eysenck, 1991). Researchers ought to conduct developmental studies tracking dominance levels over time while also considering past roles and experience to determine whether followers are in a sense born or made.

Given the paucity of research on followers, few, if any, have yet been identified. Although the current study found low levels of dominance as characteristic of followers,

researchers should turn attention to uncovering other predictors of the follower tendency. One interesting area to be explored is follower identity. DeRue and Ashford (2010) theorized that dyadic leadership relationships result from a process "whereby individuals co-create reciprocal and mutually reinforcing identities as leaders and followers" (p. 628). This theory states that individuals socially construct the leader and follower identities that they attribute to themselves and others, such that "claims" are the actions an individual takes to affirm his/her own identity as a leader or a follower and "grants" are the actions an individual takes to bestow his/her identity as a leader or follower on somebody else. In this study, a leadership nomination might be considered a reflection of one granting a leader identity to another. So examining how the follower identifies, or claims, himself/herself (i.e. leader or follower) may predict whether or not (s) he sends or receives leadership nominations. It would be expected that those who claim a follower identity tend to send leadership nominations and those who claim a leader identity tend to receive leadership nominations. It should be noted that DeRue and Ashford (2010) operationalize identity claims and grants through verbal and nonverbal behavioral interactions, yet a direct self-report measure could be an alternative way to capture leader/follower identity. Further research might seek to examine the role of both behavioral and self-report measures of leader/follower identities in predicting leadership relationships.

Generalized self-efficacy was the second follower attribute predicted to have a negative relationship with the tendency to send leadership nominations. This relationship was unsupported in this sample but opens doors for additional exploration. Research has found a significant relationship between transformational leadership and follower self-efficacy but that this relationship was moderated by the situation (Den Hartog & Beschak, 2012). Accordingly, perhaps in this case there was no effect because leaders of the group only exhibited

transformational leadership and were thus not nominated by those low on self-efficacy. A study manipulating leadership style and situational factors, such as tasks, can help to illustrate when a relationship between self-efficacy and followership might emerge

This study advances research on predictors of leadership emergence beyond the individual level to that of the dyad by examining the personality match between dyad members as it relates to leader and follower emergence. This study failed to find support for any either of the proposed relationships (dominance and self-monitoring); however this does not necessarily imply these relationships do not exist. ERGM is limited in that it is only able to model bi-directional similarity/dissimilarity relationships. That is, in this study, the dominance dissimilarity parameter estimated *both* if those with low dominance scores tend to nominate those with high scores *and* if those with high dominance scores tend to nominate those with low scores. Still, it is very plausible that complementary fit, or the Dominance Complementary Theory (Kiesler, 1983), holds for those low on dominance in that they tend to nominate those high on dominance but supplementary fit, or the Similarity-Attraction Theory (Bryne, 1971) holds for those high on dominance in that they tend to nominate those high on dominance. The main sender and receiver effects for dominance found in this study allow for the inference of this pattern, based on the finding that those with low dominance tended to nominate others and those with high dominance tended to receive nominations. Regarding self-monitoring, just as the importance of self-monitoring might depend on the type of leadership and context of interest, the effect of self-monitoring similarity may depend on the context. For example, Day & Kilduff, (2003) theorized that self-monitoring dissimilarity between dyad members may result in beliefs that the other is disingenuous or inflexible. However, if there exist high levels of trust and/or liking between the two individuals, perhaps such negative effects would occur, resulting in the

formation of leadership relationships. The influence of other dyadic relationships or perceptions on the effect of dyadic similarity on leadership emergence is an interesting area for future exploration. Since ERGM cannot statistically test for interactions in similarity or dissimilarity effects, no firm conclusions can yet be drawn using ERGM analyses; however, as statistical modeling techniques become more advanced, perhaps researchers can make more fine-grained discoveries as to individual components of the leadership process fit together to produce its emergence.

Demonstration of leadership behaviors is believed to be the primary means through which one emerges as a leader or a follower (DeRue and Ashford, 2010) and thus is a very important component of the leadership process. This study sought to measure the unique effect of perceptions of leadership behaviors on leadership nominations while accounting for all other components in the process. As expected, perceived leader behavior was a significant predictor in the model, and was in fact the strongest of all the exogenous predictors. However, the relationship was negative, implying the *more* leader behaviors one perceived, the *less likely* the perceiver was to nominate him as a leader. What is particularly curious is the relatively high positive correlation found between perceived leader behavior and both the raw ($r = 0.63$) and dichotomized ($r = 0.53$) GLI ratings. This seemingly counterintuitive negative relationship could have been driven by multicollinearity in the predictors, which is likely given the positive bivariate correlation. However, it is also possible, but less plausible, that there is truly a negative relationship between leadership behaviors and emergence. Further research is needed to investigate this potential relationship. Given the research demonstrating that individuals within a military context prefer leaders who are directive and autocratic (Solano, 2006; as cited in Shondrick, Dinh & Lord, 2010) and given that the behavioral scale used in this study consisted

of mainly team-oriented, as opposed to directive, behaviors (see Appendix A), it is possible that the current study's behavioral scale did not adequately reflect leadership for the cadets studied. Thus, further research should also ensure alignment between the behavioral scales and the sample studied and should be replicated on both cadet and non-cadet samples using the measure from the current study and one reflecting more directive leader behaviors. Doing so will not only reflect the generalizability of the findings to other military cadet samples, but might point to the important role of measurement in measured outcomes.

Consistent with findings by Zaccaro et al. (1991) that leadership emergence is stable across tasks, this study revealed that leadership nominations did not differ between initiating structure and consideration tasks. This result is, however, inconsistent with claims that the situation does matter for leadership emergence (Osborn, Uhl-Bien, Milosevic, 2014). One possible reason for this discrepancy is the ambiguity of what is meant by "situations." For example, are differing work-related tasks truly differing "situations"? Without clear taxonomical definitions of situations, researchers will not be able to draw firm conclusions as to the role of context in leadership emergence. Though efforts have been made to develop situational taxonomies (e.g. Sherman, Nave & Funder, 2010) and leadership researchers have highlighted the board variability in what is meant by "context" (Liden & Antonakis, 2009), this area is highly underdeveloped. There exists great potential in further defining how different types of situations influence the leadership emergence process. Another fascinating and uncharted area is how bottom-up leadership processes impact context, or the effect of the components of the leadership emergence processes the context in which they occur.

5.2 Limitations

The present study is certainly not free from limitations. First, in order to use ERGM for analysis, the measure of leadership emergence (GLI) was artificially dichotomized, which truncates the criterion information. However, given the high correlation between the raw and dichotomized GLI scores, it is expected that the current results do not deviate far from those expected if it were possible to use GLI scores. Still, dichotomization forces individuals to fit into either the "leader" or "non-leader" category and does so at an arbitrary cut-point. Thus, despite the reliability of the GLI as a continuous measure of leadership, dichotomization of the scale may misclassify individuals as leaders/non-leaders because of the absolute threshold used. Second, as alluded to above, ERGM is not able to model interactions between predictors and similarity/dissimilarity, so moderated similarity/dissimilarity relationships were absent from the results. Given theory proposing the moderating role of context in leadership emergence, modeling researchers should work to refine current techniques to include the ability to model such interactions.

In addition, like most leadership research, this study is cross-sectional in design. Since a process fundamentally includes development and emergence over a longitudinal period of time (Day, 2014), leadership as a process cannot be fully understood using a thin slice, or cross-section of time. However, because ERGM captures the manner in which micro-level processes combine to form macro-level phenomena, this study sheds some light on how, from a multi-level perspective, leadership emerges in leaderless groups. Nonetheless, further research is greatly needed to develop a theory of time as it relates to leadership (Day, 2014), and to develop longitudinal measures to adequately model how leadership processes develop over prolonged time frames. In doing so, consideration of behavioral *interactions* between dyadic members as

they unfold over time cannot be ignored. DeRue (2011) claimed that leading-following interactions leads to the identifying both oneself and others as either leaders or followers.

In addition, though this study did include many more components of the leadership processes than most studies, it not examine behaviors of followers nor other important relationships outside of perceived behavior, such as friendship and liking. Measuring follower behaviors is very difficult, if not impossible, since there is currently no taxonomy or scale of follower behavior. It is hoped that as leadership researchers move away from the leader-centric view, there will be a push to pursue and define behaviors characteristic of (different types of) followers. As for the other dyadic relationships, research has shown friendship (Slaughter, 20008) and liking are strongly associated with leadership (Hansborough, Lord, Schyns, 2015) and should be controlled. This study attempted to do so through design by conducting the study early in the semester before participants had spent much time to get to know each other and by strategically placing them in groups with members outside of their corps respective groups. Yet, without measuring the relationships, it is impossible to be fully certain they did not previously exist. Finally, the generalizability of this study is limited to the sample used: military cadets. Replication of this study on different samples should be conducted to generalize to populations beyond the current one.

5.3 Conclusion

The current study advances the study of leadership emergence in several ways. First, it is one of the only studies- if not, the only one- that simultaneously considers the role of leader traits, follower traits, leader-follower trait similarity, behaviors, task, and natural social network patterning in leadership emergence. Doing so is once step closer to understanding the dynamic and emergent leadership process. Second, conceptualizing leadership as social network

comprised of individuals embedded in dyads, embedded in the group, this study enables studying leadership as the multi-level process by which it is conceptualized. Finally, ERGM methodology controls for embedded relationships arising from characteristics of the network, allowing for more less biased estimates to be made about the relationship between predictors of leadership emergence. Thus, it joins the leader-centric, the follower-centric, the trait, the behavioral, and the contingency theories of leadership into one multi-level meta-theory of the process of leadership emergence. I hope that future researchers follow suit in uniting previous leadership research to clarify leadership processes.

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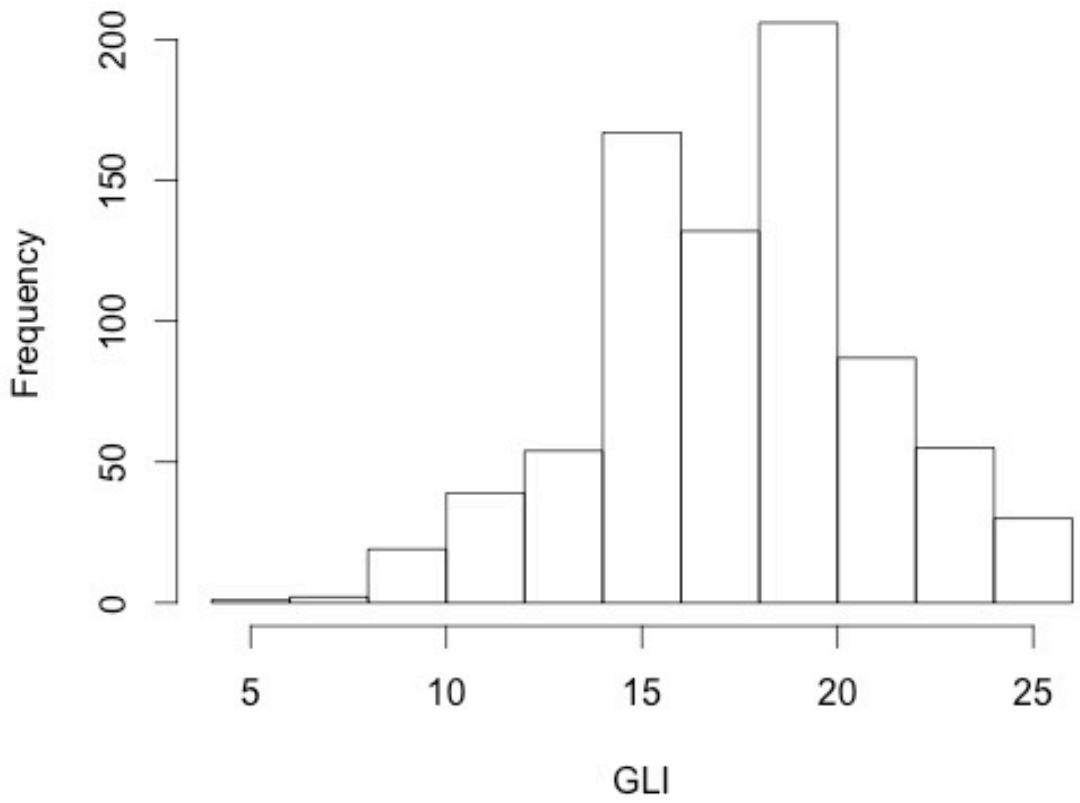


Figure 1: Histogram plot for normality of GLI data; n= 792; mean= 17.96, median= 18; SD= 2.59 skewness= -0.25; kurtosis= -0.18; SE= 0.18

0	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0
1	1	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0
0	1	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
0	1	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0
1	0	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0
1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	0	0
0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	1	1	0
0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0	0
0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0
0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0
0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1
0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	1
0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 2: Sample of GLI mega-matrix file (cases 1-18).

0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
1	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
0	0	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0
1	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0
0	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0
0	1	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0
0	0	1	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0
1	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1
0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	1	0	0
0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0
0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	0
0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1
0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	0	0
0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	1
0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	1
0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	1	0

Figure 3: Sample of task matrix file (cases 1-18).

0	37	24	37	43	41	48	49	42	0	0	0	0	0	0	0	0	0
38	0	36	41	31	19	28	35	42	0	0	0	0	0	0	0	0	0
43	48	0	36	37	44	56	47	47	0	0	0	0	0	0	0	0	0
40	60	32	0	43	28	52	46	42	0	0	0	0	0	0	0	0	0
43	24	43	39	0	32	56	51	42	0	0	0	0	0	0	0	0	0
36	56	42	34	30	0	42	41	33	0	0	0	0	0	0	0	0	0
39	51	44	37	42	45	0	43	40	0	0	0	0	0	0	0	0	0
48	24	38	48	50	41	47	0	44	0	0	0	0	0	0	0	0	0
41	60	20	48	31	36	47	32	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	52	35	42	45	43	55	42	44
0	0	0	0	0	0	0	0	0	59	0	32	29	40	45	27	47	33
0	0	0	0	0	0	0	0	0	49	51	0	40	37	52	39	40	45
0	0	0	0	0	0	0	0	0	39	60	30	0	29	34	55	23	36
0	0	0	0	0	0	0	0	0	30	54	34	38	0	21	43	42	22
0	0	0	0	0	0	0	0	0	40	39	32	12	39	0	27	42	27
0	0	0	0	0	0	0	0	0	48	28	41	39	38	41	0	41	45
0	0	0	0	0	0	0	0	0	41	53	43	53	47	30	36	0	52
0	0	0	0	0	0	0	0	0	47	21	39	47	12	51	26	31	0

Figure 4: Sample of behavioral matrix file (cases 1-18).

0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0

Figure 5: Sample of structural zero matrix file (cases 1-18).

Table 1

Visual representation and description of endogenous structural configurations

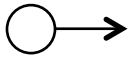
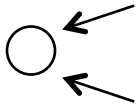
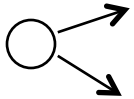
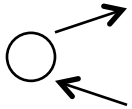
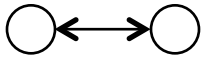
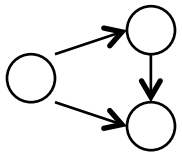
Parameter	Graphic	Interpretation
Arc (Edges)		General tendency to nominate leaders
In-star		Tendency to be nominated by multiple others
Out-star		Tendency to nominate multiple others as leaders
Two-path		Tendency to nominate others and be nominated in return
Reciprocity		Tendency to reciprocate leadership nominations
Transitivity		Tendency to also nominate the nominated leaders' leader

Table 2

Model analysis and expected results

	Model 1	Model 2	Hypothesis
Structural characteristics			
Arc	X	X	Control
In-star	X	X	Control
Out-star	X	X	Control
Two-path	X	X	Control
Reciprocity	X	X	Control
Transitivity	X	X	Control
Exogenous control			
Task	X	X	Control
Individual covariate: Receiver effects			
Intelligence		X	Positive
Self-monitoring		X	Positive
Generalized Self-efficacy		X	Positive
Dominance		X	Positive
Individual covariate: Sender effects			
Generalized Self-efficacy		X	Negative
Dominance		X	Negative
Individual covariate: Similarity effects			
Self-monitoring		X	Positive
Dominance		X	Negative
Dyadic covariate			
Perceived leader behavior		X	Positive

Table 3

Normality data for GLI

	n	Mean	Median	SD	Skewness	Kurtosis	SE
GLI	792	17.96	18	3.59	-0.25	-0.18	0.18

Table 4

Individual and dyadic covariates and correlation matrix

Variable	Mean	SD	1	2	3
1. Intelligence (SAT)	1131.24	107.28			
2. Self-monitoring	58.09	7.01	0.005		
3. Self-efficacy	67.27	10.69	0.132	0.46	
4. Dominance	31.87	6.24	0.083	0.43	0.47

Table 5

Correlations between General Leader Impression Scale and perceived leader behavior

Variable	Mean	SD	1	2
1. GLI, raw	17.96	3.59		
2. GLI, dichotomized[a]	n/a	n/a	0.82	
3. Perceived Behavior	42.88	8.72	0.63	0.53

Note: [a] Dichotomized GLI correlations are point-biserial correlations.

Table 6

Results of ERG model of leadership and followership emergence

Parameter	Model 1		Model 2	
	Estimate	Standard Error	Estimate	Standard Error
Structural characteristics				
Arc	-0.978*	0.423	-2.713**	0.002
In-star	-0.094	0.066	0.019	0.074
Out-star	0.229**	0.055	0.205**	0.054
Two-path	-0.006	0.043	0.017	0.046
Reciprocity	0.011	0.215	0.0374	0.218
Transitivity	n/a	n/a	n/a	n/a
Exogenous control				
Task			0.087	0.172
Individual Covariate: Receiver effects				
Intelligence			0.001**	0.001
Self-monitoring			0.005	0.010
Generalized Self-efficacy			-0.006	0.009
Dominance			0.038**	0.015
Individual Covariate: Sender effects				
Generalized Self-efficacy			0.010	0.007
Dominance			-0.025*	0.013
Individual Covariate: Similarity effects				
Self-monitoring			0.015	0.012
Dominance			-0.014	0.014
Dyadic covariate				
Perceived leader behavior			-0.716**	0.002

*p<0.05; **p<0.01

Table 7

Goodness of fit statistics for model parameters

Parameter	Model 1			Model 2		
	Difference	Test stat.	p-value	Difference	Test stat.	p-value
Structural characteristics						
Arc	-1.136	-0.411	0.681	-1.025	-0.410	0.682
In-star	-3.602	-0.324	0.746	-2.639	-0.270	0.787
Out-star	-2.849	-0.255	0.799	0.361	0.035	0.971
Two-path	-3.687	-0.172	0.863	-8.180	-0.420	0.674
Reciprocity	-0.390	-0.290	0.772	-0.981	-0.764	0.445
Transitivity	n/a	n/a	n/a	n/a	n/a	n/a
Exogenous control						
Task				-0.983	-0.803	0.422
Individual Covariate: Receiver effects						
Intelligence				-1207.516	-0.432	0.665
Self-monitoring				-67.552	-0.474	0.636
Generalized Self-efficacy				-92.124	-0.568	0.569
Dominance				-40.493	-0.515	0.607
Individual Covariate: Sender effects						
Generalized Self-efficacy				-85.041	-0.498	0.618
Dominance				-40.449	-0.507	0.612
Individual Covariate: Similarity effects						
Self-monitoring				-12.042	-0.620	0.535
Dominance				-3.755	-0.223	0.824
Dyadic covariate						
Perceived leader behavior				-1.024	-0.410	0.682

"p-value" = if estimated parameters are significantly different than the observed parameters

Appendix A

DIRECTIONS

READ each item carefully.
THINK about how frequently group member _____ engaged in the behavior described by the item. DECIDE whether he/she (A) ALWAYS (B) OFTEN (C) OCCASIONALLY (D) SELDOM (E) NEVER acted as described by the item. DRAW A CIRCLE around one of the five letters following the item to show the answer you have selected.

1. Presented factual information regarding the purpose of the task. A B C D E
2. Asked for information regarding the purpose of the task. A B C D E
3. Asked for ideas/suggestions from others. A B C D E
4. Built on other group members' effective ideas. A B C D E
5. Described alternative courses of action. A B C D E
6. Offered own ideas. A B C D E
7. Explained, rationally, the value of solutions proposed by group members. A B C D E
8. Asked for consensus/agreement on ideas. A B C D E
9. Showed connections between ideas to gain agreement. A B C D E
10. Offered compromise positions. A B C D E
11. Gained consensus/agreement on ideas. A B C D E
12. Attempted to influence other group members. A B C D E

Appendix B

The following questions concern your feelings towards and evaluations of **GROUP MEMBER** _____. Please circle the answer which reflects your feelings.

1. How much did this member contribute to the effectiveness of the task?

Extreme Amount	Substantial Amount	Moderate Amount	Very Little	Nothing

2. What degree of influence did this member exert in determining the final outcome of the task?

Extreme Amount	Substantial Amount	Moderate Amount	Very Little	Nothing

3. How much leadership did this member exhibit?

Extreme Amount	Substantial Amount	Moderate Amount	Very Little	Nothing

4. How much control over the group's activities did this member exhibit?

Extreme Amount	Substantial Amount	Moderate Amount	Very Little	Nothing

5. If you had to choose a leader for a new task, how willing would you be to vote for this member as leader?

Extreme Amount	Substantial Amount	Moderate Amount	Very Little	Nothing