Measures and models of personality and their effects on communication and team performance

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A B S T R A C T

The importance of teams and their impact on the contemporary workplace cannot be overstated. Many studies have been conducted to point to specific relevant factors related to team performance. Nonetheless, there remains relatively little that is known about the mechanisms and interactions that lead to high performing teams. In this study we consider communication (a key feature of teamwork) as a potentially mediating factor between each aspect of human personality (as measured by the Five Factor Model) and team performance. This exploratory study sheds further light on how personalities affect teams via communication, using a structural equation modeling approach. Results indicate that at least one team measure of extraversion, agreeableness, neuroticism, and openness is moderated by communication in influencing team performance.

Relevance to industry: This research can aid managers on the relative importance of personality metrics on team performance, as well as the nature of the relationships among these metrics. This has the potential to improve organizational performance and reinforces the need for communication in fostering teamwork.

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1. Introduction

Teams are ubiquitous in contemporary enterprises, yet there is much debate about what makes a team perform well. Although, research has tried to assess the optimal composition or selection of teams based on scientific findings, the factors that affect team performance are numerous and the interactions between these factors are intricate and often only partially understood. As a result, many questions about how team composition or team selection can improve team performance remain. Teams can be composed of two or more people, each of whom brings individual skills, experience, behaviors, and styles to the team. This leads to two primary categorizations of team performance metrics: aggregates of *individual* performance outcomes and a direct *team* outcome. Yet, ultimately it is how all these factors interact that lead to team performance.

In this paper we focus on personality, which itself is a diverse set of interrelated characteristics, as a key contributor to team performance. The leading model of personality, the Five Factor Model (FFM), consists of five elements: *openness to experience,*

conscientiousness, extraversion, agreeableness, and neuroticism (John et al., 2008; Goldberg, 1990). The FFM has been studied extensively on an individual level but further exploration is required on the team level (Hough, 2001; Goldberg, 1990; Rothstein and Goffin, 2006; John et al., 2008). Recently, Macht et al. (2014) reported that team extraversion affected team performance, mediated by verbal communication (i.e., utterances, word count, and durations). Motivated by their conclusions, further exploration is required to examine the potential mediation of other factors of personality. Initial exploration discovered that both agreeableness and neuroticism had communication-related elements within their central compositional definitions (John et al., 2008), suggesting potential relationships with respect to three of the five FFM variables (i.e., extraversion, agreeableness, and neuroticism). In this paper we use experimental data to explore the question of how verbal communication may mediate the team personality-performance relationship. The data consist of observation of dyads composed of male engineering students tasked to collaborate on locating and identifying unknown aircraft. We explore the FFM factors with four aggregation methods (i.e., mean, standard deviation, maximum, and minimum) to assess communication as a mediator in their relationship to team performance.

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The remainder of this paper will unpack the relevant theory and motivation of the work, methodology, results, and conclusion. In Section 2, we explore the literature with respect to the five factors of personality, and their relationship to both team performance and communication. In Section 3, we describe the methodology of our experimental environment and statistical analysis structure, followed by the corresponding results and detailed models in Section 4 and an overarching discussion in Section 5. We provide concluding remarks, and compelling areas for future research in the concluding Section 6.

2. Team Personality & Communication

Differential psychology highlights individual personality and intelligence as potentially influential inputs for determining a team's level of performance (Furnham, 2008). In this paper we focus on personality as a key contributor to team performance. The FFM is closely related to the "Big Five" which has been studied extensively on an individual level but still lacks empirical evidence at the team level (John et al., 2008; Rothstein and Goffin, 2006; Hough, 2001; Mount and Barrick, 1998; Goldberg, 1990). Although some links between individuals and teams have been established, there is still limited empirical research on how to relate individual personalities to the performance of teams as a whole (Morgeson et al., 2005; Kozlowski and Bell, 2003). We note that among team studies, there are two broad categories of research that empirically examine either mediating or moderating effects (Horwitz, 2005; Rothstein and Goffin, 2006). A general differentiating description of mediation and moderation is given by Baron and Kenny (1986, p.1176):

"In general, a given variable may be said to function as a mediator to the extent that it *accounts* for the relation between the predictor and the criterion. Mediators explain how external physical events take on internal psychological significance. Whereas moderator variables specify *when* certain effects will hold, mediators speak to *how or why* such effects occur." (emphasis added)

The FFM team research reports standard environmental moderators, such as task type, and aggregation methods on their relationships to team performance.

For converting individual FFM scores to team characteristics, there are several methods of aggregation based on the type of task (i.e., mechanical/technical, intellectual/analytic, imaginative/aesthetic, social, manipulative/persuasive, and logical/precision) performed by the group (Demko, 2001; Neuman et al., 1999; Barrick et al., 1998; Driskell et al., 1987; Steiner, 1972). Among these task types, engineers perform thinking, problem-solving, and decision-making exercises, which align with the key words that identify an intellectual/analytical task (Kwasitsu, 2003; Allen, 1966; Driskell et al., 1987; Lonergan et al., 2000). These terms are also used to describe intellectual teams, whose primary function is to think on intellectual/analytical tasks (Bell, 2007).

Studies suggest a wide variety of measures to formally operationalize individual personalities into *team personalities*, namely mean, standard deviation, minimum, or maximum, that perform well in modeling within various contexts (Demko, 2001; Lonergan et al., 2000; Neuman et al., 1999; Barrick et al., 1998; Driskell et al., 1987). In 1972, Steiner established definitions of individual contributions to team tasks based on their four matching aggregation methods: additive (e.g., summation or mean), compensatory (e.g., variance or standard deviation), conjunctive (e.g., minimum), or disjunctive (e.g., maximum). Bell (2007) provides evidence that the

Steiner (1972) FFM operationalizations do not better predict team performance even when appropriately matched with their task type. In the current study, we will examine heretofore unexamined models of personality, communication, and performance without *a priori* task type categorization. That is, we consider each of the general aggregations to determine the most appropriate for each FFM measure. Thus, what if an intellectual/analytical task were chosen, what team-level operationalization methods of personality link to team performance?

We will conduct an exploratory examination of potential mediation using models of the form illustrated in Fig. 1. If full mediation is indicated (i.e., if M fully mediates the relationship between X and Y), then the a and b links will be significant, and c will not be significant. However, for partial mediation all three links will be significant. Non-significance of either a or b would indicate a lack of mediation. Statistical mediation includes the errors (i.e., e denoted in Fig. 1) of both the mediator and dependent variable to account for potential variation within the model.

This study tests whether communication provides a mediating role in the relationship between any of five dimensions of individual personality aggregated among the team and team performance in an intellectual task. Since the literature is relatively sparse regarding the links among many of the measures modeled, there is in general, insufficient literature to motivate formal hypotheses. Nonetheless, in many places the literature points us toward specific potential relationships among pairs of variables (i.e., a, b, c in Fig. 1). The literature suggests that most of the FFM factors are related to communication based on their respective definitions (John et al., 2008). Consequently, we consider this an exploratory study, wherein we will first detail each of the five personality traits, discuss the relevant literature and intricacies of each associated with communication, and present our *a priori* suppositions for mediation models. Table 1 aggregates these suppositions across all personality metrics and *operationalizations* (i.e., aggregations).

2.1. Extraversion

Initially, *extraversion* was defined as "sociability", "surgency", and even synonymous with "gregariousness" (Driskell et al., 1987; Goldberg, 1990; Barrick and Mount, 1991) all of which traditionally have strong relationships to interpersonal interactions (Gill and Oberlander, 2003). Extraversion is composed of twenty-one subcomponents, six are associated with communication-related terms (John et al., 2008). These terms are related to both low levels (i.e., quiet and silent), also referred to as introversion, and high levels (i.e., outspokenness, talkativeness, sociable, and noisy). Yet, the term communication itself is not specifically a part of the definition
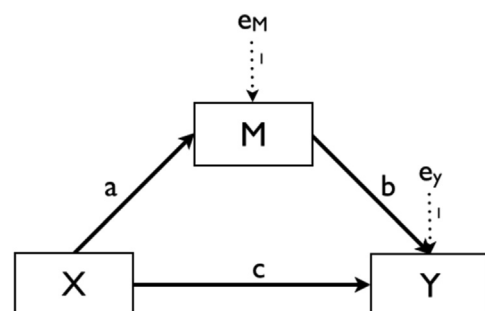

Fig. 1. Statistical graphical representation of mediation.
(Furnham, 2008; Hayes, 2013)