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MEDIATING ENGINEERING DESIGN TEAM PERFORMANCE THROUGH CONSCIENTIOUSNESS AND COGNITIVE STYLE

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ABSTRACT
Within a design context, team dynamics affect final product design, speed of project completion, innovation, and quality level. Despite the criticality of team composition, the formation of teams based directly on scientific findings remains relatively rare. Psychology has highlighted individual personalities and intelligence as potential inputs for determining the level of team performance. Design teams, in particular, are often chosen ad hoc, with membership often based more on niche expertise than with regards to interpersonal interaction.
In this paper, we examine the link between conscientiousness as an aspect of human psychology and engineering design team performance with several cognitive style variables as potential mediating variables. Through regression modeling explored in the context of structural equation modeling (SEM), our model demonstrates a possible negative relationship between the object cognitive style deviation and team performance. This supports research claiming cognitive diversity as a detriment to team success. Finally, we explore the idea that cognitive style could be a mediating variable between conscientiousness and team performance.

Keywords: teamwork, design engineering, human behavior in design, personality, cognitive style

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1 INTRODUCTION

Within a design context, team dynamics affect final product design, speed of project completion, innovation, and quality level. Psychology has highlighted individual personalities and intelligence as potential inputs for determining the level of team performance (Furnham, 2008). But other factors such as individual technical skills and experience or previously established relationships between team members may often mitigate or supersede these psychological effects. Design teams, in particular, are mostly formed *ad hoc*, with membership often based more on niche expertise than with regards to interpersonal interaction (Meneely and Portillo, 2011).

Team performance is often moderated or enhanced by the cognitive styles of members, or the interaction of individuals' perception and comprehension of information. The ability to show good cognitive ability, a trait associated with the Five Factor Model (FFM) measure of conscientiousness, has been known to have a positive effect on performance (Kozhevnikov et al., 2005; Woolley et al., 2007). FFM divides personality into five main elements: *openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism* (John et al., 2008; Goldberg, 1990). Driskell et al. (1987) highlighted conscientiousness (at the time called "prudence") as a factor that "describes socially prescribed impulse control that facilitates task- and goal- directed behavior" (John et al., 2008), such as achievement striving. Kichuk and Wiesner (1997) support the Driskell et al. (1987) conclusion that when looking at an engineering design task (intellectual/analytical task) within an academic environment with first year students that conscientiousness does not relate to team performance. Yet, Lonergan et al. (2000) found that team conscientiousness average and variance both positively relate to team performance.

Team members seek to understand the task individually. Individual cognitive style has been shown to affect the comprehension of information in a given task (Driver and Mock, 1975). Thus, individual and team cognitive style might be considered as indirect links within the personality-performance relationship, with respect to conscientiousness.

If cognitive style can be established as a mediator between conscientiousness (as defined within FFM) and team performance, perhaps this idea could be used to gain a further understanding of team dynamics. To address this notion more formally, we examine the following three research questions:

1. Does conscientiousness within a team predict team performance?
2. Does cognitive style within a team predict team performance?
3. Does cognitive style mediate the relationship between conscientiousness and team performance?

The experimental design involves teams of four, formed naturalistically, who are engaged in an intellectual/analytical (cognitive) task. Cognitive style and conscientiousness are measured along with both individual and team performance. The results are compared using measurements for variation within the teams.

2 PRIOR LITERATURE

Early literature that examined personality's effect on performance primarily focused on the individual level, relating personality to performance on individual tasks (e.g., Mount and Barrick, 1998; Hough, 2001; Rothstein and Goffin, 2006). Despite the considerable literature on how personality relates to individual success, there is still limited empirical research on how to relate the personalities of individuals to the performance of teams as a whole (Morgeson et al., 2005). Although some links between individuals and teams have been established, the question is not a simple one (Kozlowski and Bell, 2003). Teams are often described as being greater than the sum of their parts. However, it has been difficult to fully predict team performance solely on individual personalities, even with the complex statistical tools available to researchers (Hough, 2001). To help address these inconsistencies and low correlations amongst these differing results, Rothstein and Goffin (2006) called for further research on the mediating effects of personality. This literature presents the background information as to how the personality-performance relationship could be mediated by cognitive style.

2.1 Conscientiousness & Performance

A congruency of research on FFM personality factors suggests that conscientiousness (i.e., a trait associated with the terms "organized", "responsible", and "efficient"), no matter the aggregation method, is one of the strongest predictors of individual performance. Due to Barrick and Mount (1991), conscientiousness in the past 20 years is by far one of the most researched factors from the FFM model

of personality because of their conclusions that it is the more generalizable across job types and individual job performance (Rothstien and Goffin, 2006; Robert and Cheung, 2010). However, this does not necessarily dictate how conscientiousness affects people in a team environment.

The natural progression then states that since conscientiousness is highly related to job performance, it must be so for team performance. Driskell et al. (1987) state that a key feature in team formulation is the level of conscientiousness, because increased levels of this quality reflect an organized, routine, and systematic nature. Studies have supported that idea by suggesting that conscientiousness directly and positively relates to team performance (Robert and Cheung, 2010) in addition to the eight out of fifteen published studies from the meta-analysis results by Rothstien and Goffin (2006). Yet, a considerable number of studies have been undertaken with disappointing results when attempting to predict team performance based on conscientiousness (e.g., English et al., 2004; van Vianen and De Dreu, 2001; LePine, 2003; and Barry and Stewart, 1997).

When considering the typical moderating variables of group size and group level, there is no significant relationship to conscientiousness (Barry and Stewart, 1997). However, using the task type as a moderating variable, testing whether conscientiousness relates to team performance has had varying preconditions. Kichuk and Wiesner (1997) support the Driskell et al. (1987)'s conclusion; when looking at an engineering design task within an academic environment with first year students, conscientiousness does not relate to team performance. Within their discussion, Kichuk and Wiesner (1997) claim that this could be due to the fact that the students were in a novelty state of mind at college, thus creating a desire to over compensate in this particular area. Yet, their work confirms that heterogeneity of conscientiousness is significantly negative in its effects on team performance for an intellectual task. Meanwhile Lonergan et al. (2000), who elaborated on Driskell et al. (1987)'s work, found that team conscientiousness average and variance both positively relate to team performance but with moderate to small effect sizes. Lonergan et al. (2000) suggests considering heterogeneity for intellectual and imaginative tasks, even though Stewart (2006) found that team heterogeneity and performance were uncorrelated, in general. Whereas, specifically for conscientiousness, Barrick et al. (1998) support Kichuk and Wiesner (1997) in finding that conscientiousness can lead to better teams only if composed of similar roles (i.e., homogenous teams) to avoid the conflict found in highly conscientious teams. Despite some success for personality predicting team performance, forming a direct link between conscientiousness and team performance has been tenuous, with many conflicting conclusions; consequently requiring further investigations of possible moderating variables as well as others to be kept constant throughout the experiment. The next step is to investigate how conscientiousness can potentially be mediated, which may help bridge and integrate the broad set of extant results.

2.2 Cognitive Style & Performance

Cognitive style refers to how individuals perceive, comprehend, and process an information stimulus (Kozhevnikov et al., 2005). Current research contains conflicting ideas about the taxonomy of cognitive abilities, particularly when decomposed to common, discreet, abilities that can be tested ubiquitously. One of the more popular and historic ways to define abilities is by the Visual-Verbal cognitive style, which places users into two groups: visualizers (those that process with images) and verbalizers (those that process with words) (Pavio, 1971; Richardson, 1977). However, neuropsychological studies have revealed that under the visual processing category, the brain shows a tendency to separate the processing of images into object imagery (shapes, colors, intensity) and spatial imagery (location, orientation, relationships) (Farah et al., 1988; Mazard et al., 2004). Instead of considering a bi-polar design of cognitive style, Blazhenkova and Kozhevnikov (2009) introduce an accepted and validated model for three independent measures of style: object imagery, spatial imagery, and verbal. The ability to perceive and comprehend information depends on form of the stimulus and individual cognitive style. This relates to the availability of information. This information availability can differ between individuals and lead to discrepancies about project focus, needs of the client, scope, and even method of execution (Meneely and Portillo, 2011).

Understanding the composition of team cognitive style, that is, the combination of how people receive, process, and output information, can provide insight into the success of collaborative work. As pointed out by Golian (1998, p.1), "our thinking style greatly affects how we approach the world, relate to others, reason, attain goals, organized, manage, solve problems, lead, and communicate,". We can capture these differences using cognitive style diversity, or the differences in information processing

rather than the separation of information content (Schilpzand, 2010). Connecting team members with different preferences for information processing means that team members are likely to focus on differing perspectives, or aspects, of the information provided. This has been shown to be both beneficial and detrimental to team work (Schilpzand, 2010; Kim, 2012; Aggarwal and Woolley, 2010). On one hand, the similarity of cognitive style will warrant a medium of communication. On the other hand, diversity can provide a more robust conceptual picture of the task.

Research supports the idea that a team with similar cognitive styles will perform better in decision-making and design tasks. Teams formed with a high variation of cognitive style might experience more difficulty in reaching consensus about the scope of the problem and later about presenting the solution. Aggarwal and Woolley (2010) also derived supportive evidence of team composition being integral to the success of the outcome, due to the inherent ways that individuals encode information. The interaction of varying personalities and cognitive styles can create different end results.

2.3 Conscientiousness & Cognitive Style

Interestingly, while it may be difficult to directly relate individual FFM traits to team performance, certain personality traits are correlated strongly with cognitive style. As proposed by a number of researchers, personality forms an integral paradigm through which individuals react towards the world (McGhee, 1978; Pratt, 1980). Cognitive style, similarly, provides a processing lens. McGhee et al. (1978) propose that both variables mediate the process between the stimulus of information and the resultant decisions. While there has been likenesses identified, individuals with the same or similar personalities may intake and process information differently, and arrive at a different conclusion from their counterpart. Thus, it is important to consider both variables in the analysis of a decision or conclusion (Gul, 1984).

Given its history, the standard definition of conscientiousness contains twenty different item measurements, such as team cognitive style-related input measures as degree of being organized, thorough, efficient, responsible, and others (John et al., 2008). Although "being organized" has one of the highest factor loadings on conscientiousness, team cognitive style of how people receive, process, and output information is not objectively measured within the FFM's definition of conscientiousness (McCrea and Costa, 1987). Sometimes conscientiousness was described as an individual's diligent work to earn the highest grade in a particular course (John et al., 2008), and thus as a predictor in an academic setting (Duff et al., 2004). With slight variation, cognitive-motivation work orientation did mediate the FFM's extraversion and conscientiousness factors (Barrick et al., 2002; Rothstien and Goffin, 2006). Yet, in 2010 with Joseph and Newman, there was no significant correlation between cognitive ability and conscientious. Therefore, Dudley et al.'s (2006) work presents a difference between looking at a global and narrow view of conscientiousness, in which the narrow view can be broken down into achievement and dependability. Then, Gellatly (1996) tested the relationship between conscientiousness and performance, where the task was related to the cognitive process; and cognitive processes were defined by performance valence, performance expectancy, and goal choice with the latter two being significant (Rothstien and Goffin, 2006). While team cognitive style appears to have a fundamental connection to conscientiousness, these variables help mediate decisions from an individual perspective. In a design sense, a team component drives the generation of ideas and final design outcome. Therefore, it is a necessity to consider the influence of personality components with cognitive style in a team setting.

2.4 Conscientiousness, Cognitive Style & Performance

Many teams are not instantiated with any prior knowledge of individuals' cognitive style and very little knowledge of their personality. Testing for both cognitive style and personality variables has been explored in terms of variety and variation within a team (Kress, 2012). The variety refers to the personality and demographic components while variation was measured in terms of cognitive style. Kress used individual psychometric assessments and a descriptive observational method to study team performance, but found little evidence of the variation within team cognitive style affecting performance (2012). Personality was not included directly. Kozhevnikov (2007, p. 478), challenges the continuation of exploration in this area, "almost no research has been done recently to examine the relations among cognitive styles and the five basic personality factors."

Woolley et al. (2007) responded to this call for research and examined the differences between object and spatial imagers in homogeneous and heterogeneous teams with control over task type. They

recognized the effect of communication and interactions that are moderated by cognitive style (Woolley et al., 2007; Rypma et al., 2006). A nod is given to personality as a minor moderating variable, but the authors maintain the focus on the interactions within the brain that have been identified with cognitive style (Woolley et al., 2007).

In design teams, challenges arise due to conflicting goals, both on a project level as well as on a personal level. "Designers need to address disparate artistic and technical criteria" that include both personal expression as well as team performance in the achievement of client demands (Meneely and Portillo, 2011, p. 155). Meneely and Portillo studied introductory design students, working in teams and their abilities to generate pleasing designs (as measured by subject matter expert judges). Cognitive dimensions were chosen in lieu of cognitive style and personality. Thus, team performance demonstrated a relationship between both cognitive style and personality within design teams. These results can be equated to a high score in spatial imagery, meaning that the team thinks more globally along with a moderate score in conscientiousness, a key variable in logical or cognitive tasks.

We propose that common language and understanding of the task among team members is mediated by cognitive style, the effort to receive, understand, and process information. We also posit that it is mediated by personality, specifically the level of conscientiousness inherent in an individual. In this research, we explore these variables to add to the literature and further define the effect of conscientiousness and cognitive style on team performance.

3 METHODOLOGY

The purpose of this study is to test whether cognitive style is a mediating variable between conscientiousness and the performance of teams. In other words, we expect that associations between conscientiousness and team performance can be improved by exploring cognitive style dispersion of the team. The experiment consists of an intellectual/analytical task, which takes place within an introductory engineering design course offered at a major university. A total of thirteen teams were analyzed with their team assignments created randomly without prior experience in engineering or with little to no previously established relationships. Measurements of personality and cognitive style are collected using the FFM and the Object-, Spatial-Imager, and Verbalizer Questionnaire, respectively. Team performance is measured using an objective-grading rubric. We then calculate variation within teams and subsequent regression models (illustrated through Structural Equation Models (SEM)) to analyze the effects of individual personality and cognitive styles characteristics on overall team success. The team dynamics are explored in a naturalistic setting where teams are challenged to complete an introductory engineering design project, the redesign of an electric toothbrush to increase its sustainability. This allows us to examine our three research questions in an attempt to understand the relationship between conscientiousness and team performance with the potential mediator of cognitive style.

3.1 Participants

The participants were 40 students enrolled in an introductory engineering course at a major university, with little to no previously established relationships. The gender of the participants was 82.5% male (33:7; male:female). Participation was voluntary, with no compensation based on their time spent on either the measurement tools or the execution of the task. Most of the participants had little or no experience in engineering prior to this course nor had they worked together before.

3.2 Team Structure

The team assignments were formed without prior knowledge of either personality or cognitive style. This naturalistic team formation provides higher fidelity to the formation of teams due to the fact that the interactions observed within the team are not contrived or manipulated impractically. Thirteen total teams were formed from 40 participants: four teams of four; six teams of three; and three teams of two individuals.

3.3 Task

The structure of this design task is similar to that of the Kichuk and Wiesner (1997)'s study, where new collegiate students completed an engineering design task. It was presented as the challenge for teams to analyze the current offerings in the market and design an electric toothbrush that will better meet needs of the targeted environmentally conscious/green population. Students were given the

project steps of: 1) Analysis of customer needs; 2) External search for concept generation; 3) Revision of the design statement; 4) Internal work for concept generation; 5. Concept generation; 6. Concept selection; 7. Embodiment of the design and feasibility analysis; and 8. Detail design.

3.4 Measures

Throughout the experiment, individual and team measures were collected. These include individual measures of conscientiousness, three individual cognitive style metrics, and performance outcomes for both individual and team performance. The Shapiro-Wilk test found all collected variable values to be normal, with no significant correlations found beyond the relationships within the cognitive style metrics.

Conscientiousness was measured by the Big Five Inventory (BFI) as the specific instrument for measuring the Five Factor Model of personality (see John et al., 2008), whose output is scaled 0-100 for each factor. For instance, conscientiousness is scaled such that 100 is the highest level of conscientiousness, and 0 represents the highest level of disorganization. We later aggregate these scores at the team level, by averaging, which is a useful measure of team conscientiousness (Driskell et al., 1987; Lonergan et al., 2000). The use of an aggregation method instead of a true conscientiousness measure was tested and proven to be not a significant difference by English et al. (2004). Given the nature of the task, the effect of aggregation will not be tested here. Note that the average team's conscientiousness scores for these participants were greater than 50, thus representing only half of the scale.

Cognitive style utilized the Blazhenkova and Kozhevnikov (2009) procedure, which was measured using the Object-, Spatial-Imagery, and Verbal Questionnaire (OSIVQ). The questionnaire consists of 45 questions that use self-report metrics and result in three scores, on a scale of 0 to 5 for each element: Object-imagery, Spatial-imagery, and Verbal abilities. A higher score indicates strength in that particular element (Blazhenkova and Kozhevnikov, 2009). In order to compare team cognitive style, a metric for cognitive diversity along each individual cognitive style was generated using the within-team deviation, similar to the procedure followed by Schilpzand (2010). With cognitive style being measured on an interval scale, defined by Harrison and Klein (2007) as a separation type of diversity, standard deviation is an appropriate measure to explore the dispersion of team data.

The team performance metrics include an objective grading procedure. The grading procedure was guided by a rubric that was offered to the teams at the beginning of the task and accomplished by an independent grader, given the final report generated by the team at the end of the task. Ten weighted categories, including "Customer Needs & Revised Problem Statement," "External Search & Design Target," "Concept Generation," "Concept Selection," "Concept Improvement," as well as others were graded from the final report output on a scale of 0 – 10 with the final score being an aggregation of the individual scores.

3.5 Assessment Methodology

Given the metrics of team standard deviation in conscientiousness, object imagery, spatial imagery, and verbal ability, along with the team performance measurement of final score, regression offers preliminary analyses of the research questions. Structural Equation Modeling (SEM) is a flexible "system of regression equations" that has the distinct advantage of identifying rarely detectable relationships using traditional methods, which presents a valuable technique for testing for significance of multiple mediating variables (Nachtigall et al., 2003). In this paper, SEM is being used to explain complex linear and multiple linear relationships that are often examined separately (Nachtigall et al., 2003). A saturated model, shown in Figure 1, was used to ensure identifying all relationships by including each possible arc (line) between each node pair (the square represents a directly observable variable) to test whether cognitive style mediates the personality-performance relationship. Each model is based on the assumption that team conscientiousness' variance (denoted by the circle, an unobservable variable) is equal to one. We include tests for the variance of the other SEM model nodes. The following SEM models use the notation provided in Table 1 (Fox, 2002):

Table 1. Notation for Structural Equation Models (Fox, 2002).

Variables		Coefficients & Covariates		Error	
x	exogenous variables	γ_{ij}	coefficient for the effect of x_i to y_i	δ_i	measurement error for the effect of x_i
y	endogenous variables	β_{ij}	coefficient for the effect of y_i to y_i	ε_i	measurement error for the effect of y_i
		Ψ_{ij}	covariate for the effect of y_i to y_j		

The SEM model we present was selected in order to examine the three research questions posed, by considering the most general model that was reasonable to test. The first question is examined by the arc gamma$_{14}$, where it directly investigates the relationship between conscientiousness and team performance. The second half of the model using the beta arcs (one per cognitive style) helps illustrate the question of cognitive style relating to team performance. Since there are three separate measures of cognitive style each of their covariates were additionally assessed. Whereas the whole model functions to help answer the last question, which is: does cognitive style mediate the relationship between conscientiousness and team performance. Note that within Figure 1, the conscientiousness exogenous variable is the mean aggregation method, and the cognitive styles are the standard deviation aggregation method of the individuals within the team, and performance is the overall project score outcome.

The statistics to evaluate model fit are given in terms of Bentler Comparative Fit Index (CFI) and standardized root mean square residual (SRMR), as suggested by Hooper et al. (2008). Bentler's CFI is normalized to have a range of 0 to 1, with results typically greater than or equal to 0.95 as statistically significant; whereas the SRMR is a standardized version of the root mean square residuals (RMR) with statistically significant results less than or equal to 0.09. These goodness-of-fit statistics were used as information to analyze the SEM.

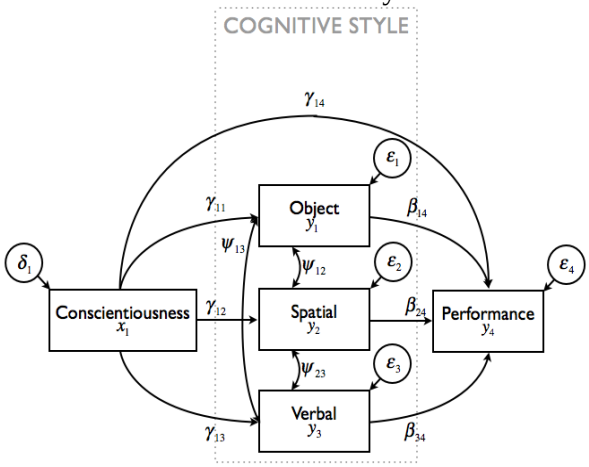

Figure 1. SEM: Team Performance with Mean Conscientiousness and Aggregate Cognitive Style

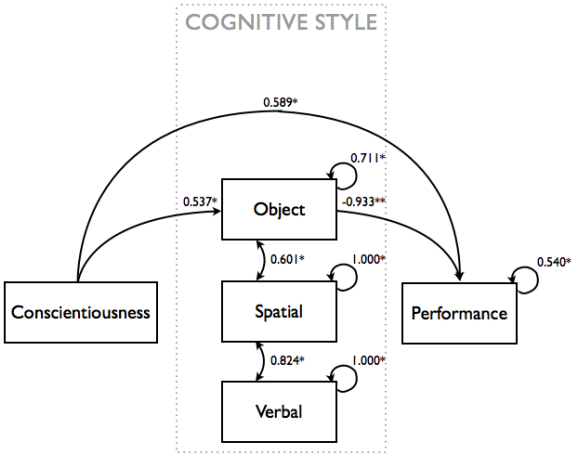

Figure 2. SEM Results (* $p < 0.05$, ** $p < 0.01$)

4 RESULTS & DISCUSSION

The data were analyzed using two complementary techniques of regression modeling demonstrated through the SEM model shown in Figure 1. Figure 2 summarizes the results from fitting the SEM, wherein only statistically significant relations from Figure 1 are shown for clarity, with their coefficients shown associated with each relationship. Overall, the SEM fits the data well (SRMR = 8.479e-17) and (Bentler CFI = 1), and yields two paths from conscientiousness to team performance.

The first path is directly from the mean conscientiousness to team performance (p = 0.0418). This agrees with Lonergan et al. (2000) and does not agree with Driskell et al. (1987), whose results for an intellectual/analytical (problems-solving) task indicate that average conscientiousness does not have a direct relationship with team performance. Thus, the personality-performance correlation was tested and it was not significant (r = 0.0842). Based on these results and the original SEM significance level at just over the 95% confidence threshold, we ran a simple linear regression model to test whether conscientiousness and team performance relate without the entire model. The regression results were statistically insignificant as there was no linear relationship (p = 0.45), thus confirming Driskell et al. (1987), and Kichuk and Wiesner (1997) and not Lonergan et al., (2000). The result between the personality-performance relationships with respect to conscientiousness for this task type is partially supported.

The second pathway relating conscientiousness to team performance goes through one of the cognitive styles. As expected, the object form of cognitive style relates to team performance in a negative fashion, -0.933 (p = 0.0098). That is, as the deviation of object styles within a team increases, team performance will suffer. This offers insights into the communication mode of the team. As discussed

by Aggarwal and Woolley (2010), less cognitive diversity within a team will warrant better performance. As expected, variances between each of the cognitive styles are positive, (Cov(Obj, Spt) = 0.601, p = 0.044*; Cov(Spt, Vrb) = 0.824, p = 0.027*; Cov(Obj, Vrb) = 0.538, p = 0.063). An interpretation of this would be that as the deviation of one cognitive element within a team increases, the deviation of other cognitive elements would also increase. This is due to a slight inverse relationship on an individual person's level between each of the cognitive styles. Individuals usually display dominance of one cognitive style over the others (Kozhevnikov et al., 2008). Thus, a high score in one aspect will usually mean a lower score in the remaining two styles. Therefore, it can be surmised that the standard deviation of scores within a team will covary positively.

The fact that conscientiousness relates to cognitive style's object measure, which in turn relates to team performance, provides an indication that cognitive style could indeed mediate this particular personality-performance relationship. The results indicate that a higher team average in conscientiousness coupled with less variation in object style within a team will result in greater team performance. In an attempt to confirm this through a two-step regression analysis, linear models with both average conscientiousness and object cognitive style standard deviation are found to be borderline significant (p = 0.058 and p = 0.118, respectively). However, the promising results from the SEM indicate a need for further investigation. The endogenous variables each demonstrate a factor of significant variance, which serve to improve the model. All of the variances are significant at the same level (p = 0.014). By taking both personality and cognitive style into account when selecting a team, designers can increase the chances for team success in an intellectual/analytical task.

5 CONCLUSION

In this paper, we examined the link between conscientiousness as an aspect of human psychology and engineering design team performance with several cognitive style variables as potential mediating variables. Our analysis produced inconclusive results as to whether a direct link exists between conscientiousness and team performance. However, each statistical test within our analysis has shed light on the mediating variables of the relationship. Our model demonstrates a possible negative relationship between the object cognitive style deviation and team performance. This supports research claiming cognitive diversity as a detriment to team success. The other cognitive styles, spatial and verbal, were not significantly related to team performance, but were significantly indirectly linked through object style. Finally, we explored the idea that cognitive style could be a mediating variable between conscientiousness and team performance. Given the strong links from conscientiousness to object cognitive style to team performance (p = 0.027; p = 0.001), respectively; cognitive style along the object-imager component could be a mediator of team performance. This insight extends current research and encourages the continuation of study in this area. For design teams, our findings indicate that creating teams with smaller object style deviation can enhance team performance. Adding this aspect as an educational component would be an avenue for future study.

We remark that despite the relatively small sample size (n = 13), the significant levels were at a 97% and 98.99% confidence for the relationship between conscientiousness to object cognitive style to team performance, respectively. Yet, the inconclusive significance associated with the conscientiousness and team performance relationship does require an increase in sample size. With the addition of the expansion to team size, the dispersion of the teams along the average conscientious spectrum should also broaden. Exploring the intellectual/analytical task in an academic setting could have been a contributing factor in confounding the results. Although teams were not contrived or manipulated, similar to professional design scenarios, the lack of experience of the student population could influence their success within the design task. Scaling this research to teams of design experts would be a goal of future research. Even with the mitigating effects of the length of time on the project, extending the current results to a wider set of participant characteristics and task types will be invaluable for better understanding the effects of conscientiousness, and cognitive style on team performance.

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