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## **CONGRUENCE, PERSONALITY AND HOMOPHILY/HETEROPHILY INTERACTIONS**

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### ABSTRACT

**Objective:** The purpose of the study was to verify if personality characteristics and congruence are associated with homophily and heterophily in two intraorganizational networks: Support Network and Team Selection Network. **Method:** a survey-type cross-sectional study in which 61 professionals belonging to a single organization of the third sector with a focus on industry participated. The participants responded to three instruments: an inventory of professional interests and occupational demands, for estimation of congruence, personality measure, and two sociometric questions. **Results:** Congruence was not shown to be related to homophily or heterophily. Personal characteristics such as extroversion, neuroticism, and agreeableness are associated with homophily, and heterophily in the two mapped networks. **Conclusion:** Differently from personality, the most congruent professionals do not interact according to homophily or heterophily in the work environment.

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# **INTRODUCTION**

There are still gaps regarding the role of person-environment congruence (hereinafter congruence) and personality in the composition of the most diverse organizational social networks (Huang et al., 2020; Laakuso et al., 2020; Rocconi et al., 2020; Vianen, 2018). The present study sought to identify whether congruence and personality present homophilic (homogeneity) or heterophilic (heterogeneity) attributes in two organizational networks: the first based on the demands for cooperation and support (SSN) and the second on the occupational demands for training teams (TSN) (Lee et al., 2010). Homophily occurs when people unite because of their similarities or affinities, creating groups that share common characteristics. The assumption is that similarities make it easier to manage group demands with positive effects on cohesion (Ilmarinen et al., 2017). Heterophily, in turn, relies on individual differences, seeking complementarity (Lee et al., 2014). In this case, it is assumed that interactions are more challenging to meet the various demands of the group. This type of composition is more likely to expand the intellectual and technical domain of the group, given the multiplicity of contributions brought by the different members (Lee et al., 2014). The literature points to the influence of personality on homophilic and heterophilic interactions (Kovacs & Kleinbaum, 2019; Laaksuo et al., 2020).

By associating with people with similar characteristics (homophily), individuals seek greater internal cohesion and are more able to predict the behavior of others, bringing stability to intragroup relationships (Noe et al., 2016). On the other hand, interactions based on heterophily are more open and able to deal with new situations, as a result of the complementarity of knowledge and actions, increasing the group's creativity and improving the problem-solving process (Laaksuo et al., 2020). Despite this accumulated knowledge, it cannot be stated whether all personality dimensions are associated with homophily/heterophily, nor whether these relationships would be established in any work networks (Smirnov &Thurner, 2017; Solomon et al., 2019). Current literature does not have a conclusive answer to these questions. For example, Wolf and Krause (2014) point out that in social networks some personality characteristics may favor cohesion or diversity (homophily and heterophily respectively), while in other contexts the effect may be the opposite. In addition, no evidence was found to support the associations between congruence and homophily/heterophily in work networks. Congruence, which refers to the adequacy of professional interests to the set of occupational demands (Hall et al., 2022; Holland, 1997; Leichener et al., 2022), could be more associated with homophily or heterophily depending on the situation. For example, in the case of high learning demands to cope with the challenges of work goals, the need for support from peers would lead the less experienced professional to select those who they assume to have greater mastery and adjustment

to organizational demands (Thiel, 2021). Their choice, therefore, would be based on heterophily. Taking into account the importance of intraorganizational social networks for achieving broader goals, the aim of the study was to identify associations between five personality dimensions (extroversion, agreeableness, neuroticism, openness to experience and conscientiousness), congruence (personalenvironment fit) and the types of interactions based on homophily or heterophily in two intraorganizational social networks. The first would be motivated by the search for social support (SSN), and the second by the selection of work teams to carry out projects (TSN). The first network assesses relationships of trust and support and the second network aims at composing groups to carry out some activity. It is expected to contribute to the field of composition and management of work teams in organizational contexts. In terms of theoretical contribution, the study can contribute to the associations between personality, congruence and intraorganizational social networks. From the practical point of view, it can generate inputs for people management and the development of intraorganizational social networks.

Congruence in intraorganizational contexts: Theories based on the person-environment fit (Person-Environment-Fit or PE-FIT) focus on the interaction between the characteristics of the individual and the work environment, considering the mutual influence between these components (Holland, 1997; Nye et al., 2016). In summary, according to Holland (1997) the preference for professional activities expresses the personality of each individual, configuring the so-called vocational type. People prefer to develop activities that can be classified into six types: Realistic, Investigative, Artistic, Social, Enterprising and Conventional. These dimensions are part of a typology represented in a hexagonal model known as RIASEC (Realistic, Investigative, Artistic, Social, Enterprising and Conventional) (Etzel & Nagi, 2021; Leichner et al., 2022). As described by Holland (1997), occupational activities are categorized according to one or more types of RIASEC. The following paragraph briefly characterizes the activities based on the six dimensions:

**Realistic:** involves activities that include explicit, orderly, and systematic manipulation of objects, tools, machines, and animals.

**Investigative:** involves activities of observation, investigation, reading, accumulation and analysis of data related to physical, biological and cultural phenomena.

**Artistic:** involves ambiguous and non-systematic activities, with a high degree of autonomy. These include those related to the manipulation of concrete (physical) and verbal materials to create forms of expression and new products.

**Social:** involves activities related to interpersonal management, group work, training, development, and avoiding orderly and systematic activities involving direct manipulation of tools and machines.

**Enterprising:** involves activities in which one can influence other people to achieve individual or collective goals. Interested in economic activities.

**Conventional:** involves systematic data manipulation activities and the performance of ordered procedures.

Individuals seek work environments whose demands involve activities of their choice, and congruence occurs when there is an adjustment between work environment demands and individual interests (Holland, 1997). Congruence is defined, then, as the adequacy of professional interests to occupational demands. Recent evidence suggests that congruent professionals influence the organizational innovation process and organizational learning capacity (Ertl *et al.*, 2022; Sun *et al.*, 2020). It is assumed that intraorganizational networks composed of more congruent professionals are more interdependent, have efficient communication and proactive behaviors, since the cost of interactions is reduced and the incentive for investment and personal development is high, since

professionals can do what they want (Chiang, &Takanashi, 2011). A work network composed of professionals with similar characteristics and skills leads to a higher incidence of prosocial behavior and an improvement in the flow of information (Chiang, & Takanashi, 2011). The essence of congruence according to Holland (1997) is found in the notion of well-being and harmony at work. Much more than performance and job satisfaction, which are related to countless other organizational variables, the person-environment fit (congruence) would be linked to the formation of homogeneous, predictable and sustainable environments in which occupational demands can be incorporated through the interaction between professionals with compatible repertoires.

Homophily and Heterophily in two intraorganizational networks: Interactions based on personality and congruence: According to Xie et al. (2015), different organizational contexts lead to different patterns of interaction between employees. In environments controlled by collaborative demands, in which the help of colleagues becomes necessary to carry out activities, significant heterophilyis observed, that is, individuals prefer to establish interactions with those who have different skills, aiming at complementarity. In organizations whose activities can be developed in isolation, with no need for collaborative effort between colleagues to complete tasks, social ties are established through similarity in order to maximize cohesion, utility and local efficiency (Solomon et al., 2019). The basis of the composition of these bonds is the homophily that occurs through the creation of bonds based on similar attributes shared between peers (Smirnov & Thurner, 2017).

For Holland (1997), occupational environments select professionals with attributes and skills compatible with the activities required by these same environments. Collaborative demands will promote groups based on heterophily criteria in order to acquire complementary skills. Competitive demands, in turn, will stimulate the creation of groups based on homophily, aiming to minimize risks and ensure performance (Xie et al., 2015). In the first case, diversity is sought to facilitate adaptation and learning, unlike the latter case in which the choice of colleagues is of an instrumental nature, that is, the desire is to achieve organizational objectives more quickly, enhancing internal cohesion (Chiang & Takanashi, 2011). What defines the flow of information and interaction in work networks are occupational demands (Park et al., 2020). In support-seeking networks (SSN), where learning and support demands are prevalent, less congruent professionals are expected to select more congruent ones to assist them in their activities. On the other hand, in team selection networks (TSN) there are projects to be completed with tight deadlines, and the already trained professional needs to select equally capable ones to carry out the task (Stadfeld et al., 2020). Therefore, the following hypothesis was formulated:

- **Hypothesis 1a:** Congruence is associated with interactions based on heterophily in the support-seeking network (SSN);
- **Hypothesis 1b:** Congruence is associated with homophily interactions in team selection networks (TSN).

The association between homophily and personality characteristics using the big five factor model has already been investigated (Huang et al., 2020; Laakuso et al., 2020; Solomon et al., 2019). For support seeking networks (SSN), characterized by interactions involving affinities, some dimensions seem to facilitate the integration and formation of groups. For example, in some studies, conscientiousness and openness have been shown to be associated with homophily (Noe et al., 2016). Homophily and heterophily are not opposites but complementary. Homophily contributes to the organization by creating cohesive and stable environments, in which fundamental interactions for the maintenance of organizational culture and practices occur (Kovacs & Kleinbaum, 2019; Smirnov & Thurner, 2017; Stadfeld et al., 2020). Heterophily, in turn, contributes to promoting new learning necessary to update organizational processes, especially in the face of challenging goals in which solutions are not already developed (Xie et al., 2015). The relationship between personality and homophily, in the understanding of Prewett et al.

(2009), will depend on contextual demands, so that in work networks (performance), dimensions such as conscientiousness and neuroticism are more relevant to predict the formation of bonds than extroversion and openness to experience. The same seems to be true for heterophily, as in the study by Wolf and Krause (2014), the authors concluded that differences in personality in the participants had effects on the behavior of professionals, increasing competition and generating changes in the structure of the network. It is argued that personality dimensions will lead to homophily-based interactions only in support-seeking networks (SSN). Professionals will show preferences for interacting with those who have similar personalities, forming homogeneous groups in circumstances where there is no competition or very intense demands between the actors. In situations involving competition, professionals may set aside their preferences and focus on solving the problem, seeking preferential interactions with more efficient individuals and not those with similar personalities. Considering the points listed above, the following hypothesis was formulated:

• **Hypothesis 2:** Personality dimensions tend towards homophily in support-seeking networks (SSN).

# METHOD

Participants: A total of 61 workers (74% women and 26% men) participated in the study. The survey was carried out in partnership with a private organization in the tertiary sector and the corporate segment. The organizations are located in Bahia, with the company's headquarters located in Salvador and with representatives in other regions of the state. Its activities involve the selection and qualification of professionals, assistance in opening companies, and training entrepreneurs, providing these services to other companies in the industry sector. Among the participants, 10 (16%) did not have higher education, 24 (40%) professionals were graduates, and 27 (44%) attended postgraduate courses. Regarding occupation, nine (15%) participants were interns, 40 (65%) permanent employees, and 12 (20%) individuals with leadership positions. The average time in the organization was 6.81 years (minimum: 0.5 years; maximum: 26 years). Inclusion criteria were a) minimum age of 18 years; b) participation in a working group.

**Choice and characterization of the organization:** To conduct the study involving networks, a small organization (20 to 99 employees) from the corporate and financial sector was selected. All the activities and projects of the organization are carried out through the composition of teams. The activities developed in the organization allow characterizing it as an Enterprising and Social RIASEC environment involving selection, training, strategy and finance. Thus, the environment presents homogeneity and representativeness for these occupational environments, allowing the understanding of intraorganizational interactions in this context.

**Ethical Procedures:** The study was submitted and approved by the coordination of the graduate program in Psychology, as well as the Psychology Research Ethics Committee (CEP). CAAE: 38443120.9.0000.5686.

#### Instruments

*Vocational Interests Scale* – *VIS:* Developed by Teixeira *et al.*, (2008), it uses the six dimensions present in the RIASEC model. The scale contains 48 items, eight items per dimension. Items contain descriptions of activities that participants are asked to rate as attractive to them. The items are arranged on a Likert scale, whose values ranged from 1 (I dislike it very much) to 5 (I like it very much). The psychometric properties are: internal consistency (Cronbach's alpha): R (.64), I (.77), A (.81), S (.82), E (.68) and C (. 74). Analysis of principal axis factoring (PAF), with Oblimin rotation, demonstrated adequacy of the items to the six-factor model, explaining 49.20% of the total variance.

**Occupational Classification Inventory Revised** – **OCI-R:** An inventory made by Brito and Magalhães (2017). The measure presents the six dimensions according to the RIASEC model, having 54 items, nine items per dimension. The statements ask the respondent to inform the frequency with which the activities are performed by the professional. Participants select their responses on a Likert scale (1 = Never; 5 = Always). The psychometric properties are: internal consistency (Cronbach's alpha): R (.85), I (.88), A (.79), S (.86), E (.80) and C (. 79). The factors explained a total of 47% of the total variance.

The Next Big Five Inventory (BFI-2) (Translated into Portuguese): The instrument uses the Big Five Personality Factors model and was adapted and validated for use in Brazilian samples (Soto & John, 2016). The scale has 76 items divided among the five dimensions. The dimensions correspond to extroversion ( $\alpha = 0.87$ ), agreeableness ( $\alpha = 0.82$ ), conscientiousness ( $\alpha = 0.84$ ), neuroticism ( $\alpha = 0.86$ ) and openness ( $\alpha = 0.82$ ). Responses are recorded on a Likert scale (1 = It has nothing to do with me; 5 = It has everything to do with me). The article with the national version of the measure is still being prepared.

**Socioeconomic and sociometric questionnaire:** A questionnaire prepared by the researcher that requests socioeconomic data (gender, age, etc.) and data relevant to interpersonal relationships in the work environment. Two questions were prepared for the composition of social networks, the first corresponding to the support search network (SSN) and the second to the team selection network (TSN): 1): If you need any support or information, indicate colleagues who you would certainly ask for assistance because they are more receptive or very knowledgeable. 2) You are one of the people responsible for forming a team and you need to select among your colleagues those who work most in tune with you and who would add more value to the group's activities. Identify the people you would select to make up this team.

**Data Collection Procedures:** Data collection took place online using Google forms. The link with the invitation and the TCLE was forwarded to the employees only after analysis and approval by the organization. By consenting, the professionals could finally have access to the questionnaires. It is worth mentioning that the study was conducted in this way due to the restrictions that organizations had to follow due to the pandemic caused by the SarsCov 2 virus (Covid 19).

**Data treatment and analysis procedures:** The following tasks were performed: a) data cleaning; b) assignment of codes to participants (with fictitious names) in order to preserve anonymity and compose the networks; c) preparation of network matrices (in which each person cites and is cited by the others); d) creation of all networks in UCINET 7.72 software; e) measurement and analysis of congruence, network and personality scores.

#### **Congruence score calculation**

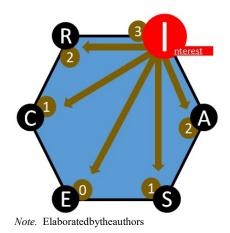


Figure 1. RIASEC Hexagonal Model and its congruence levels for the Investigative dimension

- The three highest scores for professional interests (VIS) and for the occupational environment (OCI-R) were converted into the respective categorical values relevant to each dimension of the RIASEC model. For example, Realistic (R) is assigned a value of 1, Investigative (I) is assigned a value of 2, Artistic (A) is assigned a value of 3, and so on (In this case R,I,A would be 1, 2, 3 respectively). With the nominal values corresponding to each interest/environment dimension, the comparison step is carried out.
- Three variables resulting from the paired comparison between 2) the hierarchies of interests and environments resulting from the first stage were elaborated. A value of 3 was attributed to equal interest/environment; 2 for different hut close interest/environment (e.g., interest R and environment I or C) (adjacent pairs). E 1 when the interest/environment was different, and more distant (alternate pairs) (e.g., interest R and environment E or A). And finally, 0 (zero) when interest and environment were opposites (e.g., interest R and environment S). Figure 1 presents an example of the Investigative dimension of the Interest scale and its corresponding dimensions, adjacent, alternating, and opposite in the Environments scale.
- 3) Finally, the *C-index* was used, an algorithm widely used to calculate congruence (Brito&Magalhães, 2017). The *C-index* has the formula: C = 3 (x1) + 2 (x2) + 1 (x3). Where "C" represents the congruence and "x" the congruence value of each respective interest/environment pair (values obtained in the previous step). This algorithm produces a score between 0 (minimum congruence) and 18 points (maximum congruence).

#### **Estimation of Homophily and Heterophily**

For estimation and comparison involving homophily/heterophily, the *E-I Index* generated by the Ucinet software was used (Ribeiro *et al.*, 2019). This algorithm has the formula:

$$E-I Index = \frac{EL-IL}{EL+IL}$$
(1)

EL represents the number of interactions with the outgroup (which has different scores/characteristics) and IL represents the number of interactions with the belonging group (which has similar scores/characteristics). The algorithm estimates the proportion of interactions between members of the same group with members of different groups. The values obtained can orbit between -1, which indicates total homophily (preferential interactions with members that have similar characteristics) and +1, which indicates total heterophily (preferential interactions with members that have different characteristics). Finally, values close to or equal to zero point to the absence of homophily/heterophily influence.

#### Classification of congruence and personality dimensions

Considering the absence of theoretical criteria to demarcate the thresholds in the dimensions of personality and congruence, the creation of groups was based on purely statistical criteria. Starting from the median, the scores of the dimensions of the investigated constructs are equally divided, with the lower group having the lowest scores and the upper group having the highest scores. With this, comparisons were made in the analysis of homophily/heterophily involving these groups.

#### **Data Analysis Procedures**

The analyzes are described in the following ordered steps: a) descriptive statistics of all variables studied (Statistical Package for the Social Sciences [SPSS]); b) Analysis of interactions involving homophily and heterophily as a function of personality and congruence dimensions (UCINET).

Software/tools used: SPSS 23; Ucinet; Microsoft Excel.

### RESULTS

General information about personality and congruence

Table 1. Get	neral Descriptive	e Data on Con	gruence and
]	Personality Dime	nsions (N= 61	)

Index	Е	Ag	С	N	Op	Cg
Mean	3,6	4,1	4,0	2,3	3,4	11,3
Standard Deviation	0,5	0,4	0,4	0,5	0,5	3,8
Median	3,6	4,1	4,1	2,3	3,3	11,0
Minimum	2,4	2,9	3,1	1,3	2,1	2,0
Maximum	4,8	4,7	4,9	4	4,4	18,0

Note. E = Extroversion; Ag = Agreeableness; C = Conscientiousness; Op = Openness; N = Neuroticism; Cg = Congruence; Minimum: minimum values obtained in the variable; Maximum: maximum values obtained in the variable

Table 1 presents the descriptive data of personality and congruence used in this study. Values for the extroversion (2.4), agreeableness (2.9) and conscientiousness (3.1) dimensions suggest that study participants had high scores for these dimensions.

Effects of personality and congruence on homophily and heterophily types of interaction

Table 2. Homophily/Heterophily Estimation Using the E-I Index for SSN and TSN

Variables	SSN (n = 155)			TSN (n = 200)		
	Out	In	E-I index	Out	In	E-I
						index
Extroversion	62	93	-0,21	72	128	-0,28
Agreeableness	66	89	0,15	82	118	-0,18
Conscientiousness	83	72	0,07	106	94	0,06
Openness	82	73	0,06	101	99	0,01
Neuroticism	16	139	-0,81	20	180	-0,81
Congruence	83	72	0,07	106	94	0,06

Table 2 shows the E-I Index used to estimate homophily and heterophily. Negative values represent homophily, while positive values represent heterophily. Values close to zero indicate that there is no observable trend. For SSN, the data indicate that extroversion (*E-I Index* = -0.21) has a low degree of homophily, indicating little preference for interaction with peers. Neuroticism showed a high degree of homophily (*E-I Index* = -0.81), indicating that people with lower scores are more stable and tend to prefer to interact with peers. Considering that most of the sample proved to be emotionally stable, this could also imply that the most neurotic, on the other hand, tend to be isolated. Agreeableness showed a slight tendency towards heterophily (EI Index = 0.15). For the conscientiousness, openness and congruence dimensions, the results were close to zero, so that no trend was observed. For TSN, the data in Table 2 indicate that extroversion (*E-I Index* = -0.28) and agreeableness (*E-I Index* = -0.18) have a slight tendency towards homophily, contrary to neuroticism (E-I Index = -0, 81) which shows a high tendency for homophilic interactions. For support network (SSN), the conscientiousness, openness and congruence dimensions showed values close to zero, which demonstrates the absence of a trend in these interactions.

## DISCUSSION

First, it was established that congruence, which measures Holland's (1997) person-environment fit, would correspond to a greater capacity for selection-interaction with relevant peers according to work demands. Given the scarcity of empirical evidence surrounding these relationships, this was the main contribution of the study. However, the data obtained did not support hypothesis 1a and 1b. More congruent professionals did not tend to interact with more congruent professionals in SSN. They also did not select professionals equally capable in TSN. These data bring an important point to the field literature, as congruence suggests that it is not a construct with homophilic and heterophilic properties. That is, congruent

professionals do not demonstrate preferential interactions with others in the work environment, with the most adapted professionals being able to conduct their tasks well (Ertl et al., 2022; Nye et al., 2016). Congruence would be associated with the professional's social capital. The more adjusted they are, the more they tend to establish relationships with people with whom they can gain advantages and opportunities for growth (Laakuso et al., 2020). The organization presents enterprising demands and activities focused on professional qualification and finance. Its structure is shown to be hierarchical when considering the possible interactions between interns, staff, managers and the highest management positions. It is possible that professionals, regardless of the level of adjustment, have in practice few options to freely select those with whom they share interests and skills, resulting in fixed teams defined by management (Laakuso et al., 2020; Park et al., 2020). The second hypothesis tested the relationships between personality and homophily dimensions in SSN. The literature demonstrates that personality characteristics contribute to the establishment of lasting friendships and affinity professional contacts, and that this trend can be observed both in face-to-face contacts and in digital networks (Huang et al., 2020; Laakuso et al., 2020). However, the literature also provides evidence that some personal characteristics can disrupt interactions in the work environment when demands do not involve cooperation (Wolf & Krause, 2014).

The data obtained offer partial support for the second hypothesis, since some personal characteristics (extroversion and neuroticism) tended towards homophily for both networks (SSN and TSN). Agreeableness, in turn, showed a trend towards heterophily in SSN and homophily in TSN. Finally, for conscientiousness and openness to experience no relevant results were identified. The importance of personality dimensions in the composition of homogeneous and cohesive groups differs not only from the observed personality dimension, but also from the context in which networks are observed (Prewett et al., 2009). Returning to the study data, extroversion and neuroticism are useful attributes in the composition of teams for both SSN and TSN, demonstrating that they can facilitate the composition of homogeneous work networks (Park et al., 2020). Agreeableness on the other hand, would tend in SSN towards diversity (heterophily) while in TSN slightly towards homogeneity (homophily). Some personal characteristics are more flexible in the understanding of Nelson et al., (2011), and may present different trends in each situation, since they fulfill their purpose in both cases. Agreeableness would be associated with cooperation, altruism and assertiveness, and may be more focused on harmony and group stabilization in the case of TSN, while offering greater support to complementarity and flexibility in SSN. In both cases, Agreeableness would fulfill its purpose of favoring a good image in the eyes of others. Openness and conscientiousness did not indicate preferential interactions in the studied networks. Despite the evidence presented that highlights the homophilic aspect of these two characteristics, openness refers to the breadth of interests and creativity. These results were in the opposite direction to what the literature points out. According to Noe et al., (2016), in work contexts, openness to experience and conscientiousness would be the most relevant characteristics in attracting and selecting professional teams, rather than agreeableness and extroversion. That was not verified in this study. With regard to conscientiousness, it would be expected that professionals with a greater focus on goals and impulse control, concerned with productivity, would tend to prefer people with similar attributes in how they work. Again, no relevant results were identified.

*Limitations:* It is noteworthy to mention that the classification criteria of the groups with low and high scores in the dimensions of personality and congruence were purely statistical, considering the sample distribution obtained and dividing the participants into two groups, separating those with the lowest scores from the highest. This procedure was chosen due to the absence of theoretical criteria to define the threshold that separates more and less congruent professionals, and what would be the ranges of low and high scores in the personality dimensions. In addition, the study did not directly control variables such as job title, age, and time of employment.

Taking into account the observed results, it is possible that formal characteristics such as belonging to a management team are more important than personal affinities, which perhaps influence the peer selection process more than personality itself.

### CONCLUSIONS

The present study led to the conclusion that congruence is not associated with homophilic and heterophilic characteristics, therefore it would not affect the preference for interactions in the intraorganizational networks studied. Only some personality dimensions showed homophilic tendencies, this being the case of neuroticism and extroversion that tended towards homophily in both networks. This result suggests that neuroticism and extroversion contribute to the composition of groups both in the face of cooperative and competitive demands. Considering that studies involving both congruence, personality and social networks are not frequent in the organizational literature, replication of the study is recommended, in view of the aforementioned potential and limitations. It is mainly expected that subsequent studies will investigate these relationships in different RIASEC environments.

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