



Hierarchy Navigation

Individual Differences in Tactics, Strategies, and Traits

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Abstract

Navigating status hierarchies depends on the coordination of traits, abilities, tactics, and strategies. Various components of the nomological net of hierarchy navigation have been examined in relative isolation, with mixed findings. In the current study ($N=1,042$), we examined interconnections between key aspects of hierarchy navigation psychology using network analytic methods. We found evidence of functional coordination between aspects of embodied capital, tactics, and strategies. We also found sex differences in specific links between components of hierarchy navigation that follow theoretical expectations. Finally, we found robust interconnections between broad personality traits and hierarchy navigation tactics, replicating previous research. These findings help refine the nomological network of hierarchy navigation and provide a foundation for future research to investigate whether and how its structure changes across cultures and contexts.

Keywords Hierarchy · Personality · Embodied capital · Status · Dominance · Prestige

Status hierarchies of varying degrees of steepness and complexity were a recurring feature of social groups throughout hominid evolution (Boehm, 2012; Brown, 1991). Even within relatively egalitarian groups, rank within the social hierarchy would have influenced fitness-relevant outcomes (Jaeggi et al., 2020; von Rueden & Jaeggi, 2016; von Rueden et al., 2011). The coordination of cognition and behavior to navigate status hierarchies would therefore have been a fundamental adaptive problem

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throughout human evolution (Henrich & Gil-White, 2001; Kyl-Heku & Buss, 1996). Consequently, humans should possess a rich psychology designed for navigating hierarchies (Kyl-Heku & Buss, 1996; Tooby & Cosmides, 1990).

Research has begun to shed light on aspects of the psychology of hierarchy navigation in human groups by identifying (i) specific tactics used to negotiate for higher status (Kyl-Heku & Buss, 1996; Lund et al., 2007), (ii) broad strategies of status attainment (e.g., Cheng et al., 2010), and (iii) various psychological and physical traits that are linked to status striving and attainment (e.g., Anderson et al., 2001; Gurven et al., 2014; Lukaszewski et al., 2016). But these elements have yet to be empirically integrated into a holistic picture of hierarchy navigation psychology (Grosz et al., 2020; Maner, 2017). Doing so is necessary for understanding whether and how individual differences in hierarchy navigation underpin broader trait constructs (Kyl-Heku & Buss, 1996; Lukaszewski et al., 2020; Zuroff et al., 2010). This paper integrates previous research on the psychology of hierarchy navigation and empirically examines the interconnections between (i) specific hierarchy negotiation tactics, (ii) broader strategies of status attainment, and (iii) more general psychological and physical traits within the nomological network of hierarchy navigation.

The Nomological Net of Hierarchy Navigation

Hierarchy navigation requires the coordination of specific tactics and broad strategies, as well as general psychological and physical traits, abilities, and characteristics (Kyl-Heku & Buss, 1996; Zuroff et al., 2010). Although the nomological net of hierarchy is large and complex, existing research has investigated only fragmented components in relative isolation. Below, we summarize findings from such investigations before turning to the task of exploring how each component fits within the larger configuration of hierarchy navigation psychology.

Tactics An array of tactics support hierarchy navigation. Kyl-Heku and Buss (1996) used act-nomination procedures to identify over 100 specific acts that people use to get ahead. In an initial investigation, the between-person variation in these tactics could be adequately described by five dimensions: *manipulation*, *industriousness*, *social-networking*, *autonomy*, and *aid accrual*. Each component exhibited unique associations with personality traits and several aspects of rank attainment such as self-esteem and longitudinal indicators of career success. A follow-up study in a sample of Norwegian adults across four professional business settings found further support for the effectiveness of hierarchy negotiation tactics using criteria such as income (Lund et al., 2007); however, in this study, the tactics that clustered into the *autonomy* and *aid accrual* factors in the initial study did not reliably cluster together, leaving only three robust dimensions. It is therefore unclear whether hierarchy negotiation tactics reflect a smaller number of latent common causes or are simply individual tactics that sometimes cluster together because they are themselves causally linked. For example, the tactics ‘work hard’ and ‘obtain knowledge’ may cluster together simply because obtaining knowledge to pursue status often requires hard

work, rather than because they both are caused by a latent “industriousness” trait; or the tactic ‘deceptive self-promotion’ may require ‘boasting’, which causes these tactics to cluster, rather than a latent tendency towards manipulation or deceit. Re-examining the interconnections between hierarchy negotiation tactics is necessary to understand how they are coordinated, as well as how their coordination fits within broader strategies of status attainment.

Strategies Previous research on hierarchy navigation has identified and popularized two broad strategies of status attainment: *dominance* and *prestige* (Cheng et al., 2010, 2013; Henrich & Gil-White, 2001; Maner, 2017). The dominance strategy is hypothesized to be characterized by use of forceful, coercive, and aggressive tactics. The prestige strategy, in contrast, is hypothesized to be characterized by tactics involving the development and maintenance of socially valued characteristics, such as knowledge or skills. Although both strategies may be uniquely effective for obtaining status in some contexts (Cheng et al., 2013; Brand & Mesoudi, 2019), evidence is mounting that dominance is generally less effective as a long-term strategy for maintaining status (Durkee et al., 2020; Redhead et al., 2019; von Rueden et al., 2019). The two strategies are hypothesized to be largely distinct, such that people high in dominance do not tend to be either or high or low in prestige, and vice versa (Cheng et al., 2013). However, research has not yet examined whether patterns of interconnections between the tactics used to navigate hierarchies reflect independent dimensions of status attainment. Further, little research has investigated how attainment strategies may be determined by examining, for instance, how dominance and prestige relate to the more general physical and psychological traits that are linked to status attainment.

General Physical and Psychological Traits Many specific physical and psychological traits are relevant to status attainment and hierarchy navigation (Buss et al., 2020; Kyl-Heku & Buss, 1996). Research examining links between psychological traits and status attainment tend to focus on broad personality traits in isolation, while research on links between physical traits and status attainment tend to focus on the more general constructs of bargaining power and aspects of embodied capital (e.g., formidability, physical attractiveness) in isolation. To unify these relatively disparate research programs, we summarize the evidence for links between status, personality, and embodied capital below.

Personality Traits Links between broad personality traits and status attainment are relatively clear. Extraversion is robustly related to status attainment across contexts (Anderson & Cohen, 2014; Grosz et al., 2020). Associations between other five-factor model personality traits and status attainment are more variable across contexts (Anderson & Cohen, 2014; Grosz et al., 2020). Importantly, evidence of the correlations between status attainment and broad trait constructs do not, by themselves, reveal why personality traits are (or are not) linked with status (Lukaszewski et al., 2020). But exploration of how specific tactics, broad strategies, and personality are uniquely interrelated can yield more detailed insight into how and why personality is linked to status attainment.

It remains unclear whether and how broad personality traits are related to hierarchy navigation tactics. Although several specific tactics of hierarchy negotiation are linked with extraversion, the tactics are also differentially and uniquely linked with other personality traits, suggesting that broad personality dispositions may partially capture individual differences in tendencies to use certain tactics to get ahead (Kyl-Heku & Buss, 1996; Lund et al., 2007). Unfortunately, the relatively small samples and inconsistent clustering of tactics in previous research leaves the reliability of these apparent tactic-personality links in question.

Evidence for links between personality and status-attainment strategies is also inconsistent. Some evidence suggests that extraversion and agreeableness are more closely associated with dominance than prestige, whereas conscientiousness and neuroticism tend to be more associated with prestige than dominance (Cheng et al., 2010). Contradictory findings suggest that extraversion is more closely tied to prestige, while only agreeableness is reliably linked to dominance (Monge-López & Álvarez-Solas, 2017). It is therefore unclear how these status attainment strategies map onto personality traits, suggesting that more fine-grained examination of specific tactics in relation to strategies and personality traits is warranted.

Extant research on links between personality and individual differences in hierarchy navigation psychology has tended to focus on the five-factor model of personality, with no studies directly investigating whether links differ under the HEXACO model of personality. Extant research suggests that the low end of the honesty-humility dimension of personality may reflect tendencies towards risk-taking in pursuit of status (Ashton et al., 2010), which indirectly suggests that hierarchy navigation tactics associated with this unique dimension may not be reliably captured under the five-factor model. Examinations using the broader HEXACO model could therefore be useful for understanding links between personality and hierarchy navigation psychology.

Embodied Capital Physical traits are also tied to status attainment. Most generally, the traits that contribute to status tend to be components of *embodied capital*—characteristics that generally contribute to expected future fitness, such as intelligence, attractiveness, formidability, and health (Kaplan et al., 2003; von Rueden et al., 2015). Evidence suggests that these traits are positively associated with men’s and women’s status among peers across diverse groups from around the world (Anderson et al., 2001; Buss et al., 2020; Gurven et al., 2014).

Research has not directly examined the extent to which hierarchy navigation tactics are linked with embodied capital—such that individuals with specific components of embodied capital deploy tactics that are most effective, given their possession of that component of embodied capital. However, indirect indications that embodied capital may be predictive of hierarchy navigation tactics and strategies are evident in associations between embodied capital and personality (e.g., Kerry & Murray, 2018; Lukaszewski, 2013; Sell et al., 2009; von Borell, 2019), provided that these associations overlap with status-personality links.

If hierarchy navigation tactics and strategies are calibrated to their effectiveness, then aspects of embodied capital should be differentially linked with tactics and strat-

egies that increase their likelihood of success. For example, if formidability increases the effectiveness of tactics associated with a dominance strategy more than a prestige strategy, formidability might be more strongly linked with such tactics and strategies. Further, embodied capital generally influences social *bargaining* power: the ability to get one's way across a wide variety of situations (Lukaszewski, 2013). Relationships between tactics and embodied capital traits may therefore be facilitated by bargaining power. These indirect connections could explain links between embodied capital, social value perceptions, and status.

The Current Study

Although previous research has identified many components of the nomological net of hierarchy navigation psychology and investigated various segments in isolation, the holistic picture remains incomplete. Several questions about the structure of hierarchy navigation psychology are unanswered: Does the patterning of traits and tactics of hierarchy navigation map on to the broad strategies of dominance and prestige? Are the traits that generally increase the effectiveness of specific tactics and strategies associated with their use? Is the general nomological network of hierarchy navigation the same or different for men and women? Do specific associations between components of the nomological network of hierarchy navigation differ for men and women? To answer these outstanding questions, we examined the interconnections between the specific tactics, broad strategies, and general physical and psychological traits implicated in hierarchy navigation using the psychological network approach (Borsboom, 2008; Schmittmann et al., 2013; Costantini et al., 2015; Epskamp et al., 2018; Epskamp & Fried, 2018).

Methods

Participants

A total of 1,147 undergraduate students from a large university in Central Texas participated in this research in exchange for partial fulfillment of a requirement for course credit. We did not include in our analyses 59 participants who failed four of seven attention check questions randomly placed throughout the survey, 17 participants who self-reported that they answered honestly to less than 70% of the questions, 23 participants who self-reported that they paid close attention to less than 70% of the survey, and six participants who self-reported biological sex as neither male nor female. After these 105 exclusions, the final sample size for analysis is $N=1,042$ (659 women). Participants' ages in the final sample ranged from 18 to 43 years old ($M=19.89$, $Md=20$, $SD=1.89$).

Our sample size was determined by tradeoffs between the study's primary goal of obtaining reasonably accurate estimates of associations between the focal constructs, as well as constraints on time that could be devoted to data collection. Importantly, our sex-specific sample sizes are larger than what simulations show are adequate to

reliably recover a true population correlation of $\rho = 0.10$ within a stability corridor of 0.10 with 90% confidence (Schönbrodt & Perugini, 2013). Moreover, the total sample size is more than double the sample sizes of previous studies investigating the psychology of hierarchy navigation.

Study Procedure and Materials

Participants accessed the survey through the university's research study listserv and completed it online via Qualtrics. After providing informed consent, participants answered demographic questions (i.e., sex, age, ethnicity, and sexual orientation). Participants then completed the following blocks of questionnaires in a random order for each participant to counteract potential order effects. Individual questions within each block were also presented in a random order for each participant. Participants completed the survey by answering two questions about how much attention they paid to the survey and how honest their answers were.

Hierarchy Negotiation Tactics We assessed participants use of specific hierarchy negotiation tactics using the 109-item measure developed by Kyl-Heku and Buss (1996). Participants read instructions that said, "We all do things to get ahead. Following is a list of things people sometimes do to get ahead. Please read each item carefully and decide how likely you are to perform each behavior to get ahead." Next participants rated how likely they would be to perform each of the 109-tactics to get ahead on a seven-point scale (1 = *very unlikely*; 7 = *extremely likely*). The full list of 109 items organized into the 26 tactic-parcels is provided in the inventory originally published by Kyl-Heku and Buss (1996) is provided in the appendix of Lund et al. (2007). We provide indices of reliability for each tactic-parcel in the Appendix.

Status Attainment Strategies We assessed the degree to which participants perceived their status attainment strategy to be based on prestige or dominance using the self-report version of the Dominance-Prestige scale (Cheng et al., 2010). The 17-item scale contains eight items assessing dominance (e.g., "I enjoy having control over others") and nine items assessing prestige (e.g., "Members of my peer group respect and admire me"). We instructed participants to "Please indicate the extent to which each statement accurately describes you by writing the appropriate number from the scale below in the space provided." Participants then rated each item on a seven-point scale (1 = *Not at all*; 7 = *Very much*). We provide indices of reliability for each scale in the Appendix.

Personality Traits We measured participants standing on the HEXACO personality traits (Lee & Ashton, 2004): Honesty-Humility (H), Emotionality (E), Extraversion (X), Agreeableness (A), Conscientiousness (C), and Openness (O). To reduce the burden on participants, we used the 24-item brief HEXACO inventory (De Vries, 2013), which exhibits strong and reliable associations with longer HEXACO mea-

asures (e.g., HEXACO-PI-R; Lee & Ashton, 2004). Example items from each of the six factors include, “I find it difficult to lie” (H), “I am afraid of feeling pain” (E), “I easily approach strangers” (X), “I tend to quickly agree with others” (A), “I make sure that things are in the right spot” (C), “I have a lot of imagination” (O). See the appendix of De Vries (2013) for the full list of 24 items and their groupings. Participants indicated how much they agreed each of the 24 statements were true of them on a five-point scale (1 = *strongly disagree*; 5 = *strongly agree*). These aim to tap the broad conceptual space of each personality dimension with few items, and thus have lower reliabilities than longer measures or scales that focus on narrower aspects of trait space (see Appendix for reliabilities Table 1).

Aspects of Embodied Capital We assessed three specific aspects of self-perceived embodied capital: *formidability*, *attractiveness*, and *health*. Before completing these measures, participants were instructed to “please rate how much you agree or disagree with the following statements.” Participants provided answers on a four-point scale (1 = *strongly disagree*; 4 = *strongly agree*) for all embodied capital questions. We measured *self-perceived formidability* using the Self-Perceived Formidability Scale (Durkee et al., 2018). Example items from the nine-item measure include “I am a physically strong person” and “If I had to, I could beat most people my age and sex in a fight” (for full item list, see Durkee et al., 2018). We also asked participants to report the maximum number of full push-ups they could do without stopping ($M_{\text{men}} = 31.04$, $Mdn_{\text{men}} = 29$, $SD_{\text{men}} = 20.39$, $Range_{\text{men}} = 0\text{--}150$; $M_{\text{women}} = 10.59$, $Mdn_{\text{women}} = 9$, $SD_{\text{women}} = 8.78$, $Range_{\text{women}} = 0\text{--}75$). We measured *self-perceived attractiveness* using a three-item measure developed for the current study to tap specific and broad aspects of physical attractiveness: “I have an attractive body”; “I have an attractive face”; and “I am physically attractive”. We measured *self-perceived health* with an additional three items developed for the current study: “I rarely get sick”; “I am a generally healthy person”; and “I often feel like I am not as healthy as I should be [reverse-scored].” We provide indices of reliability for each scale in the Appendix.

Bargaining Power We assessed participants self-perceived bargaining power among their peers using the eight-item Personal Sense of Power Scale (Anderson et al., 2012). Example items include “I think I have a great deal of power” and “Even if I try, I am not able to get my way [reverse-scored]”. The full list of items is presented in the appendix of Anderson et al. (2012). Participants indicated the degree to which they agreed or disagreed with each of the eight statements using a seven-point scale (1 = *strongly disagree*; 7 = *strongly agree*). The reliability indices for this scale are provided in the Appendix.

Analytic Methods

We applied network analysis methods to examine the interconnections between hierarchy navigation tactics, status attainment strategies, and the general psychological and behavioral traits that we measured. We provide a brief overview of network anal-

ysis below for readers unfamiliar with its psychological applications. More thorough treatments and tutorials are widely available (e.g., Costantini et al., 2015; Epskamp et al., 2018; Epskamp & Fried, 2018).

In psychological network terminology, individual constructs of interest, such as psychological traits or disease symptoms, are referred to as *nodes*. The estimated statistical associations between the nodes are referred to as *edges*. Edges in psychological network analysis are typically constructed from partial correlations among nodes, after controlling for associations with all other nodes in the network. This partial correlation approach is generally favored over networks constructed from zero-order correlations because the latter are more likely to contain spurious connections between nodes (Costantini et al., 2015). Further, partial correlation networks (i) allow for interpretations of unique associations between variables, (ii) provide insight into mediation by essentially linking all possible multiple regression models, (iii) highlight potential casual pathways, and (iv) reveal clusters indicative latent variables (Epskamp & Fried, 2018). A perennial problem in network analysis is that sampling variability prevents partial correlation estimates from being exactly zero even if two variables are truly independent, leading to potentially spurious edges (Costantini et al., 2015; Epskamp & Fried, 2018).

The problem of spurious edges in network estimation is commonly addressed using a statistical technique called *least absolute shrinkage parameter regularization* (LASSO regularization; Tibshirani, 1996). The LASSO regularization limits the sum of all absolute partial correlation coefficients in a network, so that all estimates shrink, and some become zero. This creates a sparse network, which (i) reduces the number of spurious edges, (ii) constrains over-interpretation, and (iii) increases the likelihood that the network is replicable. The level of sparsity in a network is controlled by the LASSO tuning parameter, which can be iteratively selected and compared by the analyst, or it can be optimized to the data by minimizing an information criterion.

A generally robust optimization approach that balances the exclusion of spurious edges while recovering true edges in network estimation is the *Extended Bayesian Information Criterion* (EBIC; Chen & Chen, 2008). Under the EBIC approach, the analyst must specify a *hyperparameter* (i.e., a parameter than controls other parameters), which sets the strength of the EBIC's preference for models with fewer edges. This hyperparameter—called *gamma*—is typically specified between 0 and 0.5, where higher values indicate a preference for more sparse, parsimonious networks.

After estimation, networks are typically visualized such that nodes are laid out in two-dimensional space and connected by edges that vary in transparency, thickness, and color according to the strength and direction of the association between connected nodes. Researchers then examine a variety of indices that provide information about the general connectivity of the network and the connections between specific nodes in order to describe associations between constructs or to test specific hypotheses (e.g., Costantini et al., 2015; Manson et al., 2020). Our analyses generally followed these methods, but we describe the details used to calculate specific indices and their meanings where relevant. We conducted all data cleaning and analysis in R.

Network Estimation

After reverse-scoring the appropriate items for each scale, we created scores for each of the constructs of interest by averaging across the items within each respective scale. For the hierarchy negotiation tactics inventory, we created 26 tactic-parcels from the 109 items following the tactic groupings in the appendices of Lund et al. (2007), instead of grouping at the broad factor level, in order to examine whether clusters of tactic-parcels within the network would reflect the factor structure identified in Kyl-Heku and Buss (1996) and Lund et al. (2007).

Before conducting the main network analyses, we first estimated the number of dimensions underlying the 26 hierarchy negotiation tactic parcels using the exploratory graph analysis function in the *EGAnet* package based on the walktrap algorithm (Golino & Epskamp, 2017), which suggested six dimensions. However, the model fit did not provide good evidence that the covariances among hierarchy negotiation tactics are sufficiently accounted for by the six higher order latent factors ($\chi^2 = 5437.05$, $p < .001$, $CFI = 0.74$, $RMSEA = 0.08$). Because the model fit of the suggested latent structure was poor and the number of factors did not agree with previous research, we opted to conduct the main network analyses using the 26 tactic-parcels so that the unique information associated with each tactic is not lost when aggregating across factors for which there is inconsistent and weak evidence.

We then used the *bootnet* package (Epskamp et al., 2018) to estimate separate partial correlation networks for men and women using mean-scores for each of the constructs of interest as nodes in the networks. We used full information maximum likelihood to handle data missingness. To reduce spurious edges, we used LASSO regularization with EBIC model selection and set gamma to the most conservative value of 0.5 as recommended by (Foygel & Drton, 2010). The EBICglasso solutions were moderately sparse (men: density = 0.306; women: density = 0.318), indicating that roughly one-third of potential edges remained after regularization. The average absolute edge weight was 0.023 in both networks (men: 0.0234; women: 0.0235), consistent with conservative shrinkage of weak associations under $\gamma = 0.5$. To visualize the network, we used the *networktools* package (Jones et al., 2018) to arrange nodes according to a multidimensional scaling (MDS) algorithm based on the absolute values of the zero-order correlation matrix.

Results

To help interpret the results, we first describe the overall structure and sparsity of the networks, then highlight the most central nodes and theoretically meaningful clusters that illustrate how tactics, strategies, and traits are functionally linked. The visualizations of the estimated partial correlation networks for men and women are presented in Figs. 1 and 2, respectively. The MDS visualization approach makes the distances between nodes readily interpretable as their degree of relatedness and allows for comparison across network replications, such as comparing the networks for men and women (Jones et al., 2018). The transparency and color of the edges connecting nodes in the visualized network represent the strength (opacity/width; clearer = stron-

Men (N = 383)

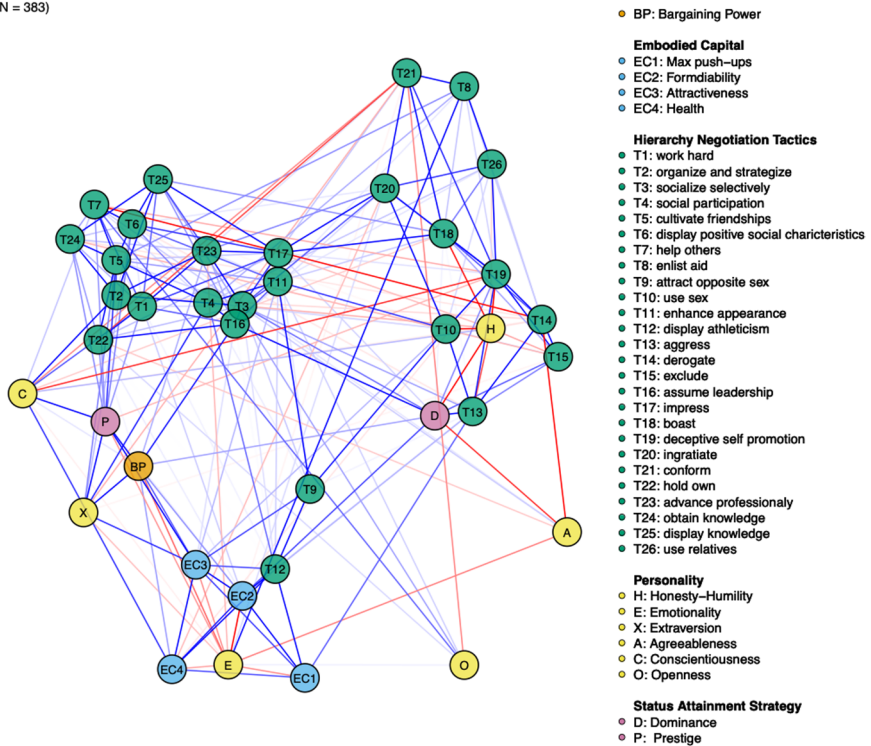


Fig. 1 LASSO-regularized partial correlation network of men's hierarchy navigation with nodes arranged using multidimensional scaling. The transparency and color of the edges connecting nodes in the visualized network represent the and direction (clearer=stronger) strength (red=negative; blue=positive) of the partial correlation between connected nodes

ger) and direction (red=negative; blue=positive) of the partial correlation between connected nodes. Both men's and women's networks are relatively densely connected, with unique edges connecting even relatively distant nodes. Together, these networks reveal a coherent integration of embodied capital, bargaining power, and personality with hierarchy negotiation tactics; such relationships that had not been examined jointly in prior research.

We evaluated the stability of the networks using the *CS*-coefficient (Epskamp et al., 2018), which quantifies the proportion of cases that can be excluded from network estimation in *k*-bootstrapped subsets of the data while still maintaining a correlation with the original centrality indices of at least 0.7 with 95% certainty. Simulation studies suggest that network parameters are stable and reliably interpretable when the *CS*-coefficients are greater than 0.5 (Epskamp et al., 2018). The *CS*-coefficients estimated across 2500 bootstrapped subsets for the men's and women's networks were 0.52 and 0.67, respectively, indicating the networks are interpretable.

We then calculated the signed version of the Zhang clustering coefficient for each node to examine the degree of clustering or redundancy among the hierarchy navi-

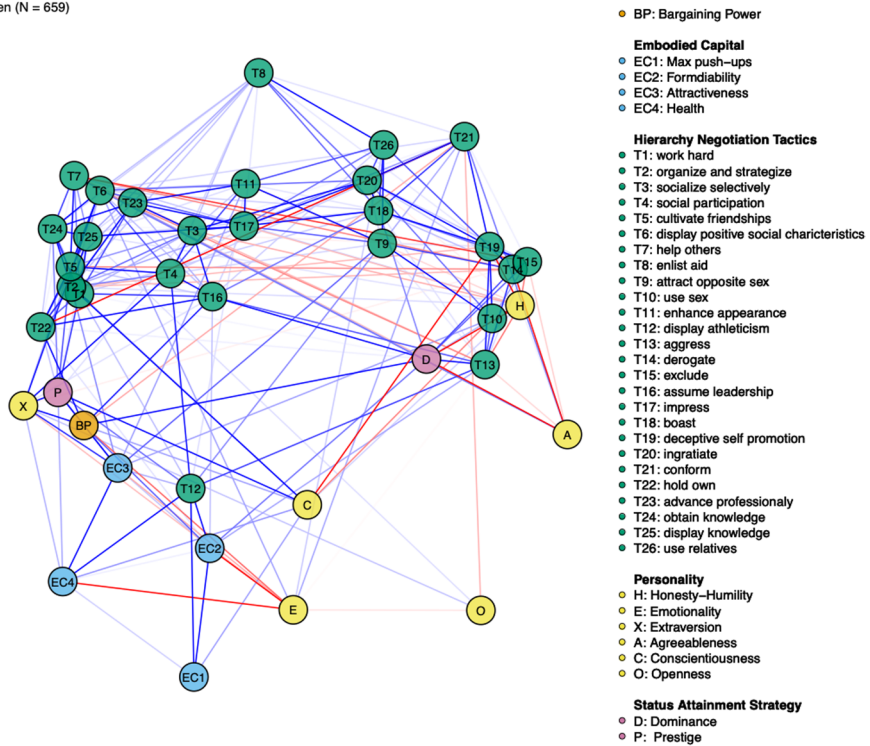


Fig. 2 LASSO-regularized partial correlation network of women's hierarchy navigation with nodes arranged using multidimensional scaling. The transparency and color of the edges connecting nodes in the visualized network represent the and direction (clearer=stronger) strength (red=negative; blue=positive) of the partial correlation between connected nodes

gation tactics, strategies, and general traits in each network. In both networks, all clustering coefficients were less than 0.09, suggesting low redundancy, with two exceptions being 'max push-ups' and the tactic 'exclude others', which both had clustering coefficients larger than 0.10 with neighboring nodes in men's and women's networks. Neither network exhibited *small world topology*, which describes the tendency of networks to be characterized by relatively short connections between nodes and high degrees of clustering (Costantini et al., 2015); the nodes within the hierarchy navigation networks do not appear to form cliques of densely connected nodes reflecting common latent causes.

Network Comparison

To compare overall structure of the sex-specific hierarchy navigation networks, we conducted a permutation test based on 1000 iterations using the *NetworkComparison-Test* package (van Borkulo et al., 2016). Network Comparison Tests (NCTs) can be used to evaluate whether groups differ in (i) the overall structure of a network, (ii) the

overall connectivity among nodes in the network, and (iii) the strength of individual edges connecting nodes in the network. The NCT did not reveal a significant difference in global network strength between the networks ($S=0.03$, $p=.934$), suggesting that the nodes in men's and women's hierarchy navigation nomological networks are relatively equally densely interconnected. Nor was there a significant difference in the maximum difference in edge weights between the networks ($M=0.18$, $p=.051$), suggesting that the overall network structure is not strongly sex-differentiated.

Thus, the networks are similar in overall structure and connectivity. However, because network comparison tests require very large samples to confidently accept the null hypothesis that two networks are the same (cf., Schweren et al., 2018; van Borkulo, 2015), and a major focus of the current investigation is to explore sex differences in hierarchy navigation, we also tested differences in individual edge weights. We found that 43 edges (6% of total edges) were significantly different for men and women. Figure 3 depicts the magnitude and direction of the edge weights that are sex-differentiated ($ps < 0.05$). We place these tentative sex differences in associations between hierarchy navigation tactics, status attainment strategies, and general traits in context in the discussion.

We also explored differences in node centrality between the sex-specific networks using three common indices: *strength*, *closeness*, and *betweenness* (Costantini et al., 2015). *Strength* refers to the number of direct connections a node has with other nodes, where higher strength indicates that a node has more direct connections and is therefore more likely to influence, and be influenced by, other nodes. *Closeness* refers to the number of indirect connections between nodes, where higher closeness indicates that a node has more indirect connections and is therefore more likely to be affected by changes in other nodes. *Betweenness* refers to the degree to which a given node is important for connecting other nodes, where higher betweenness indicates that a node is more important or mediating links between other nodes. Examining centrality indices clarifies which components of hierarchy navigation are most interconnected within the network structure and provides insight into which tactics and strategies could be thought of as hubs connecting multiple nodes.

Figure 4 displays the sex-specific z-scored values for the three centrality indices for each node, while highlighting the four node centrality estimates that were estimated to be significantly different between men's and women's networks. The strength centrality estimates are readily interpretable ($CS=0.52$ for men and 0.67 for women), but the stability estimates suggest that the betweenness and closeness estimates should be interpreted with caution (CS range $0.29 - 0.44$). For both men and women, the node with the highest strength (i.e., the most direct connections in the network) is the tactic 'deceptive self-promotion' which was significantly more connected than all other nodes except the tactics 'organize and strategize' and 'impress others'. The nodes with the lowest strength in both networks include the personality dimensions openness, agreeableness, and emotionality, as well as the tactics 'enlist aid', 'use relatives', and 'exclude others.' Push-up abilities exhibited significantly less direct connections in the women's network than in the men's network, whereas the tactic 'attract opposite sex' had fewer direct connections in the men's network than the women's.

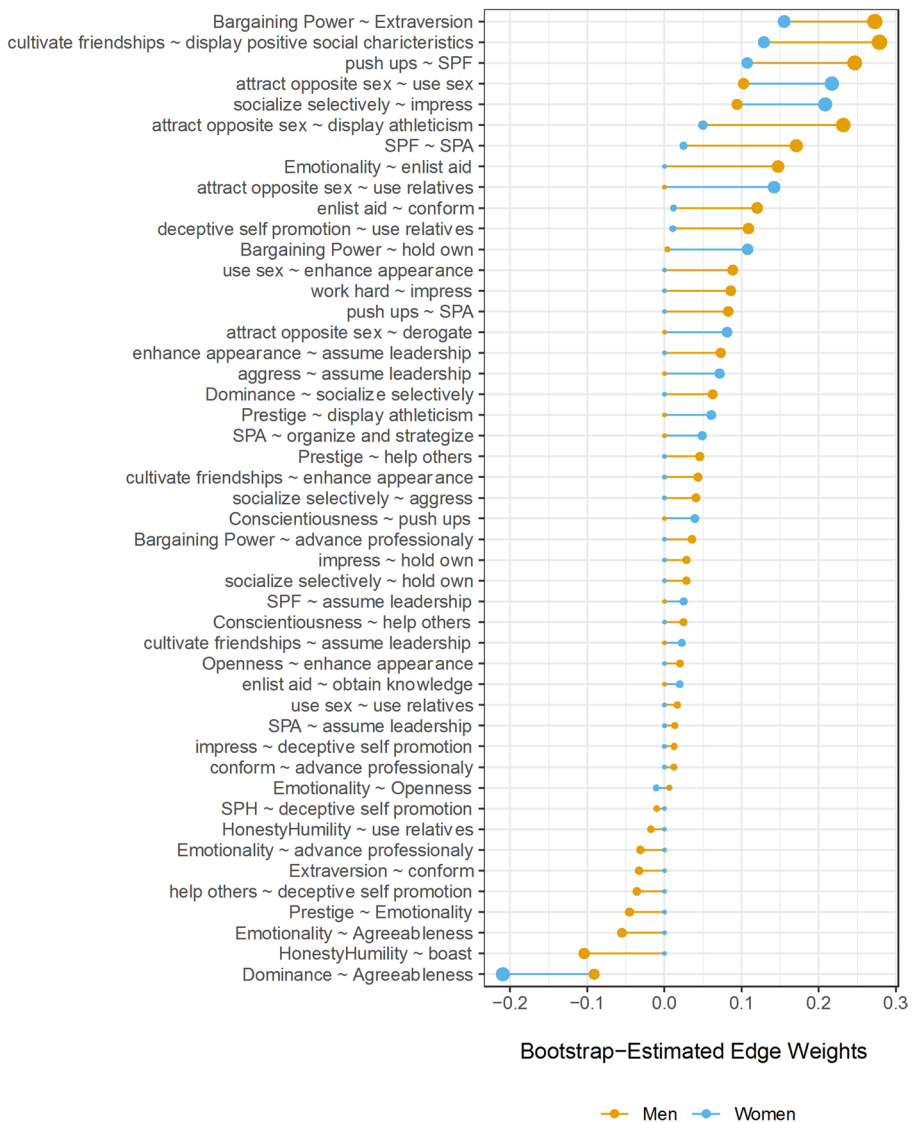


Fig. 3 Plot depicting the bootstrap-estimated edge weights for men and women and their relative difference for edges that are estimated to be statistically different between men's and women's networks ($p_s < 0.05$). Point size is proportional to the estimated edge weight, or the degree to which two nodes covary. SPF=Self-perceived formidability; SPA=Self-perceived attractiveness; SPH=self-perceived health

Discussion

Previous research has examined how status attainment strategies, hierarchy negotiation tactics, embodied capital, and personality traits relate to status attainment in relative isolation. We replicated and extended this work by examining how these indi-

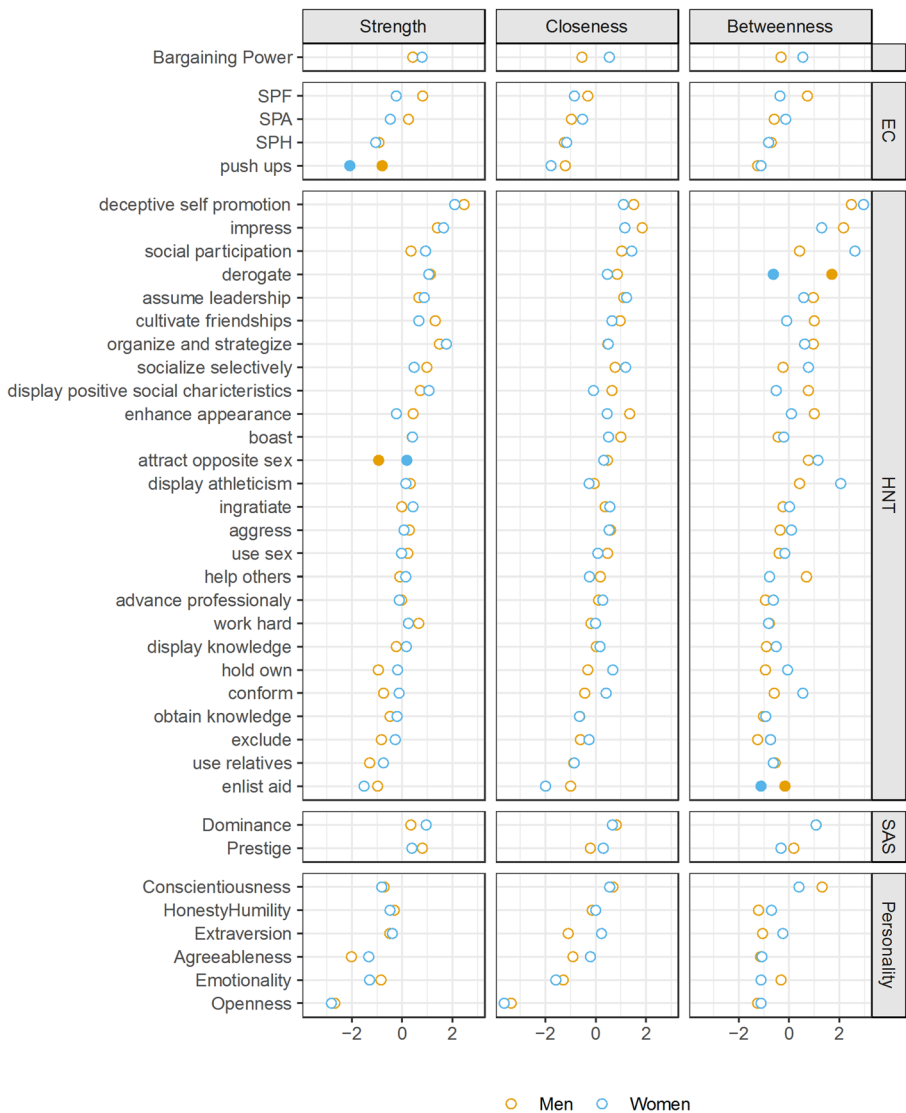


Fig. 4 Plot of z-scored centrality indices for the networks estimated in men and women. Nodes with values of centrality indices that are statistically significantly different between the networks are highlighted by filled points, while unfilled points depict values of the centrality indices that are not significantly different between networks; SPF=Self-perceived formidability; SPA=Self-perceived attractiveness; SPH=Self-perceived health. EC=embodied capital characteristics; HNT=hierarchy negotiation tactics; SAS=status attainment strategies

vidual components of hierarchy navigation fit together as a network. This approach yielded several insights into (i) the overall similarity of hierarchy navigation psychology between men and women; (ii) sex differences in links between specific hierarchy navigation constructs; (iii) the coordination of tactics and strategies; (iv) the specific

tactics underpinning broad dominance and prestige strategies; and (v) the role of broad personality traits in hierarchy navigation.

Comparison of the topology of the nomological nets of men's and women's hierarchy navigation revealed general similarity in overall structure and general interconnectedness. The components of hierarchy navigation psychology, and the links between them, are generally similar for men and women—at least in the broader, relatively gender-egalitarian population represented by the current sample. This finding supports mounting efforts to address the gap in understanding women's hierarchy navigation psychology, which itself appears to be a vestige of historical perspectives discounting the relevance—or even existence of—women's hierarchies and status-striving motivations (Liesen, 2017). Although the overall network topology is more similar than different for men and women, there were interesting sex differences in both the relative importance of some components and the magnitude of the links between specific nodes.

Sex differences in the centrality of network components that did emerge largely agree with theoretical expectations and existing empirical research. The finding that formidability was more directly connected to other components of men's hierarchy navigation than women's supports theoretical expectations that formidability should be more relevant to men's than women's interpersonal tactics and strategies (e.g., Lukaszewski, 2013; von Rueden et al., 2015) and more central to men's than to women's status (e.g., Buss et al., 2020; Lukaszewski et al., 2016). That attracting the opposite sex as a hierarchy negotiation tactic was more directly connected to components of women's, rather than men's, hierarchy navigation network may reflect the greater degree to which (i) a mate's status can influence women's status in the eyes of others, or (ii) being a desirable mate is a cue to other female-biased status characteristics, such as attractiveness (Buss et al., 2020).

Some sex differences in associations between specific network components were less theoretically obvious and shed light on nuances of hierarchy navigation. In men, cultivating friendships was more strongly linked with displaying positive social characteristics and enhancing appearance than in women; enhancing appearance itself was more strongly linked to willingness to use sex and assume leadership to get ahead in men than in women; and enlisting aid was more strongly linked with conformity and trait-emotionality in men than in women. In women, attracting the opposite sex was more strongly predictive of willingness to employ tactics that involve derogating others, using sex, and using relatives to get ahead, while men's use of attracting the opposite sex as hierarchy negotiation tactic was more predictive of displaying athleticism. These differences in specific connections between tactics may reflect how the costs and benefits of different tactic combinations vary across the sexes.

Many links between network components—and sex differences in the strength of the association between them—conceptually replicate extant findings from the literature. For instance, aspects of embodied capital and bargaining power were positively associated with extraversion and negatively associated with emotionality, consistent with research testing facultative calibration hypotheses (Lukaszewski, 2013; Rodriguez & Lukaszewski, 2020). Men's but not women's self-perceived attractiveness was more strongly tied to self-perceived formidability and upper-body strength, mir-

roring sex differences in the relevance of physical strength to assessments of mate value (e.g., Sell et al., 2017). Our finding that bargaining power predicts extraversion for both men and women—but more strongly for men—replicates sex differences found in seminal work on facultative calibration (Lukaszewski et al., 2013). That men's prestige strategy was more strongly tied to being willing to help others as a hierarchy negotiation tactic than women's prestige comports with findings of a sex difference in the relative importance of benefit generation in status allocation (Durkee et al., 2020).

The dual-pathway model of hierarchy maintains that dominance and prestige are distinct dimensions of status attainment strategies, relying on a different repertoire of tactics and traits (Cheng et al., 2013). In support of this, the results of this investigation show that several traits and tactics are more reliably linked with one dimension than the other. For example, formidability was directly linked to dominance but not prestige in men and women, whereas health and attractiveness were linked to prestige but not dominance. Interestingly, both dominance and prestige strategies were positively associated with self-perceived bargaining power, which itself is linked to formidability, attractiveness, and health. Perhaps bargaining power regulates associations between status attainment strategies and more general physical characteristics, depending on how that bargaining power is leveraged. Contrary to previous findings that dominance may be linked with extraversion (Cheng et al., 2010), we found that greater pursuit of the dominance strategy was only directly associated with lower agreeableness and honesty-humility, whereas greater pursuit of prestige strategy was predictive of higher extraversion, lower emotionality, and higher conscientiousness.

Personality traits were generally relegated to the outskirts of the nomological net of hierarchy navigation, while specific tactics and strategies were themselves generally more directly interconnected. This pattern of results seems to align more closely with the perspective of personality traits as emergent dimensions of emotional and behavioral variation which themselves are caused by a plurality of latent social cognition mechanisms—of which hierarchy navigation mechanisms are one class—than the more traditional view of personality traits as latent causal orchestrators of behavior and cognition (Borsboom et al., 2003). This finding suggests that future investigations of personality and status attainment would benefit from carefully considering how the behavioral variation produced by the underlying psychological mechanisms of hierarchy navigation might explain broader personality dimensions. The finding that extraversion and honesty-humility were the most central personality traits to the nomological network, agrees with previous research establishing links between extraversion and status attainment (e.g., Grosz et al., 2020), and also suggests that more research into specific links between honesty-humility facets and specific hierarchy navigation tactics would be constructive, as these hierarchy navigation benefits may help to explain the existence of variation along this dimension of thoughts, feelings, and behavior.

Limitations and Future Directions

There are several limitations of this study that highlight directions for future research. We relied on self-report data to efficiently measure a broad array of relevant constructs, but other-reports and behavioral observations of tactic use will be crucial in future research. Further, our participants were relatively young college students, so it will be important to expand the diversity of participants in future research to understand cultural and age-specific variation. Additionally, the cross-sectional nature of this study cannot tease apart the causal associations between the constructs of interest. To further our understanding of hierarchy navigation psychology, future research should investigate whether and how the structural network of hierarchy navigation varies across a wider variety of contexts and across time. For example, the specific tactics involved in successfully navigating academic hierarchies differ from those useful in navigating the hierarchy of a motorcycle gang, sports team, internet forums, or everyday group of friends (Kyl-Heku & Buss, 1996). Relatedly, hierarchy navigation tactics can be expected to vary intra-individually across the different social hierarchies that people inhabit throughout their life, such as at different workplaces, at school, with family members, and with different groups of friends. Future work could, for instance, experimentally manipulate the contexts of hierarchy navigation to investigate the within- and between-individual variation and stability in hierarchy navigation psychology.

The present study limited its focus to pairwise associations estimated within a Gaussian graphical model. Future research, however, could explore higher-order structural patterns—such as motifs (Milo et al., 2002; Shizuka & McDonald, 2015)—to examine whether certain clusters of tactics, traits, and strategies recur more often than expected by chance. Such analyses would extend the current approach but require methodological adaptations for weighted, undirected networks and larger samples designed specifically for that purpose.

Conclusion

Hierarchy navigation is a central component of human sociality (Anderson et al., 2015), facilitated by an array of traits, tactics, and strategies. Previous research has identified key features of hierarchy navigation psychology and how they individually relate to status attainment. The current study clarifies how the components of the nomological network of hierarchy navigation fit together, and the extent to which hierarchy navigation psychology shows sex differences. Collectively, these findings show how distinct domains—physical traits, personality, and behavioral tactics—are functionally interrelated providing empirical support for adaptationist models of hierarchy navigation. Future research could fruitfully examine whether and how this structure changes across cultural contexts, across age groups, and levels of inequality.

Appendix

Table 1 Reliabilities for each of the scales used in the current investigation.

Scale	Cronbach's α	Guttman's λ_2
SP-Formidability	0.930	0.930
SP-Health	0.513	0.458
SP-Attractiveness	0.875	0.838
Personal Sense of Power (Bargaining Power)	0.849	0.851
Dominance	0.823	0.820
Prestige	0.821	0.820
HEXACO Personality Traits		
Honesty-Humility	0.457	0.401
Emotionality	0.454	0.391
Extraversion	0.637	0.578
Agreeableness	0.303	0.265
Conscientiousness	0.572	0.517
Openness	0.448	0.399
Hierarchy Negotiation Tactic (HNT) Parcels		
Work Hard (HNT 1)	0.743	0.737
Organize and Strategize (HNT 2)	0.741	0.719
Socialize Selectively (HNT 3)	0.783	0.738
Social Participation (HNT 4)	0.710	0.670
Cultivate Friendships (HNT 5)	0.631	0.586
Display Positive Social Characteristics (HNT 6)	0.701	0.670
Help Others (HNT 7)	0.745	0.691
Enlist Aid (HNT 8)	0.203	0.165
Attract Opposite Sex (HNT 9)	0.790	0.774
Use Sex (HNT 10)	0.805	0.760
Enhance Appearance (HNT 11)	0.771	0.752
Display Athleticism (HNT 12)	0.807	0.779
Aggress (HNT 13)	0.639	0.542
Derogate (HNT 14)	0.789	0.752
Exclude (HNT 15)	0.767	0.622
Assume Leadership (HNT 16)	0.656	0.596
Impress (HNT 17)	0.693	0.678
Boast (HNT 18)	0.658	0.639
Deceptive Self-Promotion (HNT 19)	0.813	0.802
Ingratiate (HNT 20)	0.745	0.593
Conform (HNT 21)	0.472	0.379
Hold Own (HNT 22)	0.496	0.398
Advance Professionally (HNT 23)	0.685	0.664
Obtain Knowledge (HNT 24)	0.714	0.672
Display Knowledge (HNT 25)	0.550	0.489
Use Relatives (HNT 26)	0.357	0.217

SP=self-perceived

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Declarations

Conflict of interest The authors declare that they have no conflict of interest.

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