Journal of Vocational Behavior 145 (2023) 103897

Contents lists available at ScienceDirect

Journal of Vocational Behavior

journal homepage: www.elsevier.com/locate/jvb

We've come full circle: The universality of People-Things and Data-Ideas as core dimensions of vocational interests☆

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ARTICLE INFO

Keywords:
Vocational interests
Circumplex model
Interest taxonomy
Vocational choices
People-Things/Data-Ideas
Interest structure

ABSTRACT

Vocational interest research relies on interest taxonomies that partition the construct space of activity preferences into a small number of broad interest domains. To this day, the most widely used classification system is Holland's (1997) RIASEC taxonomy, which distinguishes between six overarching interest domains. A central feature of this model is that the six domains are connected via a circular similarity structure, the circumplex, which is often described with the help of two orthogonal core dimensions: People-Things and Data-Ideas. In recent years, alternative interest taxonomies have been proposed, which suggest different partitionings of the construct space that are said to better reflect today's world of work. Using the example of one such alternative, namely, the recently introduced SETPOINT model (Su et al., 2019), the current article argues that such taxonomies still strongly reflect the underlying core dimensions that define the interest circumplex. Using a mixed online sample from Germany ($N = 560$), it is shown that 1) the main and subdomains of the SETPOINT model reflect a circular similarity structure, 2) this circular similarity structure is conceptually identical to the ones identified in previous research, and 3) the discriminatory power of the SETPOINT scales for occupational group membership can largely be traced back to the core dimensions of the interest circumplex.

1. Introduction

In the past decades, vocational interests have regained attention as central individual difference variables in applied psychology. Many studies have emphasized the role of vocational interests and their fit with the characteristics of work and academic environments for individuals' choice behavior (e.g., Hanna & Rounds, 2020; Schelfhout et al., 2021), performance (e.g., Nye et al., 2012, 2017), and attitudes towards their current job, school type, vocational training course, or study major (e.g., Etzel & Nagy, 2021; Hoff et al., 2020; Junkuhn & Nagy, 2022). To this day, the majority of research is based on Holland's (1997) theory of vocational personalities and work environments, which distinguishes six broad interest domains: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional (RIASEC). Despite the prevalence of the RIASEC model, researchers have continuously worked on extending and improving interest theory.

In general, these extensions can be divided into two branches of research. The first branch of research is concerned with the spatial

☆ All data and syntaxes required to reproduce the analyses presented in this article can be retrieved from: https://osf.io/zd7x2/.

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https://doi.org/10.1016/j.jvb.2023.103897
Received 11 January 2023; Received in revised form 7 June 2023; Accepted 28 June 2023
Available online 3 July 2023
0001-8791/

representation of the similarity structure[1] of interest domains. This research focuses on modeling the similarity structure that underlies broad interest domains (such as RIASEC) as the core aspect of the construct domain. Thereby, researchers typically draw on Prediger's (1982) People-Things and Data-Ideas dimensions as theoretically meaningful interpretational anchors of the construct space. These dimensions have been shown to be powerful predictors of individuals' choices (e.g., Su & Rounds, 2015), experiences, and behavior in occupational and educational contexts (e.g., Junkuhn & Nagy, 2022). These findings suggest that the behavioral and attitudinal consequences of vocational interests are already encoded in these core dimensions. The second branch of research aims to identify alternative sets of broad interest domains. Studies from this branch of research typically comprise comprehensive surveys of occupational activities that are combined into broader interest domains via factor analysis (e.g., Su et al., 2019). In doing so, the aim is to find a dimensional representation of the construct space that reflects the current world of work better than the RIASEC domains. Although both branches of research aim to optimize the representation and measurement of vocational interests by trying to determine the underlying structure of the construct domain, they often fail to refer to each other. This is unfortunate because both branches of research complement each other in important ways. For instance, a combination of the two perspectives could make it possible to evaluate whether the interest domains of new taxonomies depict additional indicators of Prediger's core dimensions or whether they contain unique aspects of individuals' activity preferences that are not captured by People-Things and Data-Ideas.

The central aim of the current study was to approach this issue by examining the structure of a relatively new interest taxonomy and by contrasting it with the pattern of relationships between the new interest domains it proposes and the established circumplex model. Specifically, within their dimensional model of vocational interests, Su et al. (2019) postulate eight new interest domains (*Health Science*, *Creative Expression*, *Technology*, *People*, *Organization*, *Influence*, *Nature*, and *Things*; SETPOINT). Using data from two independent sources, namely, the summary data provided in the original article and a new data set from Germany, we examined whether or not the broad and basic SETPOINT domains reflected a circular similarity structure resembling Prediger's core dimensions. In the second sample, we extended the assessment of the SETPOINT domains that were measured with a German translation of the Comprehensive Assessment of Basic Interests (CABIN, Su et al., 2019) by using an additional interest assessment: the basic interest scales of the Personal Globe Inventory (PGI; Tracey, 2002). By relating the CABIN scales to the (latent) interest circumplex of the PGI, it was possible to examine whether the factors identified on the basis of this new instrument coincided with the core dimensions of the established circumplex model. Finally, we broadened the scope by analyzing the extent to which the discriminatory power of the CABIN scales for occupational group membership was due to their resemblance to Prediger's core dimensions.

1.1. *The development of vocational interest taxonomies*

Vocational interests are defined as "traitlike preferences for activities, contexts in which activities occur, or outcomes associated with preferred activities that motivate goal-oriented behaviors and orient individuals toward certain environments" (Rounds & Su, 2014, p. 98). An important characteristic of vocational interests is that they are always directed towards an object of interest. Typically, these objects are (classes of) work-related activities, which are defined at different levels of abstraction. The lowest level of abstraction is given by preferences for specific work tasks (e.g., repairing cars, organizing reports), which form the basis of almost all important interest inventories (e.g., the Self-Directed Search [Holland et al., 1994], the Strong Interest Inventory [Harmon et al., 1994], or the PGI [Tracey, 2002]). To better communicate the results of these assessments, interest inventories use classification systems that comprise a smaller number of broad interest domains that combine similar activities under a common label.

The most widely used classification system is Holland's (1997) RIASEC taxonomy. This taxonomy was developed by applying factor analysis and related procedures to broad collections of activity preference items in order to identify superordinate interest domains that adequately partition the entire interest construct space. The resulting RIASEC domains are a compromise between information content and parsimony. In fact, Holland (1997) acknowledged that some analyses even suggested more than six factors and that the decision to retain the RIASEC domains was primarily due to pragmatic reasons. This example demonstrates that the final composition of any interest taxonomy depends on substantive decisions made by its proponents. Moreover, it also contributes to explain why different taxonomies with varying numbers and definitions of interest domains exist and why attempts to optimize the dimensional representation of interests persist to this day.

1.1.1. *A new taxonomy: the SETPOINT model*

In a recent article, Su et al. (2019) aimed to establish a new taxonomy of vocational interests at different levels of abstraction. One advancement of their taxonomy is that it takes recent developments in the world of work into account that had not been explicitly considered before (e.g., healthcare, technology, and green occupations). In addition, the resulting SETPOINT model distinguishes between *specific preferences*, *basic interest dimensions*, and *broad-band interest dimensions*. Specific preferences are located at the lowest level of abstraction and are measured with single activity preference items (e.g., repairing a car engine). Basic interest dimensions represent a medium level of abstraction by grouping similar activities together to form homogenous units that "share similar properties and represent the same abstract object" (p. 692). For example, activities referring to researching viruses and their effects on the human body, possible prevention strategies, and treatments are summarized under the basic interest dimension *Medical Science*. Finally, broad-band interest dimensions depict a high level of abstraction. They represent theoretically meaningful dimensions that comprise

[1] The term similarity structure is used throughout this manuscript to describe the idea that interest domains are not just loosely interrelated. Instead, the correlations between interest domains follow a systematic pattern that mirrors their psychological similarity (more similar interest domains are more strongly correlated).

sets of more heterogeneous work activities that are connected by a common theme (e.g., *Life Sciences*, *Medical Science*, and *Health Care Service* are summarized under the theme *Health Science*).

This particular way of organizing interests on different levels of abstraction implies a hierarchical structure in which the different levels correspond to how broadly interests are defined. Such a model has the obvious appeal that it follows the tradition of hierarchical factor models that play an important role in many psychological fields (e.g., general cognitive abilities; Carroll, 2005). Hierarchical models are typically based on a simple structure loading pattern that implies that factors on higher levels of the hierarchy branch into finer facets with minimum overlap. In the case of the SETPOINT model, each broad-band domain reflects a number of similar basic interest domains, which are themselves indicated by a set of similar specific preferences (upper panel of Fig. 1). However, such an approach leads to a strong focus on the conceptual meaning of the top-level domains (i.e., their factor loading patterns), whereas the possibility of systematic relationships between these domains is often neglected.

By identifying the top-level dimensions of vocational interests, researchers aim to establish a parsimonious taxonomy that makes it possible to better communicate their findings and to foster counseling practice. In this vein, Su et al. (2019) developed their SETPOINT taxonomy to better represent the current world of work compared to the traditional RIASEC model. Empirically, this has been supported by the fact that their eight-dimensional model fitted the data better and was slightly more predictive of occupational group membership than an alternative six-dimensional model. However, like any interest taxonomy, SETPOINT represents only one possible segmentation of the construct space among many. Importantly, putting a strong focus on isolated interest domains does not provide any insights into the way in which individuals distribute their preferences across domains, a feature that is widely considered to be a central aspect of the vocational interest construct (e.g., Etzel & Nagy, 2021; Holland, 1997; Junkuhn & Nagy, 2022; Prediger, 1998) and that is closely connected to the underlying similarity structure between interest domains, namely, the circumplex. Investigating the extent to which the similarity structure of the SETPOINT's basic and broad-band domains is consistent with the organizing principles of previous interest models could help to better reconcile the SETPOINT model with existing interest theories (e.g., Holland, 1997; Tracey & Rounds, 1996).

1.1.2. The spatial representation of interests and the circumplex model

The question of the underlying structure of vocational interest domains constitutes a key issue in vocational interests research that was first formalized in Holland's (1997) *calculus hypothesis*. The calculus hypothesis states that the similarity structure of the RIASEC domains can be represented by a regular hexagon (left panel of Fig. 2), whose edges connect the domains that are psychologically most similar (i.e., R-I, I-A, A-S, S-E, E-C, and C-R; thus defining the acronym RIASEC). Whereas the hexagon depicts an idealized model of the domains' interrelationships, empirical studies often yield "misshapen polygons" (Holland, 1997, p. 138; right panel of Fig. 2) that support the postulated order of the RIASEC scales but relax the strict equidistance assumption (e.g., Holland & Gottfredson, 1992).

Today, interest researchers often refer to the circumplex (Guttman, 1954) as a more general model for circular similarity structures. There, the RIASEC domains are represented by their angular positions on the circumference of a circle and the similarity of any two domains is represented by their separating angle (e.g., Browne, 1992). When the angular locations of the RIASEC domains are equally spaced, the resulting perfect circumplex coincides with a regular hexagon (left panel of Fig. 2). In the more realistic scenario, in which the locations of the RIASEC domains are not equally spaced, the resulting structure coincides with a "misshapen polygon" and is commonly referred to as a quasi-circumplex (right panel of Fig. 2).

Although most studies on the circular structure of vocational interests have been conducted in the context of the RIASEC model (e.g., Day & Rounds, 1998; Nagy et al., 2010; Ryan et al., 1996; Tracey & Rounds, 1993), the main findings are not limited to this particular taxonomy. Instead, it has been shown that the circular structure can also be found in other taxonomies that partition the interest construct space into finer segments (e.g., Etzel & Nagy, 2021; Holtrop et al., 2015; Tracey et al., 1997; Tracey & Rounds, 1995, 1996). The validity of the circumplex model across taxonomies suggests that it represents a core aspect of the vocational interest construct that captures individual differences in configurations of likes and dislikes. However, in order to fully justify this interpretation, it is not sufficient to simply find that the similarity structures of different interest taxonomies conform to a circular arrangement. Instead, it must also be shown that the planes on which these circular arrangements are located reflect the same underlying dimensions. One way to examine this is to compare the respective coordinate axes that define these planes.

Within the RIASEC framework, Prediger's (1982) People-Things and Data-Ideas dimensions have been widely accepted for this purpose.[2] These axes serve as interpretational anchors for the two-dimensional coordinate system and make it possible to represent the RIASEC domains as blends of the axes' poles (e.g., Investigative is a blend of Things and Ideas, whereas Enterprising depicts a blend of People and Data). In addition, these axes make it possible to summarize individuals' profiles of likes and dislikes by means of their axis scores (e.g., a high score on Ideas indicates preferences for Artistic and Investigative activities and a dislike of Enterprising and Conventional activities). Comparing individuals' axis scores across inventories thus provides a way to study the convergence of the dimensions underlying different interest taxonomies. Previous studies on this issue often found a strong convergence between the underlying construct planes (e.g., Etzel et al., 2016; Tracey, 2002). At this point, it is important to note that the factor analytic approach typically yields an additional general factor with homogeneous loadings on all variables that is attributed to individual differences in interest levels (e.g., Browne, 1992; Tracey, 2000). This means that a bipolar interpretation of Prediger's axes (i.e., a

[2] Note that the rotation of the coordinate axes in a circumplex is arbitrary, which means that different coordinate systems provide the same fit to the data (Tracey, 2000). In the case of the RIASEC model, alternative coordinate systems have been proposed (e.g., Hogan & Blake, 1999) but Prediger's People-Things and Data-Ideas axes are widely accepted as the most meaningful rotation because they are easy to interpret and because they are strongly related to external variables (e.g., sex differences; Su et al., 2009).

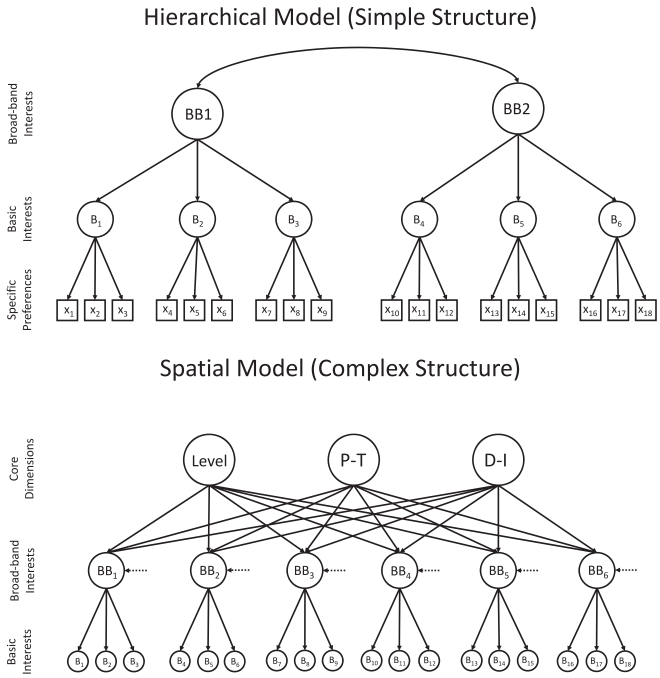

Fig. 1. Schematic hierarchical/spatial interest models with simple/complex structure loading patterns.
Note. Upper panel: Broad-band interest domains (BB) reflect the highest degree of abstraction and are indicated by more specific basic interest domains (B), which are measured with multiple items (x). All BBs are allowed to correlate freely. Lower panel: Correlations between BBs are modeled with factors with complex loading patterns reflecting the circular similarity structure. P-T = People-Things; D-I = Data-Ideas. The dotted arrows represent unique factors that capture variance that is not attributable to the common factors that represent the core dimensions.

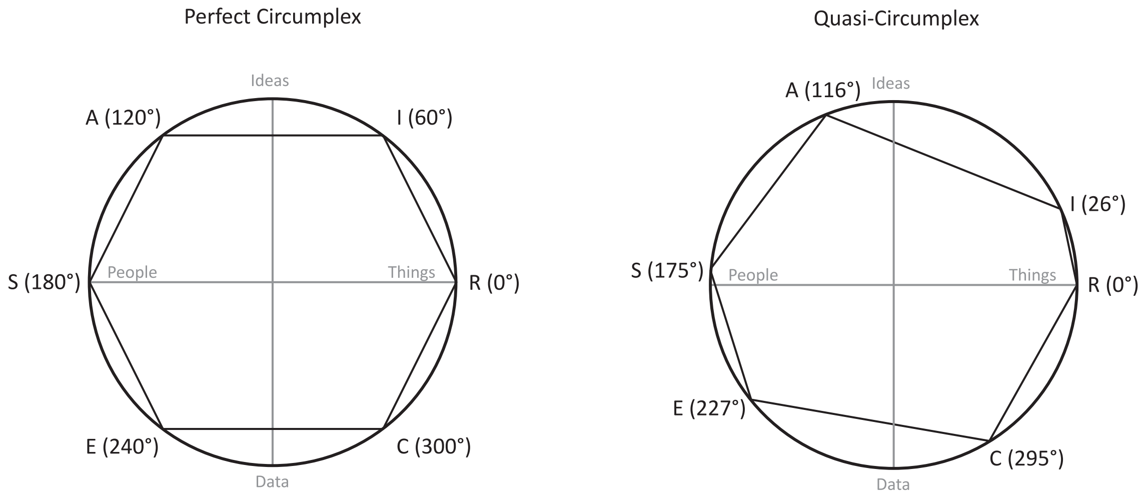

Fig. 2. Schematic representation of an equidistant circumplex and a quasi-circumplex.
Note. R = Realistic, I = Investigative, A = Artistic, S = Social, E = Enterprising, C = Conventional. Inside the circumplexes are depictions of the traditional regular RIASEC hexagon (left) and the more realistic “misshapen polygon” (right).

reflection of psychologically antagonistic activity types) depends on whether or not individual differences in interest levels have been accounted for.[3]

Regardless of these methodological nuances, the theoretical and practical relevance of Prediger's axes has been supported in numerous studies that demonstrated that the relationships between vocational interests and other variables can be largely reduced to their relationships with People-Things and Data-Ideas. For example, Su et al. (2009) demonstrated that sex differences in RIASEC interests manifest along the People-Things dimension. Other studies demonstrated that the relationships between personality traits and vocational interests can be traced back to their relationships with Prediger's axes (e.g., Armstrong & Anthoney, 2009). Similar findings were reported with respect to the relationships with school grades (Etzel & Nagy, 2019) and domain-specific self-concepts (Etzel et al., 2021). Finally, individuals' scores on Prediger's axes have been shown to predict choice behavior in different contexts (e.g., Su & Rounds, 2015; Volodina & Nagy, 2016) and to be useful for assessing person-environment fit and its association with students' satisfaction (Junkuhn & Nagy, 2022).

Taken together, a large body of research suggests that Prediger's People-Things and Data-Ideas axes reflect important core dimensions of vocational interests that transcend different interest taxonomies and that are related to individuals' attitudes and behavior in organizational and educational contexts. Thereby, the exact correspondence of the interest domains to a circular structure appears to be of lesser importance than the assessment of the core dimensions. Indeed, Prediger (2000) pointed out that although a perfect circumplex is unlikely to be found in empirical data, it still posits a useful model that makes it possible to identify individuals' prevailing interest configurations via their standing on the domain-overarching core dimensions.

1.2. Integrating the hierarchical and spatial representations

Given the salience of the People-Things and Data-Ideas dimensions, it is plausible to assume that new interest taxonomies will also reflect them to a substantial extent. However, new taxonomies could also contain new information that reaches beyond what is contained in Prediger's core dimensions. For example, the eight basic interest domains of the spherical interest model (Tracey, 2002) were developed with the aim of optimizing the assessment of the circular structure and should therefore strongly reflect Prediger's core dimensions. In contrast, the SETPOINT model (Su et al., 2019) was developed to extend existing taxonomies with new domains covering vocational fields that had not been previously considered. As a consequence, the interest domains of this model should contain additional diagnostic information that could be manifested, for example, in a superior predictive power for behavioral and attitudinal outcomes. In the following sections, we outline possible scenarios that demonstrate how Prediger's core dimensions might be reflected in new interest taxonomies. Although this is done using the SETPOINT model as an example, the arguments can be applied to any new interest taxonomy.

1.2.1. Core dimensions as higher-order factors with complex loadings structures

In their seminal study, Su et al. (2019) emphasized the connection between their hierarchical SETPOINT model and confirmatory factor analysis (CFA). They used factor analysis methods to optimize a simple structure loading pattern (each indicator reflects only one common factor). In such models, the relationships between the top-level domains are typically unconstrained. However, CFA models are not limited to simple structure loading patterns but can also be specified to model complex relationships (one indicator reflects multiple common factors). Such complex loading patterns make it possible to represent the broad-band domains as blends of domain-overarching core dimensions (Browne, 1992; Nagy et al., 2009).

The lower panel of Fig. 1 provides a schematic diagram of such a model. One common factor (Level) captures individual differences in overall interests and the other common factors (P-T and D-I) represent the two core dimensions (e.g., Nagy et al., 2009). Note that the diagram uses latent indicators (represented by circles instead of boxes) to reflect the idea that the interest domains themselves could also be modeled with a measurement part. Conceptually, this means that the inclusion of the domain-overarching core dimensions adds an additional layer to the hierarchy, which replaces the unconstrained correlations between top-level domains with a systematic model for their underlying similarity structure. From this perspective, the broad-band domains can be understood as reflections of overarching core dimensions (Level, P-T, and D-I).

The model outlined in the lower panel of Fig. 1 does not rule out that the broad-band domains could contain additional information beyond the core dimensions. This is indicated by the dotted arrows that represent additional factors capturing unique variance that is not attributable to the core dimensions. Such information can arise, for example, when an interest scale contains activities from a new vocational field that cannot be clearly assigned to any of the core dimensions or a blend of two neighboring poles. When unique variances are small, most of the variance between interest domains is captured by the core dimensions. However, when they are large, it is possible that the interest domains contain reliable diagnostic information beyond what is contained in the core dimensions. In cases where the amount of unique variance varies between domains, the visual identification of a circular similarity structure could be

[3] Some researchers have questioned the bipolar interpretation of Prediger's axes because interest domains on opposite sides of the circumplex do not necessarily show a strong negative correlation (Tay et al., 2011). However, this argument does not take into account that individual differences in overall interest levels induce positive correlations between all interest domains. How such individual differences in interest levels are handled depends on the statistical techniques employed. In factor analysis or principal component analysis, overall interest levels give rise to a general factor/component, characterized by consistently high and positive loadings (Browne, 1992; Tracey, 2000). In contrast, multidimensional scaling and smallest space analysis are based on centered data, which means that individual differences in overall interest levels are excluded by definition (Davison, 1985).

hampered because some domains would show weaker relationships with the core dimensions than others.

Taken together, it is important to note that spatial and hierarchical interest models are not mutually exclusive. Hierarchical models focus on the measurement of broad interest domains, whereas spatial models focus on modeling the similarity structure between them. The integration of both perspectives enables researchers to learn more about the nature of new interest taxonomies. On the one hand, such taxonomies should incorporate the essential information contained in established interest taxonomies that have demonstrated their value for research and practice for decades. On the other hand, they should also yield additional diagnostic information that exceeds what is contained in traditional taxonomies.

2. The present investigation

The goal of the current study was to examine the extent to which the interest domains of the recently introduced SETPOINT model (Su et al., 2019) reflect the organizing principles of previous interest models. Specifically, we addressed this issue with the help of three interrelated (sets of) research questions. The first research question tackled the *internal similarity structure* of the SETPOINT's basic and broad-band domains by examining the most dominant components that explain their intercorrelations. The second research question tackled the *external similarity structure* by relating the SETPOINT's basic and broad-band domains to the (latent) circumplex of an established interest inventory, namely, the PGI (Tracey, 2002). Lastly, the third research question concerned the question of how much of the predictive power of the SETPOINT's basic and broad-band domains was due to their resemblance to Prediger's core dimensions.

2.1. Internal similarity structure

Previous research on the structure of vocational interests has consistently demonstrated the existence of a circular similarity structure underlying different interest taxonomies such as RIASEC (e.g., Nagy et al., 2010; Tracey & Rounds, 1993) or the spherical interest model (e.g., Etzel et al., 2021; Etzel & Nagy, 2019; Tracey & Rounds, 1996). Because the basic and broad-band domains of the SETPOINT model depict yet another alternative partitioning of the interest construct space, it can be expected that they, too, reflect a circular similarity structure. However, because they are said to also capture new developments in the world of work that have not been considered in previous taxonomies (Su et al., 2019), differences in their sensitivities for the circular structure are likely to occur. This should be especially the case for the basic interest domains that specifically target newer, more narrowly outlined vocational fields.

In order to structure our expectations about the spatial ordering of the SETPOINT scales, we use Prediger's core dimensions as an organizational frame of reference. The SETPOINT domains *People* and *Things* can be expected to be located opposite each other, thus defining the poles of the People-Things axis. The two business-related interest domains, *Organization* and *Influence*, which are characterized by administrative, managing, and instructional tasks, can be expected to be located close to the Data pole of the Data-Ideas axis. In contrast, the flexible and highly creative tasks comprised in the *Nature*, *Creative Expression*, and *Health Science* domains predestine them as plausible indicators of the Ideas pole. Therefore, they can be expected to be located opposite *Organization* and *Influence*. Finally, *Technology* can be expected to be located in the vicinity of the Things and Ideas poles.

The 41 basic interest domains can be expected to be located close to the position of the respective broad-band domain they are said to measure. However, even though the broad-band domains group similar basic interest domains under a common theme (i.e., one of the eight broad-band domains), it is plausible to assume some variation in their spatial arrangement and their sensitivity for the underlying dimensions because they constitute empirically and theoretically separable interest domains. For example, *Influence* comprises the basic domains *Management/Administration* and *Public Speaking*. While the former can be expected to be strongly indicative of Data activities, the social interaction component of *Public Speaking* could move this particular subdomain closer towards the People pole. Therefore, we expected that the basic interest domains would not form eight clearly separable clusters and that some of these domains would instead overlap with subdomains from neighboring broad-band domains.

2.2. External similarity structure

For the second part of our investigation, we examined the extent to which the plane defined by the SETPOINT's similarity structure was based on the same core dimensions as those of previous interest models. As argued above, the visual correspondence of a loading pattern to a circular structure does not necessarily imply that the identified axes correspond to the dimensions identified in other interest taxonomies. To address this issue, we examined the associations between the SETPOINT domains and the established basic interest circumplex of the spherical interest model (Tracey & Rounds, 1996). Specifically, we expected to find a strong correspondence between the loading pattern of the SETPOINT's internal similarity structure and the relationships between the SETPOINT's basic and broad-band interest domains and the axes underlying the PGI (Tracey, 2002). For example, we expected domains that were assumed to be located opposite each other in the SETPOINT (e.g., *Nature* and *Organization*) to be similarly related to the PGI circumplex (e.g., if *Nature* is related to the Ideas pole of the PGI circumplex, then *Organization* should be related to the Data pole on the opposite side of the circumplex).

2.3. Importance for predicting occupational group membership

Lastly, we examined the importance of Prediger's core dimensions for the SETPOINT domains' ability to discriminate between different occupational groups. Su et al. (2019) demonstrated that the SETPOINT domains are well suited to distinguish between occupational groups. However, the degree to which this discriminatory power can be traced back to their reflection of Prediger's core dimensions is still unknown. Previous research has demonstrated that individuals' standing on these dimensions is a strong predictor of their occupational choices (e.g., Su & Rounds, 2015). Based on our previous expectations that the SETPOINT domains would strongly reflect Prediger's core dimensions and the fact that these core dimensions have been shown to be largely responsible for occupational choice behavior (e.g., Prediger, 1998; Volodina & Nagy, 2016), we expected that a large part of their predictive power for occupational group membership would be attributable to their resemblance to these core dimensions.

3. Methods

3.1. Participants and procedure

The current study used data from two sources. First, the summary statistics of the 41 basic interest scales reported in Su et al. (2019) were used to reexamine the similarity structure in the original sample ($N = 1464$ working adults, 51.2 % female, $M_{age} = 43.5$, $SD_{age} = 13.4$). Second, a newly collected mixed sample of university and high school students, working adults, and vocational education and training students was recruited online via Facebook groups of German universities and by distributing flyers with links to the study at vocational schools in the German federal state of Schleswig-Holstein. Participants were given the option to join a lottery to win one of 25 vouchers for a large online shopping site (valued at €20 each). Participation was voluntary and was approved by the institute's ethics board prior to data acquisition. A total of $N = 669$ participants started the survey. Because the central analyses concerned the relationships between the two interest models, we only considered individuals who provided data from both instruments. In the current sample, participants either dropped out before starting the second instrument or completed the entire questionnaire, which led to a final sample of $N = 560$ participants with complete data on the scale level. The final sample consisted of university students ($n = 371$), high school students/trainees ($n = 63$), and working adults ($n = 122$) from a variety of majors and vocational fields. The average age was 25.8 ($SD = 9.9$) years and 69 % of the participants were female (30 % male, 1 % diverse).

3.2. Instruments

Participants from the Su et al. (2019) study completed the original CABIN, which comprises 164 activity preference items (e.g., "Examine how viruses infect the human body"), assessed on a Likert scale ranging from 1 (= *not at all*) to 5 (= *very much*). The basic interest scales were reported to have very high internal consistencies ($.90 \leq \alpha \leq .97$). The German sample used a translation of the CABIN (Krey, 2020). Thorough validity evidence for the factor structure of this translation is provided in the online Supplemental materials. The scales' internal consistencies in the German sample were good to very good ($.83 \leq \alpha \leq .96$). After finishing the CABIN, participants were asked to complete the basic interest scales of the German PGI (Etzel, 2019). Both instruments used the same prompt ("How much would like to perform this activity?") and the same response scale ranging from 1 (= *not at all*) to 5 (= *very much*). The German translation of the PGI has been used in various studies and there is solid evidence for the validity of its circumplex structure (e.g., Etzel et al., 2021; Etzel & Nagy, 2019). Internal consistency estimates of the PGI scales were acceptable to good ($.73 \leq \alpha \leq .88$). Descriptive statistics and correlations for the CABIN and PGI are given in the Online Supplemental Materials.

3.3. Statistical analyses

3.3.1. Similarity structure of the SETPOINT model

In order to explore the similarity structure of the basic and broad-band interest domains of the SETPOINT model, we conducted principal component analyses (PCA) on the respective correlation matrices from both samples. PCA has a strong standing as a method for exploring circular structural arrangements (Gurtman & Pincus, 2003) and is widely used as an explorative analytical technique in research involving circumplex models (e.g., Etzel et al., 2016). An advantage of this method over alternative methods, such as exploratory factor analysis, is that its sequential extraction criterion ensures that the meaning of the first components (i.e., the ones that explain the most variance) does not depend on the total number of components extracted. Typically, unrotated PCA solutions of circumplex data yield three interpretable components. One component is characterized by homogenous positive loadings of all variables and reflects the average interest level across all domains. The other two components represent the interest domains' coordinates in two-dimensional space. Although it is possible to extract even more components, these additional components often reflect theoretically less meaningful aspects of the construct domain and do not necessarily contain substantial diagnostic information. After rotating the loadings from the two samples to maximum agreement with an orthogonal Procrustes rotation (Schönemann, 1966), we compared their correspondence with the help of the Tucker Congruence Coefficient (TCC; Lorenzo-Seva & ten Berge, 2006; Tucker, 1951). The TCC determines the cosine of the angle between two factor loadings vectors and ranges from −1 (perfectly dissimilar) to 1 (perfectly similar). The analyses were conducted in *R* (R Core Team, 2021) using the packages *psych* (Revelle, 2021) and *GPArotation* (Bernaards & Jennrich, 2005).

3.3.2. Circumplex structure of the PGI

The circumplex structure of the PGI's basic interest scales was examined with the circular stochastic process model for the circumplex (SPMC; Browne, 1992; Nagy et al., 2019). The SPMC is a confirmatory method for latent (quasi-)circumplex structures. In this model, the correlation between two interest domains *j* and *k* is modeled via an *internal correlation function* (ICF) that uses a Fourier series approximation to express the relationships between two interest scales (e.g., Artistic and Managing) as a function of their separating angle (Nagy et al., 2019):

$$r_{j,k} = h_j\left\{\beta_0 + \sum_{m=1}^{M}\beta_m cos\left[m\left(\theta_j - \theta_k\right)\right]\right\}h_k. \tag{1}$$

In Eq. (1), the θ-parameters indicate the scale's angular positions on the circumplex ($0^\circ \le \theta \le 360^\circ$). The β-parameters define the shape of the ICF. They are constrained to be larger than zero and to sum up to one ($1\text{-}\beta_0 = \sum_{m=1}^{M}\beta_m$). The communalities ($h_j$) reflect the scales' sensitivities for the latent circumplex and account for the variance in the observed variables that is not attributable to the latent circumplex. Finally, M depicts the total number of components in the Fourier series. The SPMC has been applied in several studies on the structural validity of the interest circumplex (Etzel et al., 2021; Etzel & Nagy, 2019).

3.3.3. Integrating the CABIN scales into the latent interest circumplex

The relationships between the CABIN's 41 basic interest scales and its eight general interest scales with the latent interest circumplex were examined with the extension to the SPMC that integrates external variables into the latent circumplex (SPMC-E; Nagy et al., 2019). The SPMC-E expands Eq. (1) with an *external correlation function* (ECF) that models the correlation between an external variable (q) and the interest scales (Etzel & Nagy, 2019) as:

$$r_{j,q} = h_j\left\{\gamma_{0,q}\beta_0 + \gamma_{1,q}\sum_{m=1}^{M}\beta_m cos\left[m\left(\theta_j - \delta_q\right)\right]\right\} + \sqrt{1-h_j^2}\psi_{j,q}. \tag{2}$$

The ECF depicted in Eq. (2) has the same form as the ICF in Eq. (1). The relationship between q and a circumplex indicator scale j, $r_{j,q}$, consists of two parts. The first part (before the closing curly bracket) captures the relationship between q and j that is attributable to the latent circumplex, whereas the second part ($\sqrt{1-h_j^2}\psi_{j,q}$) indicates the relationships between q and the uniqueness of j that is not captured by the latent circumplex. In Eq. (2), all parameters have the same meaning as in Eq. (1), but there are additional parameters that capture the central aspects of q's relationship with the circumplex.

First, $\gamma_{0,q}$ indicates q's average correlation with the latent circumplex indicators. Second, $\gamma_{1,q}$ is an estimate of the variability of q's correlation profile with the indicators' scales (*content sensitivity*), which indicates the strength of the relationship between q and the circumplex. Third, δ_q provides q's angular orientation in the circumplex space, indicating the region where the highest correlation between q and the circumplex is expected (*content specificity*). Lastly, $\psi_{j,q}$ is the correlation between q and the unique part of scale j that is not attributable to the circumplex. This term can be used to derive a measure of alignment to the circular structure (RMSECA, values $\le$.08 indicate good fit; Etzel et al., 2021).

The SPMC-E parameters can be used to derive additional measures that indicate the strength of the association between external variables and the circumplex. First, $\widehat{\gamma_1}/\overline{\overline{h}}$ standardizes the content sensitivity on the average communality ($\overline{\overline{h}}$) of the circumplex indicators (i.e., the PGI scales). In the context of the current study, this measure thus designates how similar a CABIN scale is to a prototypical indicator of the latent circumplex (i.e., a typical PGI scale). Second, the measure R^2_{circ} assesses the shared variance between an external variable and the latent interest circumplex. The SPMC-E was estimated separately for all of the SETPOINT's 41 basic and eight broad-band interest domains. Because the extension part of the SPMC-E is fully saturated, the model fit is always identical to that of the corresponding SPMC model. All SPMC and SPMC-E models were estimated with M*plus* (version 8.4; Muthén & Muthén, 2018).

3.3.4. Importance of the core dimensions for group differences in interest profiles

For the final analyses, two independent raters (interrater agreement: $\kappa = .92$) categorized all eligible participants ($n = 478$) based on their self-reported study majors, vocational training courses, and occupations. Categories were chosen according to a commonly used categorization scheme from the German Federal Statistical Office (Statistisches Bundesamt, 2022). Because one category (Law, Social, and Economics) comprised three occupational fields with clearly distinct activity demands, we split this category into three. The category counts were: Engineering ($n_{\text{ENG}} = 30$), Natural Sciences ($n_{\text{NAT}} = 80$), Medicine ($n_{\text{MED}} = 92$), Economics ($n_{\text{ECO}} = 105$), Law ($n_{\text{LAW}} = 142$), Language & Culture ($n_{\text{LAN}} = 56$), and Social ($n_{\text{SOC}} = 73$).

After standardizing the scores of the CABIN's eight broad-band interest scales and the PGI's basic interest scales in the full sample, we split the sample by occupational group and calculated the group-specific average profiles of the 16 interest scales (SETPOINT and PGI). To assess the extent to which these observed profiles could be explained by the core dimensions of the interest circumplex, we used the factor loadings from the fitted SPMC-E models as predictors in a linear regression. The resulting models predict the average profiles from the interest circumplex and yield expected model-based interest profiles for each occupational group. A strong correspondence between the observed and model-based average interest profiles would provide evidence for the importance of the interest circumplex and its underlying core dimensions in capturing the essential information encoded in the observed interest profiles.

Finally, we used linear discriminant analysis (LDA; see Boedeker & Kearns, 2019) to find those linear combinations of the SETPOINT scales that yielded the highest degree of separation between the occupational groups. The LDA models were estimated in R with the *lda* function of the *MASS* library (Venables & Ripley, 2002). Prior probabilities were set to be equal to the relative frequencies of the categories in the sample. We then used the resulting linear discriminant functions (LDFs) to compute scores for each individual in the sample. These scores were then implemented as external variables in six SPMC-E models to examine how strongly each LDF was associated with the latent interest circumplex. In order to judge the degree of overlap between the LDFs and the core dimensions, we used the proportion of variance in the LDFs that was shared with the latent circumplex (R^2_{circ}). The data and analysis code for all analyses can be retrieved via https://osf.io/zd7x2/.

4. Results

4.1. Similarity structure of the SETPOINT model

We estimated four separate PCA models to examine the extent to which the basic and broad-band interest dimensions of the SETPOINT model provided evidence of a circular arrangement. The central estimates of these models are the loadings of the first three unrotated components, which were expected to reflect a general component and two components resembling Prediger's core dimensions. In order to compare the corresponding component loadings across samples, they were rotated towards maximum agreement with each other. For the 41 basic interest scales, the first three PCA components explained 51 % (original sample) and 41 % (German sample) of the total variance. The corresponding loading patterns from both samples showed strong agreement with each other, as indicated by the high TCCs (PC1 = .99, PC2 = .95, and PC3 = .95). In the case of the eight broad-band domains, the three components explained 79 % (original sample) and 69 % (German Sample) of the total variance. The first component was perfectly aligned between samples, with a TCC of 1.00. Correspondence was also very high for the second and third components, with TCC = .97 and TCC = .93, respectively. In sum, these findings suggest that the similarity structures underlying the basic and broad-band interest scales of the CABIN were highly similar between samples.

As expected, all four PCA models yielded a general component with positive loadings for all interest scales and two components that defined the variables' spatial configuration. The resulting similarity structures for all four PCA models are displayed in Fig. 3.[4] The upper panels of Fig. 3 show that the 41 basic interest scales in both samples mirrored a circular similarity structure. Subscales belonging to the same SETPOINT domain tended to be located in broader, overlapping regions of the coordinate system instead of being arbitrarily distributed across the entire plane. For example, subscales belonging to *Technology* (Y_1–Y_4) and *Things* (T_1–T_4) were exclusively located close to the horizontal axis and to the right of the vertical axis. In contrast, all subscales from the *Creative Expression* (E_1–E_7) and *People* (P_1–P_5) domains were located left of the vertical axis. This particular spatial ordering suggests that the horizontal axis closely reflects Prediger's People-Things dimension. Likewise, the vertical axis primarily separated business and administrative subscales of the *Influence* (I_1–I_8) and *Organization* (O_1–O_5) domains from those that involve creative thinking and scientific work, indicated by the *Creative Expression* (E_1–E_7), *Health Science* (S_1–S_3), and, to some extent, the *Nature* domains (N_1-N_3). The resulting axis thus indicates the Data-Ideas dimension.

As expected, the basic interest domains' sensitivities for the underlying circular structure were not entirely homogenous. Out of all 41 basic interest domains, only a few yielded critically weak sensitivities for the core dimensions, as indicated by their close proximity to the origin of the coordinate system (Fig. 3). Across samples, these were primarily domains that belonged to the *Influence* and *Things* broad-band domains. Taken together, the circular similarity structure was clearly evident in both samples. However, it was slightly more consistent in the original sample, as evidenced by the more consistent grouping of subdomains in direct vicinity to each other. For example, the subscale *Personal Service* (O_1) was located more closely towards the other subscales of the *Organization* domain in the original sample, whereas its position in the German sample was slightly shifted towards the People pole.

For the similarity structure of the eight SETPOINT domains, the overarching impressions of the aforementioned findings from the basic interest scales were largely confirmed (Fig. 3). The *People* (P) and *Creative Expression* (E) domains were located opposite *Things* (T) and *Technology* (Y) along the horizontal axis and *Organization* (O) and *Influence* (I) were located opposite *Nature* (N) and *Health Science* (S) along the vertical axis (lower panels of Fig. 3). The similarity structure was slightly more pronounced in the German subsample, but the ordering of the scales around the circle was largely identical. Two minor inconsistencies involved the *Health Science* scale in the original sample, which was located closer to the People pole compared to its location in the German sample, and the *Technology* subscale, which was less sensitive for the underlying core dimensions in the original sample than in the German subsample. In the latter, the SETPOINT domains formed four clusters consisting of two domains each that corresponded strongly with the People, Things, Data, and Ideas poles. This finding strongly suggests that the SETPOINT domains depict alternative indicators of Prediger's core dimensions.

4.2. Locating the CABIN scales in the latent interest circumplex

4.2.1. Structural validity of the PGI circumplex

As a first step, the SPMC was estimated with different numbers of components in the Fourier series to determine the optimal shape of the ICF. In the German sample, the model with two components fitted the data better than the model with one component ($\Delta\chi^2_1 = 38.0, p < .001$), whereas adding a third Fourier component did not increase model fit ($\Delta\chi^2_1 = 0, p = 1$) and led to convergence problems. Consequently, the model with two Fourier components was retained for all subsequent analyses [$\chi^2(N = 560, \mathrm{df} = 11) = 64.7, p < .001$, RMSEA = .093, CFI = .973, SRMR = .046]. The suboptimal RMSEA value is probably due to the relatively high number of parameters and should not be given too much weight (Kenny et al., 2015). The central estimates are shown in Table 1. As expected, the spatial

[4] In this visualization, the component loadings were rotated towards maximum agreement with the results of the SPMC-E analysis that are addressed in the following section. This rotation target was chosen to maximize the comparability of the results from all analyses presented in this article and to ensure a straightforward communication of the central findings. Typically, one would choose an objective rotation target, for example, the theoretical positions of indicator scales on the circumplex (e.g., Etzel et al., 2021). However, this was not possible in this case because the SETPOINT model does not make any theoretical assumptions about the spatial similarity structure. The respective component loading matrices used to create these figures can be found in the online supplemental materials.

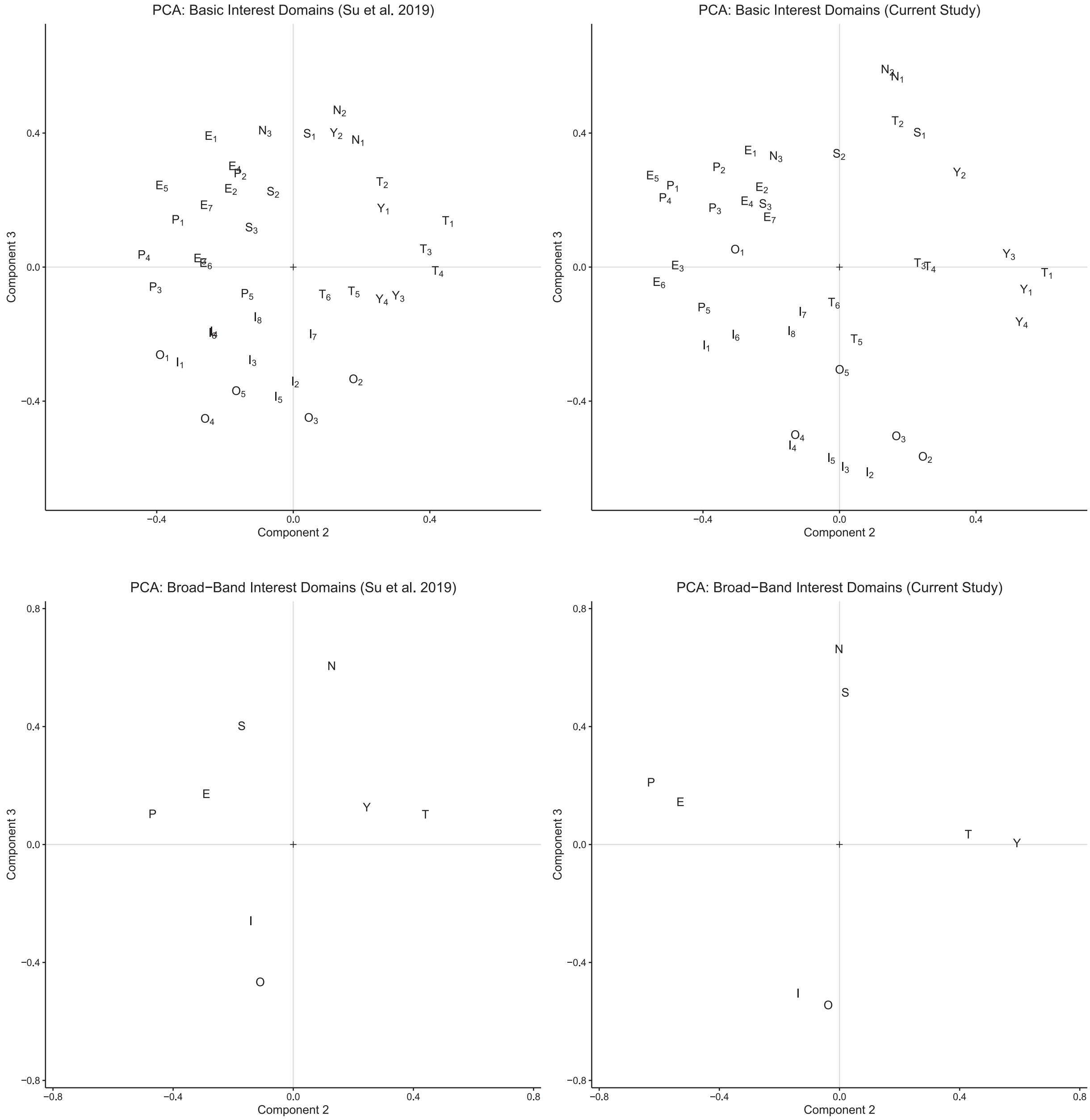

Fig. 3. Scatter plots of the second and third factors from the PCA models of the 41 basic interest scales and eight broad-band interest scales. Note. All PCA solutions were rotated towards maximum agreement with the coordinates implied by the results of the SPMC-E analyses portrayed in Fig. 4. Component 2: People-Things; Component 3: Data-Ideas. Labels: Y = Technology, T = Things, N = Nature, S = Health Science, P = People, E = Creative Expression, O = Organization, I = Influence.

configuration of the PGI scales yielded a quasi-circumplex (see Fig. 4) that was very similar to the theoretical ordering of the scales and closely mirrored the arrangement from previous studies (Etzel et al., 2021; Etzel & Nagy, 2019).

4.2.2. *Relationships between basic interest domains and the latent circumplex*

The findings of the central analyses, that is, the SPMC-E models that were used to locate the 41 basic interest domains and the eight SETPOINT domains in the PGI's circumplex space, are presented in Tables 2 and 3 and are visualized in Fig. 4. First, the projections of the 41 basic interest scales onto the latent circumplex (Table 2 and left panel of Fig. 4) should be considered. All but four basic interest scales were well aligned with the circular pattern, as indicated by the small RMSECA values ($\leq$.08). Only three subscales of the *Creative Expression* domain (*Media*, *Creative Writing*, and *Visual Arts*) and one subscale of the *People* domain (*Social Service*) exceeded the cutoff value of .08. Nevertheless, their alignment was still acceptable, with RMSECA values smaller than .13. Upon closer inspection, misfit in

Table 1
Results of the SPMC model with two Fourier series components.

	θ_{target}	$\widehat{\theta}$	(SE)	$\widehat{h}$
Mechanical [ME]	22.5°	359.0°	(4.7°)	.79
Nature/Outdoors [NO]	67.5°	86.3°	(5.9°)	.86
Artistic [AR]	112.5°	126.7°	(9.8°)	.69
Helping [HE]	157.5°	156.9°	(7.1°)	.76
Social Facilitating [SF]	202.5°	195.7°	(6.5°)	.88
Managing [MA]	247.5°	281.0°	(5.9°)	.95
Business Detail [BD]	292.5°	295.3°	(5.7°)	.85
Data Processing [DP]	337.5°	347.4°	(4.0°)	.93

Note. θ_{target} = Target position based on the theoretical circumplex, $\widehat{\theta}$ = Estimated scale position, SE = Standard error, $\widehat{h}$ = Estimated communality.

Table 2
Results of the SPMC-E models – basic interest scales.

	RMSECA	$\widehat{\gamma_0}$	95 % CI	$\widehat{\gamma_1}$	95 % CI	$\widehat{\delta}$	95 % CI	$\widehat{\gamma_1}/\widehat{\overline{h}}$	R^2_{Circ}
Life Science [S_1]	.07	.58	[.46; .70]	.67	[.51; .82]	77.9°	[65.9° 90.8°]	.95	.40
Medical Science [S_2]	.08	.46	[.33; .60]	.47	[.31; .64]	111.2°	[93.3° 134.7°]	.67	.22
Health Care Service [S_3]	.07	.37	[.25; .49]	.40	[.26; .55]	135.3°	[111.5° 159.3°]	.57	.15
Media [E_6]	.09	.60	[.48; .73]	.48	[.34; .61]	166.2°	[141.8° 189.3°]	.68	.29
Applied Arts & Design [E_2]	.08	.76	[.66; .86]	.52	[.39; .64]	151.0°	[129.9° 171.9°]	.73	.41
Music [E_4]	.07	.64	[.52; .76]	.46	[.28; .66]	116.0°	[93.6° 149.9°]	.64	.30
Visual Arts [E_1]	.10	.68	[.57; .79]	.66	[.53; .80]	129.1°	[112.0° 149.5°]	.93	.44
Performing Arts [E_3]	.05	.58	[.47; .70]	.48	[.34; .61]	158.3°	[136.0° 180.8°]	.67	.28
Creative Writing [E_5]	.13	.52	[.40; .64]	.78	[.66; .90]	138.9°	[123.5° 155.6°]	1.10	.45
Culinary Art [E_7]	.05	.57	[.46; .68]	.42	[.27; .56]	168.8°	[146.5° 190.5°]	.59	.24
Engineering [Y_1]	.04	.75	[.66; .84]	.70	[.58; .82]	350.1°	[337.0° 3.0°]	.99	.52
Physical Science [Y_2]	.04	.61	[.51; .72]	.68	[.54; .82]	57.7°	[46.4° 69.1°]	.96	.42
Information Technology [Y_4]	.05	.67	[.59; .75]	.90	[.82; .97]	344.3°	[334.2° 354.5°]	1.27	.64
Mathematics/Statistics [Y_3]	.05	.50	[.39; .61]	.56	[.43; .70]	4.4°	[345.9° 22.0°]	.80	.29
Social Science [P_1]	.06	.46	[.34; .57]	.52	[.38; .66]	144.8°	[126.2° 164.1°]	.73	.24
Humanities & Foreign Lang. [P_2]	.05	.55	[.44; .67]	.46	[.30; .64]	118.2°	[97.3° 145.5°]	.66	.25
Teaching/Education [P_3]	.08	.58	[.47; .69]	.42	[.27; .57]	133.3°	[111.3° 158.2°]	.60	.25
Social Service [P_4]	.11	.55	[.45; .66]	.58	[.44; .72]	156.1°	[140.3° 172.5°]	.82	.32
Religious Activities [P_5]	.04	.51	[.40; .63]	.35	[.20; .49]	167.0°	[139.5° 193.7°]	.49	.18
Human Resources [O_4]	.04	.76	[.67; .84]	.67	[.55; .79]	254.8°	[243.9° 266.0°]	.95	.50
Personal Service [O_1]	.04	.62	[.53; .72]	.71	[.60; .83]	209.2°	[198.6° 219.9°]	1.01	.45
Accounting [O_3]	.07	.66	[.56; .75]	.80	[.68; .92]	281.2°	[270.2° 292.2°]	1.13	.54
Office Work [O_5]	.02	.71	[.62; .80]	.69	[.57; .80]	251.2°	[240.4° 262.0°]	.97	.49
Finance [O_2]	.07	.56	[.46; .65]	.86	[.75; .97]	294.2°	[284.0° 304.6°]	1.22	.55
Management/Admin. [I_5]	.04	.60	[.50; .70]	.65	[.53; .77]	278.6°	[266.3° 290.5°]	.91	.39
Business Initiatives [I_2]	.03	.60	[.51; .70]	.72	[.60; .83]	279.7°	[268.5° 290.8°]	1.02	.45
Marketing/Advertising [I_4]	.03	.63	[.53; .73]	.64	[.52; .76]	250.4°	[238.1° 262.6°]	.90	.40
Professional Advising [I_1]	.06	.65	[.55; .76]	.41	[.27; .55]	214.4°	[193.2° 235.4°]	.58	.28
Public Speaking [I_6]	.04	.58	[.47; .70]	.12	–	171.9°	–	.17	.16
Sales [I_3]	.01	.68	[.59; .77]	.69	[.57; .80]	267.3°	[256.3° 278.4°]	.97	.47
Politics [I_7]	.05	.43	[.31; .56]	.20	[.04; .38]	26.3°	[314.9° 73.9°]	.28	.11
Law [I_8]	.05	.50	[.38; .62]	.11	–	262.7°	–	.16	.12
Agriculture [N_1]	.04	.55	[.44; .66]	.57	[.43; .71]	86.1°	[71.4° 102.1°]	.80	.31
Nature/Outdoors [N_2]	.04	.66	[.56; .75]	.59	[.45; .72]	91.5°	[77.1° 106.9°]	.83	.38
Animal Service [N_3]	.07	.37	[.24; .50]	.55	[.41; .70]	139.6°	[120.9° 159.5°]	.78	.23
Mechanics/Electronics [T_1]	.08	.50	[.40; .60]	.83	[.71; .96]	1.1°	[349.2° 12.8°]	1.18	.50
Transportation/Machine Op. [T_3]	.04	.55	[.44; .67]	.27	[.13; .41]	341.6°	[306.7° 19.9°]	.38	.18
Construction/Woodwork [T_2]	.04	.53	[.42; .65]	.32	[.17; .49]	101.8°	[73.0° 135.7°]	.46	.19
Physical/Manual Labor [T_4]	.04	.58	[.48; .69]	.26	[.10; .41]	297.0°	[263.9° 333.4°]	.36	.19
Athletics [T_6]	.04	.38	[.26; .50]	.03	–	296.6°	–	.04	.06
Protective Service [T_5]	.02	.36	[.23; .48]	.20	[.04; .36]	274.6°	[224.5° 320.5°]	.28	.08

Note. RMSECA = Root mean square error of circumplex approximation; $\widehat{\gamma_0}$ = profile level, $\widehat{\gamma_1}$ = content sensitivity, $\widehat{\delta}$ = content specificity; 95 % CI = 95 % Confidence Interval; $\widehat{\gamma_1}/\widehat{\overline{h}}$ = standardized content sensitivity; R^2_{Circ} = proportion of variance shared with the latent circumplex.

these scales was largely due to a single larger correlation with one unique factor of the PGI (*Artistic* for the subscales of *Creative Expression* and *Helping* for the subscale of *People*).

All of the basic interest scales were significantly related to the level component of the circumplex ($.36 \leq \widehat{\gamma_0} \leq .76$), which means

Table 3
Results of the SPMC-E models – broad-band interest scales.

	RMSECA	$\widehat{\gamma_0}$	95 % CI		$\widehat{\gamma_1}$	95 % CI		$\widehat{\delta}$	95 % CI		$\widehat{\gamma_1}/\widehat{\overline{h}}$	R^2_{Circ}
Health Science	.08	.57	[.45;	.69]	.57	[.42;	.71]	103.0°	[87.0°;	120.6°]	.68	.32
Creative Expression	.10	.87	[.77;	.98]	.73	[.63;	.83]	145.3°	[128.5°;	163.2°]	.87	.63
Technology	.04	.84	[.75;	.92]	.81	[.72;	.91]	7.3°	[357.0°;	17.4°]	.97	.68
People	.08	.74	[.64;	.84]	.62	[.49;	.75]	143.4°	[127.0°;	161.6°]	.74	.46
Organization	.05	.87	[.81;	.93]	.84	[.74;	.95]	263.5°	[255.4°;	272.2°]	1.01	.73
Influence	.04	.82	[.74;	.91]	.51	[.38;	.64]	264.9°	[249.9°;	280.4°]	.61	.45
Nature	.06	.65	[.52;	.75]	.64	[.52;	.77]	105.2°	[91.6°;	119.5°]	.77	.42
Things	.06	.83	[.74;	.92]	.29	[.15;	.42]	359.7°	[12.6°;	347.4°]	.34	.35

Note. RMSECA = Root mean square error of circumplex approximation; $\widehat{\gamma_0}$ = profile level, $\widehat{\gamma_1}$ = content sensitivity, $\widehat{\delta}$ = content specificity; 95 % CI = 95 % Confidence Interval; $\widehat{\gamma_1}/\widehat{\overline{h}}$ = standardized content sensitivity; R^2_{Circ} = proportion of variance shared with the latent circumplex.

that higher overall interests in the PGI were associated with higher average interests for all basic interest scales of the CABIN. More importantly, all but three (*Athletics*, *Law*, and *Public Speaking*) basic interest scales were significantly related to the latent circumplex, yielding moderate to high content sensitivities ($.20 \leq \widehat{\gamma_1} \leq .87$). Only six scales had a content sensitivity smaller than $\widehat{\gamma_1} = .40$. These scales were *Religious Activities*, *Politics*, *Transportation/Machine Operation*, *Construction/Woodwork*, *Physical/Manual Labor*, and *Protective Service*, which are by and large the same scales that yielded weak relationships with the core dimensions found in the PCAs presented in the previous section (see Fig. 3).

The angular orientations of the 41 basic interest scales in the circumplex space ($\widehat{\delta}$) were in line with our expectations. As can be seen in Fig. 4, scales from the *Things* and *Technology* domains were located close to the Things pole of the circumplex (indicated by the PGI's *Mechanical* and *Data Processing* scales), whereas scales from the *Creative Expression*, *People*, and *Health Science* domains were located close to the People and Ideas poles of the circumplex (in between *Helping* and *Artistic*). On the vertical axis, scales indicating the *Influence* and *Organization* domains were located close to the Data pole of the PGI circumplex (*Managing/Business Detail*), whereas scales from *Nature*, *Health Sciences*, and *Creative Expression* were located closer to the Ideas pole (indicated by the *Nature/Outdoors* scale).

Despite this relatively clear pattern of relationships, there were some unexpected outliers. First, the *Politics* subscale (I_7) of the Influence dimension was shifted towards the Things pole of the circumplex ($\widehat{\delta} = 26.3°$). The second outlier was the *Construction/Woodwork* subscale (T_2) of the Things dimension, which was shifted towards the Ideas pole ($\widehat{\delta} = 101.8°$), indicating a stronger relationship with the *Nature/Outdoors* scale. However, both scales had rather weak content sensitivities (*Politics*: $\widehat{\gamma_1} = .20$, *Construction/Woodwork*: $\widehat{\gamma_1} = .32$), which means that their relationships with the circumplex were almost negligible. Overall, agreement between the PCA loadings and the SETPOINT projections was very strong, with TCC values of .93 (People-Things) and .95 (Data-Ideas). A visualization of the congruence between the internal and external similarity structures is given in the online Supplemental materials.

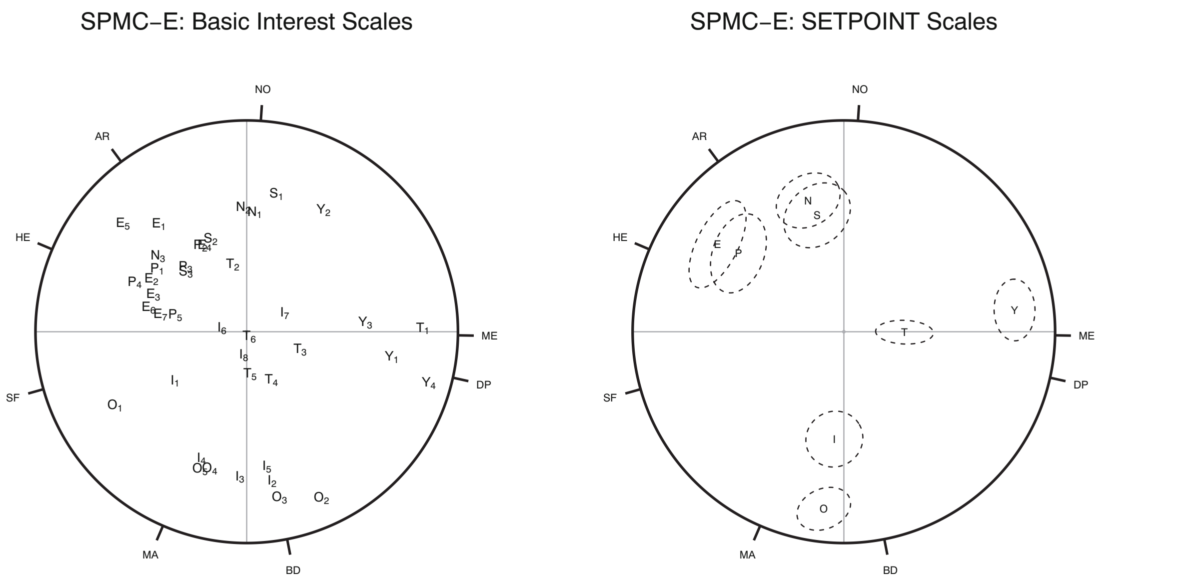

Fig. 4. Projections of the basic (left) and broad-band (right) interest domains of the dimensional model onto the PGI's latent circumplex structure. Note. Labels: Y = Technology, T = Things, N = Nature, S = Health Science, P = People, E = Creative Expression, O = Organization, I = Influence. The legend for the abbreviated basic interest scales shown in the left panel can be found in Table 2.

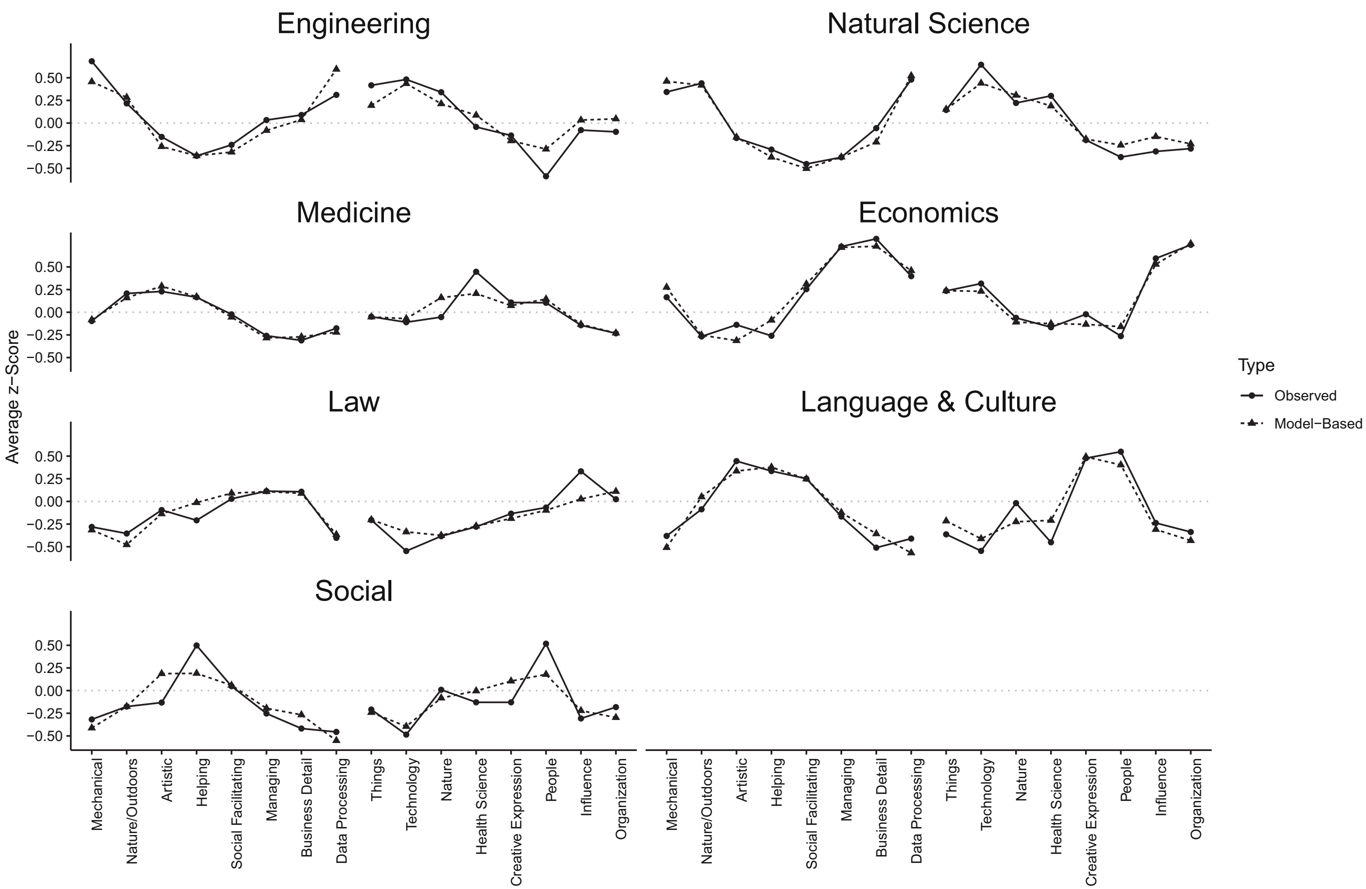

Fig. 5. Observed and model-based average interest profiles of the PGI and SETPOINT domains for each occupational group.

Finally, to further foster the interpretation of the strength of the relationships, two distinct effect size measures are presented in the last columns of Tables 2 and 3. The average communality of the PGI indicators was $\overline{\overline{h}} = .84$, and the standardized sensitivities ranged from .03 to 1.07 with a median of .66. In other words, the CABIN's basic interest scales were, on average, almost 79 % (i.e., .66/.84 = .79) as sensitive for the interest circumplex as the PGI scales. For the R^2_{circ} measure, values ranged from .06 (*Athletics*) to .65 (*Finance*) with a median of .35. This means that for more than half of the CABIN's basic interest scales, 35 % to 65 % of their total variance was attributable to the latent circumplex and the underlying core dimensions.

4.2.3. Relationships between broad-band SETPOINT domains and the latent circumplex

Table 3 and the right panel of Fig. 4 summarize the relationships between the CABIN's eight broad-band interest scales (SETPOINT) and the latent interest circumplex. Alignment was very good for all scales except for *Creative Expression*, whose alignment was still acceptable (RMSECA = .10). Again, all scales were strongly related to the general factor ($.57 \le \widehat{\gamma}_0 \le .87$), indicating a strong association between interest levels in both models. All eight SETPOINT scales were significantly related to the latent circumplex. With the exception of *Things* ($\widehat{\gamma}_1 = .29$), all scales yielded high content sensitivities for the circular structure ($.51 \le \widehat{\gamma}_1 \le .84$). Seven of the eight SETPOINT scales were more than 60 % as sensitive for the circumplex as the PGI scales, as indicated by their standardized content sensitivity measures ($\widehat{\gamma}_1/\overline{\overline{h}}$ in Table 3). The variance in the SETPOINT scales that was attributable to the latent circumplex ranged from $R^2_{\text{circ}} = .32$ (*Health Science*) to $R^2_{\text{circ}} = .73$ (*Organization*). Taken together, these findings indicate that six out of the eight SETPOINT domains behave nearly equivalent to the circumplex indicator scales of the PGI.

As can be seen in the right panel of Fig. 4, the SPMC-E analyses revealed four qualitatively distinct clusters of the SETPOINT scales. Left of the vertical axis, the *People* and *Creative Expression* domains of the SETPOINT model occupied indistinguishable positions in between the PGI's Artistic and Helping scales. On the opposite side of the vertical axis, *Things* and *Technology* yielded indistinguishable content specificities close to the *Mechanical* and *Data Processing* scales, which define the Things pole of the circumplex. However, these scales differed significantly with regard to their content sensitivity. This means that these scales exhibited the same relationship pattern with the latent circumplex (highest correlations with *Mechanical/Data* Processing, lowest correlations with *Helping/Social Facilitating*), but with different clarity (difference between highest and lowest correlations was larger for *Technology*). The same was true for *Organization* and *Influence*, which were both located near the Data pole of the circumplex, with the former demonstrating a stronger relationship ($\widehat{\gamma}_1 = .84$) with the circumplex than the latter ($\widehat{\gamma}_1 = .51$). Finally, at the Ideas pole of the circumplex, the two SETPOINT scales *Nature* and *Health Science* occupied indistinguishable positions.

Comparing the SETPOINT scales' projections onto the latent circumplex space (right panel of Fig. 4) with the corresponding projections of the PCAs (lower right panel of Fig. 3), it can be seen that the two spatial configurations corresponded strongly, except for a slight tilt of the People-Things axis. Again, the strong correspondence is reflected by the high congruence of the respective loading matrices (Level: TCC = 1; People-Things: TCC = .94; Data-Ideas: TCC = .96).

4.3. Prediction of occupational group membership

The final set of analyses tackled the question of how important the core dimensions are for distinguishing between different occupational groups. Fig. 5 displays the observed and model-based average interest profiles for the eight basic interest scales of the PGI and the eight SETPOINT scales for each occupational group. For both instruments, the group-specific profiles were clearly pronounced and their shapes were well in line with what would be expected based on the respective scale descriptions. For example, individuals in the Social group had, on average, very strong interests in *Helping* (PGI) and *People* (SETPOINT) and very low interests in *Mechanical/Data Processing* (PGI) and *Technology/Things* (SETPOINT), whereas the opposite pattern was found for Engineering. Deviations between the model-based and observed profiles were generally small and mostly attributable to single outliers in the profile. For example, the observed standardized score of the SETPOINT's People scale was somewhat underestimated by the corresponding model-based profile.

Table 4 shows the central results of the LDAs and the central parameters of the subsequent SPMC-E models. Because the categorization scheme used in this study distinguished between seven different occupational groups, it was possible to extract six LDFs. As can be seen in the first column of Table 4, the first two LDFs accounted for 84 % of the variance between groups, whereas only 16 % of the variation between groups was attributable to the last four LDFs. This means that the first two LDFs contained the bulk of the information contained in the SETPOINT scales that is used to distinguish between different occupational groups.

The central question then was how much of the SETPOINT domains' predictive power was attributable to the underlying core dimensions. This is best reflected by the corresponding R^2 measure presented in Table 4. This measure indicates the shared variance between an external variable (i.e., the discriminant scores derived from the LDFs) and the latent circumplex of the PGI. As can be seen, the two most important LDFs were very strongly related to the latent circumplex ($R^2_{LDF_1} = .55$, $R^2_{LDF_2} = .73$). Although all LDFs were significantly related to the circumplex, the strength of the relationship was weaker for the final four ($.06 \le R^2$ .13), with the exception of LDF_4 ($R^2_{LDF_4} = .43$). However, due to their relatively small discriminatory power, these LDFs are of little relevance for differentiating between groups. These results demonstrate that those parts of the SETPOINT domains that are primarily responsible for predicting occupational group membership are strongly linked to the PGI's underlying core dimensions.

5. Discussion

The main reason for the development of the SETPOINT model (Su et al., 2019) was the assertion that there is a "lack of consensus"

Table 4
Results of the latent discriminant analyses and subsequent SPMC-E models.

	Proportion of Trace	R^2_{circ}	$\widehat{\gamma_0}$	$\widehat{\gamma_1}$	$\widehat{\delta}$
LDF_1	.53	.55	−.34	.96	149.6°
LDF_2	.31	.71	−.16	1.15	64.7°
LDF_3	.08	.06	−.20	.29	213.6°
LDF_4	.05	.11	.07	.46	295.7°
LDF_5	.03	.43	−.90	.34	341.4°
LDF_6	.01	.13	.37	.36	169.2°

Note. R^2_{circ} = Shared variance with the latent circumplex, $\widehat{\gamma_0}$ = profile level, $\widehat{\gamma_1}$ = content sensitivity, $\widehat{\delta}$ = content specificity.

(p. 691) regarding the dimensional structure of vocational interests. The authors attributed this circumstance primarily to the outdated nature of existing taxonomies and their respective segmentations of the construct domain. As a consequence, they saw the need for a new interest taxonomy that explicitly considers the state of the world of work in the 21st century. The findings of the current study contribute towards reconciling the new aspects of the SETPOINT model with the organizing principles that have shaped vocational interest research in the past decades. Specifically, our findings suggest that the underlying similarity structure defined by Prediger's (1982) People-Things and Data-Ideas dimensions constitutes a unifying element between traditional and new interest taxonomies.

The findings of our study further show that the two different foci on the specific interest domains on the one hand and the underlying organizing principles between them on the other hand are not incompatible. Instead, they reflect different perspectives on the construct domain of vocational interests that emphasize either the meaning of these specific interest domains or the systematic relationships between them. In the current study, we introduced and demonstrated a rationale on how to bring these perspectives together and how to examine the extent to which new interest taxonomies still reflect the established circumplex structure. In doing so, we were able to show that the SETPOINT model, despite its topicality and its thorough survey of the current world of work, largely reflects the core dimensions of vocational interests: People-Things and Data-Ideas. These findings suggest that although alternative interest taxonomies differ in the way in which preferences for specific work activities are grouped together into a number of broad interest domains, they are similar with regard to the overarching principles according to which individuals distribute their preferences across these domains.

Empirical support for the SETPOINT domains' alignment with Prediger's core dimensions (or rotations thereof) was found in three interrelated analysis steps. First, the analysis of the correlation structure of the CABIN's 41 basic and eight broad-band scales via PCA revealed that these scales mirrored a circular similarity structure. Although there was some variation in the scales' sensitivities for the underlying dimensions, their overall spatial ordering strongly resembled what was expected based on the conceptual definitions of the respective interest domains. Second, the relationship patterns of the CABIN's scales with the established and thoroughly validated PGI circumplex (Etzel et al., 2021; Etzel & Nagy, 2019; Holtrop et al., 2015) were highly congruent with the spatial configuration identified in the corresponding PCAs. This particular finding provides solid evidence for the interpretation of the identified axis as Prediger's People-Things and Data-Ideas dimensions. Thereby, our results further indicated that most CABIN scales were almost equally well-suited indicators of Prediger's core dimensions as the PGI scales themselves, which have been optimized for this exact purpose. Finally, it was found that a large part of the CABIN scales' ability to differentiate between occupational groups was attributable to individuals' interest profiles as implied by the circumplex. In line with previous studies (e.g., Junkuhn & Nagy, 2022; Prediger, 1998; Su & Rounds, 2015), these findings emphasize that the predictive power of vocational interests for vocational choice behavior is largely attributable to individuals' standing on Prediger's core dimensions, which reflects their patterns of domain-specific likes and dislikes.

5.1. Theoretical implications

The findings of the current study have important implications for vocational interest theory. Although the SETPOINT model (Su et al., 2019) provides a taxonomy of vocational interests that reflects today's world of work better than older taxonomies, we were able to show that the key principles according to which individuals structure their interests across the SETPOINT domains appear to be the same as in established taxonomies (e.g., RIASEC). In other words, although the world of work is undeniably and constantly changing in light of societal and technological progress, the way in which individuals structure their preferences appears to be an integral part of the human personality that is largely unaffected by these changes. Consequently, it seems reasonable to assign a universal standing to Prediger's (1982) core dimensions similar to that of other well-known conceptions of personality traits (e.g., Heine & Buchtel, 2009).[5]

[5] It should be noted that interest and personality taxonomies differ in a fundamental way. Personality traits are often considered to be essentially uncorrelated (e.g., Goldberg, 1993). Therefore, the factor analytically determined clusters of behavioral descriptions can be equated with the traits (no systematic correlations exist between behavioral clusters that could describe prototypical trait profiles; for an alternative view see, e.g., Digman, 1997). In the case of vocational interests, however, the interest domains that make up different taxonomies are not considered to be independent of each other. Instead, interest domains have always been considered to reflect more or less strongly related clusters of preferences for similar work activities (Holland, 1997).

Another central implication of the current study is that any particular interest taxonomy reveals little about the core dimensions that systematically connect the specific interest domains it comprises and that are strongly related to the structure of individuals' interest profiles (Nagy et al., 2009). However, this does not mean that we consider regular adaptations of interest taxonomies to important changes in the world of work to be futile. On the contrary, the work of Su et al. (2019) includes useful new activity domains that adequately characterize the current world of work and that make it possible to evaluate the importance of Prediger's (1982) core dimensions in the present. In the current study, we found that the SETPOINT's basic and broad-band domains can be well integrated into the interest circumplex. However, such a finding is not guaranteed, which means that the structural model requires continuous validation as interest taxonomies are regularly updated in order to keep up with changes in the world of work. Only when these steps of progressing interest theory are jointly considered is it possible to ensure that new interest taxonomies cover all relevant vocational fields comprised in the current world of work while still upholding the established core principles of previous interest models.

The topicality and thoroughness of an interest taxonomy is also important for another reason. The core dimensions that underlie spatial structural models are very broadly defined (e.g., the People pole subsumes preferences for all work activities that involve human interaction) and, therefore, cannot fully reconstruct individual differences in specific likes and dislikes. In this sense, Prediger's core dimensions seem to be best suited for explaining global behavioral tendencies (e.g., pointing towards a suitable, broadly defined field of occupations instead of exactly matching a specific occupation). Hence, it can be expected that the interest in a specific content domain has additional unique value in explaining behavior over and above what is captured by the core dimensions. This is partially supported by our finding that the predictive power of the SETPOINT domains could not be fully explained by Prediger's core dimensions.

Although the present study did not explicitly consider the exact roles that the core and specific dimensions (e.g., residuals of domain-specific interests after accounting for core dimensions) play in explaining occupational choice behavior, it seems plausible to assume that they are involved in different points of the process of making career-related decisions (Gati, 1986). For example, the core dimensions could determine more general decisions for or against broader occupational fields, each of which comprises many different options for specific occupations. Importantly, these decisions are not necessarily made consciously. Instead, the values and attitudes associated with Prediger's core dimensions could unknowingly lead to an a-priori exclusion of certain occupational fields. For example, individuals who strongly value being challenged by new and creative problems (Ideas pole of the Data-Ideas dimension) could rule out occupational areas that primarily require the enforcement and monitoring of rules and protocols (Data pole of the Data-Ideas dimension) from the start. According to this view, the individual configurations of the core dimensions limit the range of occupational alternatives under consideration without requiring a fully rational decision to be made (Krieshok et al., 2009). The specific dimensions are then expected to come into play in the second step of the decision making process after the number of alternatives to be considered has been narrowed down. At this point, rational decisions that are based on comparing specific features of a limited number of occupational alternatives are more likely to be made (e.g., Gati, 1986). However, whether or not the interplay between core and specific dimensions outlined above adequately describes the career decision making process is, at this point, only speculative and must be addressed more thoroughly in future studies on this topic.

5.2. Practical implications

We believe that Prediger's (1982) core dimensions and the SETPOINT's basic and broad-band interest domains each play their own role in practical settings. The results of the current study support the widely held view that the most important source of information in interest assessment is the interest profile. Hierarchical approaches (e.g., SETPOINT) focus on how activity interests can be grouped into more or less homogenous domains, whereas spatial approaches (e.g., the circumplex model and its underlying core dimensions) focus on how individuals distribute their preferences across domains. Counseling procedures that are based solely on hierarchical models require the assessment of all interest domains to ensure that no relevant activities are overlooked. Such an approach can be time-consuming and might negatively affect counselees' compliance by requiring them to complete lengthy inventories (e.g., 164 items in the case of the CABIN; Su et al., 2019) that include many activities that are of little to no relevance to them. Therefore, it could be worthwhile to identify the broad kinds of activities that are most relevant for a counselee prior to a more fine-grained assessment. This could be done by prefacing the counseling session with a screening of counselees' standing on Prediger's core dimensions, assessed with short versions of established interest instruments based on the circumplex model (e.g., the PGI-Mini with only 20 items; Tracey, 2021). Depending on the results of this screening, counselors can decide which fine-grained interest information to assess in a second step (e.g., fitting basic interest scales from the CABIN).

The first step can be expected to yield either (1) a differentiated interest profile that is well represented by Prediger's (1982) core dimensions, (2) an undifferentiated (flat) interest profile that does not suggest any specific likes or dislikes, or (3) an interest profile that is inconsistent with the circumplex. For the first scenario, consider an example where the screening revealed clear preferences for a blend of People and Ideas. If no other interest information is available, the counselee's interest profile can be summarized by their dominant interest (e.g., Artistic interests), yielding diagnostic information similar to a single-code approach. In order to gain a more differentiated insight into the counselee's specific interests, counselors should then zoom in on more narrowly defined interest domains from the field identified as most relevant. In the present example, this could be done by administering the CABIN's basic interest scales that are sensitive for the region of the circumplex between People and Ideas (e.g., Social Science, Creative Writing, and Health Care Service). This approach would substantially reduce the total number of items administered while still providing differentiated diagnostic information about the most relevant interest domains. In this sense, the proposed approach would yield substantially more differentiated diagnostic information than a simple single-code approach.

If the screening instrument indicates an undifferentiated interest profile, even an extensive interest assessment is unlikely to provide valuable information about a client's likes and dislikes. In this case, other types of diagnostic information should take precedence. For example, counselors might choose to identify career alternatives for which the counselee has the necessary skills. In a second step, the specific activity opportunities that characterize these environments can be compared with the counselee's specific or basic interests. In general, vocational interests should be considered a secondary source of information in such scenarios and should be given less weight in the counseling process. Finally, a counselee's interest profile could be differentiated but inconsistent with the interest circumplex. In this case, Prediger's core dimensions do not provide reliable diagnostic information about the counselee's configuration of likes and dislikes. Consequently, it is not clear which basic interest domains are most important to the counselee. In this scenario, a full assessment of the CABIN seems warranted because the counselee's profile cannot be meaningfully summarized. However, based on the strong validity evidence for Prediger's core dimensions, such cases can be expected to be rather rare.

Taken together, the proposed screening approach for individuals' tendencies to organize their interests across domains could substantially reduce the number of items required in interest assessments. Possible benefits include increased efficiency of counseling procedures and increased compliance with the counseling setting. Moreover, because Prediger's (1982) core dimensions are not tied to a specific taxonomy, the two-step procedure does not rely on a specific instrument to zoom in on a counselee's specific interests. Instead, it allows counselors to choose an interest inventory for the second step that best fits the specific counseling situation. Of course, the screening approach proposed in this section is only an idea at this point, and its feasibility needs to be tested in further research.

5.3. Limitations and future directions

The present study has some limitations that should be addressed in subsequent research on the structure of vocational interests. First, the focus of the current analyses was on the two established core dimensions of the vocational interest construct domain: People-Things and Data-Ideas. However, research has shown that vocational preferences can also be distinguished with respect to the degree of specialization, required education, complexity, and responsibility associated with particular activities, which are typically comprised under the label of occupational prestige (Etzel & Nagy, 2019; Sodano & Tracey, 2008; Tracey, 2002; Tracey & Rounds, 1996). Whether or not occupational Prestige depicts a third core dimension that has the same standing as Prediger's People-Things and Data-Ideas dimensions should be addressed in future studies. Second, a deeper analysis of the specific roles of the core and specific dimensions was beyond the scope of the current study. As argued above, a clear dissection of the incremental value of these two aspects could help researchers and practitioners to better understand the processes involved in making vocational choices. Future studies could aim to separate the two parts and to analyze their respective impact on important outcomes such as vocational choices or person-environment fit. In doing so, it would be possible to further examine how important the core dimensions truly are or whether they are differentially important for different outcomes.

Finally, the data analyzed in this study came exclusively from Western samples, which limits the claim that Prediger's core dimensions can be considered as universal core dimensions of the vocational interest construct domain to Western civilization. In order to broaden the scope of the concepts discussed in this study, future studies should aim to analyze similar questions in more diverse samples. For example, it would be interesting to see whether Prediger's core dimensions play an equally important role in samples from different non-Western countries or in diverse samples with individuals from different socioeconomic and educational backgrounds.

6. Conclusion

After 40 years, Prediger's (1982) People-Things and Data-Ideas dimensions and the circular similarity structure underlying different interest taxonomies are still alive and well (Prediger, 2000). The current study has shown that one should not mistake interest taxonomies that identify homogenous interest domains that reflect activity preferences for prototypical tasks in broad occupational fields with the core principles that underlie individual interest profiles. Taxonomies are important and have to be updated continuously in order to keep up with changes in the world of work. However, because the world of work is constantly changing, it is nearly impossible to agree on a single taxonomy that will stand the test of time. Instead, if interest researchers want to agree on the central dimensions of the vocational interest construct, they should look beyond specific taxonomies and focus on the core dimensions that transcend different taxonomies and that have been shown to be highly relevant for occupational behavior.

CRediT authorship contribution statement

Julian M. Etzel: Conceptualization, Data curation, Methodology, Formal analysis, Visualization, Writing – original draft, Writing – review & editing. **Lara Krey:** Conceptualization, Investigation, Data curation, Writing – review & editing. **Gabriel Nagy:** Conceptualization, Methodology, Writing – review & editing, Supervision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data and syntaxes are shared openly via OSF (link in method section and author note)

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jvb.2023.103897.

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