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Academic Research Values: Conceptualization and Initial Steps of Measure Development

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Abstract

In this paper we draw on value theory in social psychology to conceptualize the range of motives that may influence research-related attitudes, decisions, and actions of researchers. To conceptualize academic research values, we integrate theoretical insights from the personal, work, and scientific work values literature, as well as the responses of 6 interviewees and 255 survey participants about values relevant to academic research. Finally, we propose a total of 246 academic research value items spread over 11 dimensions and 36 sub-themes. We relate our conceptualization and item proposals to existing work and provide recommendations for future measurement development. Gaining a better understanding of the different values researchers have, is useful to improve scientific careers, make science attractive to a more diverse group of individuals, and elucidate some of the mechanisms leading to exemplary and questionable science.

1. Introduction

With an increasing interest in the empirical study of the scientific process itself (i.e., research on research, or meta-science) there has been an increasing interest in the psychological constructs that underlie research-related attitudes, decisions, and behaviors of researchers. A range of constructs such as personality traits (Tijdink et al., 2016), attitudes (Sacco et al., 2018), career incentives (Jussim et al., 2019), values (English et al., 2018), and motivations (Lam, 2011) have been studied to examine why researchers do what they do. In this conceptual paper we aim to contribute to this growing body of research on values in a scientific work context, by integrating and extending existing lists of scientific work values.

Understanding values specific to scientific work help to make scientific careers more attractive for a more diverse set of scholars. By extrapolating a long line of research that documents the influence of values on behavior (Sagiv et al., 2017; Sagiv & Roccas, 2021) it can provide insights into why some researchers engage in exemplary work, while others engage in questionable scientific practices. An improved conceptualization and measure of values specific to the academic context could serve as a basis for an improved empirical understanding the role of values in research practices, as a way of assessing outcomes of responsible conduct of research courses, and as a tool for exploring personal differences between researchers of various career stages, nationalities, and disciplines (English et al., 2018).

In this paper we discuss how we set out to create a conceptually sound description of values relevant to researchers in the scientific context and - as part of this work - took the initial steps of creating a measure of these values that can be predictive of research-related behaviors. To make this new measure as comprehensive as possible, we aimed to identify, describe, and include the most important underlying factors of academic work values based on the personal, work, and scientific work value literatures. In the remainder of this paper, we

first present a review of the psychological literature on personal values, work values, and scientific (work) values.

We first present the outcomes of both interview responses and survey responses based on personal values. Insights from these two sources were indicative of a need for further contextualization of values. They also revealed potential limitations of existent scientific work value items, as presented in the literature review. We give an overview of all work value dimensions represented in earlier research. The present research is rooted in value research that defines values as underlying psychological criteria that guide behaviors and preferences. Our aim was to advance our initial understanding of scientific work values as "desirable goals or motivators within the scientific context that transcend specific situations, vary in importance, and serve as guiding principles in the science-related decisions of a researcher or group of researchers". We limited the scope of this initial approach by restricting our literature search to values as psychological constructs. This excludes research that falls within a broader definition of research values, such as core universal moral values (M. S. Schwartz, 2005), constructs such as scientific virtues (Pennock & O'Rourke, 2017), and scientific values (National Academies of Sciences et al., 2017). We present our delimitations of scientific work values and provide an initial set of scientific work values that can form the basis of future measure development work on this topic.

2. Literature review

2.1. What are values?

Values are considered central to human behavior (Kluckhohn, 1951; Rokeach, 1973). As such, they serve as an essential, unifying construct to many fields in the humanities, social sciences, and especially psychology (Sagiv et al., 2017). Two lines of value research are especially relevant for the study of scientific work values: personal values and work values. While personal values provide guidance to researchers in everyday matters, researchers also

operate in an environment characterized by a set of rules, norms, and reward structures specific to academic work, and therefore work values are equally important when aiming to conceptualize scientific values. However, whereas some values recognized in the work values literature (i.e., ambition or having challenging work) are easily applicable to research, other work values need to be adapted to the scientific context. Academia has a specific culture and reward structure, and we should expect a different set of relevant work values compared to non-academic jobs.

Personal values are desirable goals that vary in importance, transcend specific situations, and serve as guiding principles in the life of a person or group (S. H. Schwartz, 1992; S. H. Schwartz et al., 2012). They are key determinants of a wide range of beliefs and behaviors (Sagiv & Roccas, 2021). The most prominent and well-validated personal value theory of S. H. Schwartz (1992) maps two dimensions underlying unique values (Figure 1).

Figure 1

Structure of value relations. Redrawn based on S. H. Schwartz (1992)
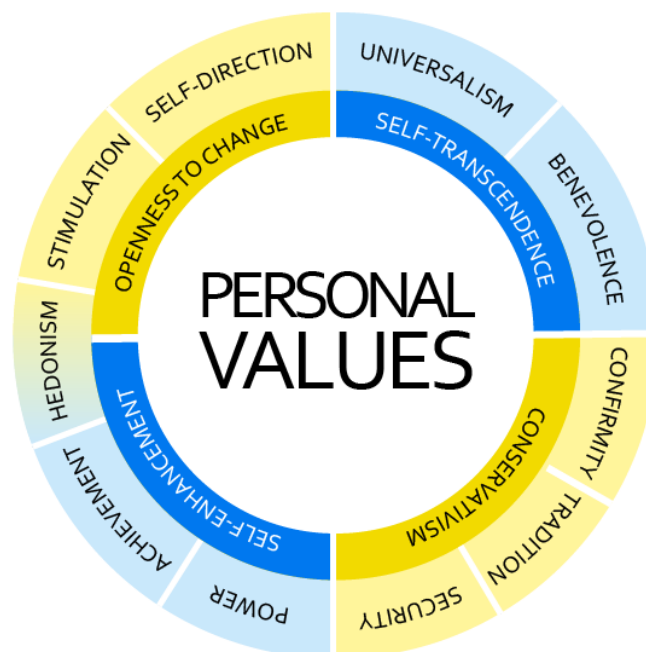
The first dimension contrasts "openness to change" and "conservation" values, which captures a conflict between valuing independence, thought, and readiness to change, versus

an appreciation of order, self-restriction, and resistance to change . The second dimension ranges from "self-enhancement" to "self-transcendence" and captures concerns for self-interest and relative success versus the interests and welfare of others. Self-enhancement values are positively associated with unethical behaviors and competition, while self-transcendence values facilitate cooperation and prosocial behavior (Sagiv & Roccas, 2021). Values are further subdivided into ten motivational types labeled stimulation, self-direction, universalism, benevolence, tradition, conformity, security, power, achievement, and hedonism. Research has indicated that these categories maintain their relevance across cultures and provides a comprehensive, universal measure of human values (Sagiv et al., 2017; S. H. Schwartz, 1994). In the context of scientific research, a study by Knafo and Sagiv (2004) on the personal values of researchers as opposed to those in other professions concluded that investigative occupations (incl. science) mainly emphasize self-direction values and, to a lesser extent, benevolence and universalism, but attribute low importance to hedonism, tradition, and security values.

A second line of relevant research concerns *work values.* They comprise a specific, distinguishable set of values pertinent to a person's working life that can predict or are linked to a wide range of work-related attitudes, behaviors, and outcomes, such as work satisfaction, career choice, work-related decisions, career adaptability, work engagement, motivation, basic work-related psychological needs, work-related learning, and life satisfaction (as summarized by Busque-Carrier et al., 2022).

The work values literature is marked by a lack of a single, unifying, widely accepted, and comprehensive definition and delimitation of work values. . The fragmented nature of the work values literature (Sagie et al., 1996), as well as the conceptual confusion (Lyons et al., 2010) can be a source of delayed progress of work value research (Busque-Carrier et al., 2022; Fields, 2002; Schleicher et al., 2011). Recent attempts to better understand the

construct of work values have yielded studies on construct validity based on widely used measures of work values (Leuty & Hansen, 2011), connected the parallel paths of work and personal values by customizing the motivational types underlying personal values (as posited by S. H. Schwartz, 2012) to the work context (Albrecht et al., 2020), and developed a valid work values scale based on a comprehensive review of the work values literature (Busque-Carrier et al., 2022). The main components outlined by these lines of thought cluster work values into six (Leuty & Hansen, 2011), eleven (Albrecht et al., 2020), or fifteen (Busque-Carrier et al., 2022) components, as depicted in Figure 2.

2.2. Scientific work values

In the past twenty years, there have been relatively few empirically driven psychological approaches to identifying values relevant to scientific work contexts. Prior studies of researchers' personal and work values aimed to make comparisons between the personal value profiles of different professions (Knafo & Sagiv, 2004), utilized value measures to study sub-populations of researchers such as describing the personal values of economists (van Dalen, 2019), or examined gender differences in the impact of work values on research careers (Hüttges & Fay, 2015). We know of two papers that aim to pursue a psychological approach to scientific values. The first is a study by Demirutku & Güngör's (2021), who add a value type labeled "scientific values" into the circular structure of Schwartz's personal value theory (1992). However, Demirutku & Güngör's approach adds value items drawn from sociological and educational sources not in line with the psychological conceptualization of values (e.g., rationality or objectivity) to a set of personal value items without further integration.

The other study presents a measure of work values specific to scientific research. The Values in Scientific Work scale, proposed by English et al. (2018), is the first such instrument based on a psychological conceptualization of work values and the research integrity

literature. This scale comprises eight subscales: autonomy, research ethics, social impact, income, collaboration, innovation and growth, conserving relationships, and job security. Despite being a much-needed step towards conceptualizing values in scientific work, the Values in Scientific Work scale does not incorporate several of the value dimensions most found within the values literature (Figure 2). Since our own approach in this paper seems to align, to a large extent, with the construction of the Values in Scientific Work scale, it is worthwhile to specify these gaps in some detail.

First, compared to personal values, the Values in Scientific Work scale does not include items related to achievement, hedonism, conformity, and tradition. Having a social impact as reflected in items such as "It is important to her/him that research helps to solve real world problems" might be a relevant value to researchers and does capture some parts of the universalism construct posited by S. H. Schwartz (1992). Still, building on the conceptualization of personal values embedded in a work setting by Albrecht et al. (2020), who conceptualize universalism as including values emphasizing the importance of environmental sustainability and social justice, universalism in the context of scientific work values could be conceptualized as a broader construct that reflects a need for understanding, appreciation, tolerance, and protection for the welfare of all people and of nature.

English et al.'s (2018) important work could be naturally extended by incorporating a more extensive set of power values in line with S. H. Schwartz's work (2012) where power values reflect needs for social status and prestige, control or dominance over people and resources, and include value items such as wealth and authority. With items such as "Earning a good salary is important to her/him", power-related values of English et al. (2018) successfully incorporated the aspect of wealth or income from this definition. A natural extension would be to add other elements of power values potentially relevant to the study of behaviors and decisions of researchers. For example, status is an often cited motivation for

researchers (e.g., Eftekhari et al., 2021; Lam, 2011; Zhou et al., 2022). Exclusion of such features might decrease the measuring potential of the instrument.

Second, compared to the core work values outlined by Leuty and Hansen (2011), the Values in Scientific Work scale does not include items reflecting the importance of working environments (i.e., the physical conditions of the working environment, quality of management or supervision, job security, supportive co-workers, and work-life balance) and organizational support (i.e., not being pressed to engage in work that can be seen as immoral, support from management, proper training, fair organizational policies, and clear procedures). Opportunities for status and income are only partly covered by items related to income. Comparison to the Integrative Work Values Scale recently developed by Busque-Carrier et al. (2022) yields comparable results; value categories pertaining to authority, recognition, travel, work environments, work-life balance, and supervisors are not represented in the Values in Scientific Work scale.

Even if features that are included, such as income, are aligned with the work values posited by Leuty and Hansen (2011) and Busque-Carrier et al. (2022), the wording presented in the Values in Scientific Work scale may reflect a limited interpretation of what wealth and resources mean within the (scientific) work environment. In the original construct posited by S. H. Schwartz (1992), valuing wealth is an indicator for a need for control over resources or prestige - a notion mirrored in the following two work value items of Albrecht et al. (2020): "To have authority over limited resources", "To determine how money is spent". While value items included in the Values in Scientific Work scale such as receiving a high salary might be of relevance to researchers, having a control over research resources might often be more important. For example, in a study on the motivations of researchers Lam (2011) found that while assigning importance to increasing funding and research resources scored at the top of the motivational hierarchy, increasing personal income was at the bottom.

Figure 2

Comparison of main value categories based on value domain descriptions given by S. H. Schwartz (1992), Albrecht et al. (2020), English et al. (2018), Leuty &

Hansen (2011), and Busque-Carrier et al. (2022)

S. H. Schwartz (1992) *personal values*	Albrecht et al. (2020) *work values*	English et al. (2018) *values in scientific work*	Leuty & Hansen (2011) *work values*	Busque-Carrier et al. (2022) *integrative work values scale*
		Income	Opportunities for status and income	Income
Power	Authority			Authority
				Advancement
Achievement	Ambition			Recognition
Hedonism	Enjoyment			Travel
Stimulation	Variety	Innovation and growth	Having challenging work / Competence	Variety
				Development
				Intellectual stimulation
				Creativity
Self-direction	Autonomy	Autonomy	Autonomy	Autonomy
Universalism	Environmental sustainability	Social impact		
	Social justice	Collaboration	Relationships	Altruism
Benevolence	Helping and supporting	Conserving relationships		
Conformity	Rule respecting			
Tradition	Traditional values			
Security	Safety	Job security	Working environment	Security
				Work environment
				Work-life balance
			Organizational support / culture	Supervisors
		Research ethics		

In conclusion, we regard the Values in Scientific Work scale as a key step towards an overview of important work values in the context of science, but believe the fields of metascience and psychology of science need a more comprehensive approach to values that systematically extends and integrates the different insights in the literature as visualized in Figure 2. This extension is important to arrive at a complete set of values that can be used to study the actions, attitudes, and beliefs of researchers.

3. Methods

3.1. Measure development: Process overview

Survey construction is a complex, iterative process often involving a wide variety of qualitative and quantitative methods. Boateng et al. (2018) distinguish three phases – item development, scale development, and scale evaluation. These steps are listed and explained in Table 1 (first and second columns). Although survey construction guidelines tend to emphasize the importance of the initial steps of item generation, practical examples and guidance are often missing in this area (Sinclair et al., 2020). To transparently document and solidify our understanding of the construct and its domains, and following the examples of other authors who dedicated their papers to rigorously discuss these initial steps of measure construction (Amendola et al., 2021; Barreca et al., 2004; Ismail et al., 2021; Ruksakulpiwat, 2021; Sinclair et al., 2020), within this paper we focus exclusively on the first of the three phases: item development.

3.2. Identification of the domain and item development

We first identified and defined the domain of interest based on literature reviews and discussions. After a review of the values literature in which we located the most widely utilized conceptualizations and instruments, we arrived at a preliminary conceptual definition, specification, and definition of the dimensions of scientific work values. Then we prepared an initial set of items within the item generation phase that could later be assessed for content

validity by integrating insights from a mix of deductive and inductive methods (i.e., values listed by other value measures and inquiries about the values of researchers by conducting interviews and a survey). Before continuing the process, we updated our preliminary definitions based on the conclusions of these methods. We then generated the set of item proposals which will be presented as our main result. This item generation process and a step-by-step overview of the methods and results of our studies are further detailed in Table 1 and the next section of this paper.

4. Results

4.1. Domain identification

The present research aimed to identify those scientific values that can serve as determinants to scientific actions of researchers. Our initial conceptualization of relevant instruments and provisional definition of the concept was created to serve as a basis for an iterative process of concept development (Gerring, 1999), initially primarily influenced by the original value framework developed by S. H. Schwartz (1992). At this stage, we did not exclude the possibility that work values or scientific work values could serve as a more suitable basis, but decided to progress from generic to specific values and follow recent integrative approaches that grounded their work in Schwartz's personal value theory.

Accordingly, we defined scientific work values as "desirable goals or motivators within the scientific context that transcend specific situations, vary in importance, and serve as guiding principles in the science-related decisions of a researcher or group of researchers". With our focus on scientific research in an academic setting and related generic tasks and goals, we intentionally excluded values related to other activities usually linked to academic positions, such as teaching and administration, to limit the scope of our research. Definitions of the dimensions were modified to the scientific work context based on the original definitions (Table 2).

Table 1

Step-by-step process overview of the methods and results of the development of the Academic Research Values (ARV) scale

Steps	Aim	Methods		Results
1. Domain identification: To specify the boundaries of values in science and facilitate item generation				
1.1 Define purpose of domain	To identify the domain and the purpose of the construct to be measured	Literature search		Domain of interest: Scientific values. Purpose: Find scientific values that can serve as determinants to scientific actions of researchers using S. H. Schwartz's personal values as a basis.
1.2 Locate existing instruments	To identify instruments measuring that can be implemented to the study of scientific values, with a specific focus on Schwartz's personal values			A list of instruments measuring personal values. We excluded other sources, such as moral values and scientific virtues, but included studies utilizing value measures potentially relevant for researchers (see list at 2.1). At this point, we decided to test if personal values are the best basis in terms of constructs covered and phrasing (i.e., not too generic, or abstract for our purposes), see outcomes at 2.2.
1.3 Preliminary conceptual definition	To provide a preliminary conceptual definition of scientific values	Team discussion		"Scientific values are desirable goals or motivators within the scientific context that transcend specific situations, vary in importance, and serve as guiding principles in the science-related decisions of a researcher or group of researchers. Scientific values relate to research activities and related generic tasks and goals, but exclude specific values related to other activities usually linked to academic positions, such as teaching and administration."
1.4 Specify preliminary dimensions of domain	To specify the dimensions included within scientific values	Literature search	Team discussion	Preliminary dimensions coincide with dimensions specified by S. H. Schwartz (1992): Self-direction, Stimulation, Hedonism, Achievement, Power, Security, Conformity, Tradition, Benevolence, Universalism (Table 2). We assumed that additional dimension(s) specific to the scientific context might be present, but before including new dimensions or items we wanted to check if personal values can serve as a solid basis for scientific values (as described in our inductive methods at 2.2).
1.5 Define each dimension	To provide a preliminary definition and delimitation of each dimension of scientific values	Team discussion		Preliminary dimensions coincide with dimensions specified by S. H. Schwartz (1992). Definitions were modified to the scientific context (see Table 2).

2. Item generation: To identify appropriate questions that fit the identified domain			
2.1 Deductive methods	To collect data from the literature	Literature search for possibly relevant value items in validated value instruments	**Schwartz's personal values**: S. H. Schwartz's Value Survey (SVS) - 57 items (S. H. Schwartz & Sagiv, 1995) **Work values**: Values at Work (VaW) - 52 items (Albrecht et al., 2020), Minnesota Importance Questionnaire (MIQ) - 20 items (Rounds et al., 1981), Super's Work Values Inventory - Revised (SWVI-R) - 12 items (Zytowski, 1970), Manhardt's Work Values Inventory (MWVI) - 25 items (Manhardt, 1972) **Scientific values**: Values in Scientific Work (VSW) - 35 items (English et al., 2018) (Value items and dimensions from these scales are listed in Appendix 1 and Appendix 2)
2.2 Inductive methods	To collect data from samples within the target group	Interviews **N = 6**	Relevance rating **N = 255**	We used the **Schwartz Value Survey 57 items** as an initial basis for the interviews and a modified version (**60 items**) for the relevance rating survey. Based on our outcomes, short formats of personal values seem less relevant to the scientific context. Accordingly, we revisited the work values literature and modified our approach. (Appendix 3)
2.3 Update definitions, generating the item proposals	To update the definitions and delimitations of the construct, dimensions, and items. Reevaluating possibly relevant concepts.	Team discussion		Summarizing all sources reviewed so far, we redefined our construct as: "**Academic research values** are principles which serve as a basis of evaluating outcomes of scientific work-related actions, guide the selection of scientific work goals, and represent the relative importance assigned to various academic job aspects related to research activities. They serve as guiding principles in the decisions of a researcher or groups of researchers in the academic work setting and are less broad than personal values, but still represent motivational goals that transcend specific work situations. Similar to personal values, academic research values are desirable in the sense that they represent important and worthy causes to researchers." We made decisions about item characteristics (i.e., wording, form, and response types), generated an initial set of items (11 dimensions, 36 sub-themes, 246 items), and compared our items to the Integrative Work Values Scale as a control. (Appendix 3 - item development, Appendix 4 - dimension development, Appendix 5 - item proposals, Appendix 6 - comparison)
3. Item selection and content validity: To assess if the generated items adequately measure the domain of interest – *Future research*			

Note: The table columns in rows 2.1 and 2.3 span across sub-columns. The structure:

Section	Description	Method(s)	Details
2.1 Deductive methods	To collect data from the literature	Literature search for possibly relevant value items in validated value instruments	(see Schwartz's personal values / Work values / Scientific values above)
2.2 Inductive methods	To collect data from samples within the target group	Interviews N = 6 / Relevance rating N = 255	(see description above)
2.3 Update definitions, generating the item proposals	To update the definitions and delimitations of the construct, dimensions, and items. Reevaluating possibly relevant concepts.	Team discussion	(see description above)

4.2. Item generation

To identify appropriate questions for the identified domain, we combined deductive methods based on the review of the literature and existing measures and inductive methods informed by the responses in personal interviews and an online survey.

4.2.1. Literature search

S. H. Schwartz's theory is the most dominant and empirically best-validated assessment of personal values in surveys (Lechner et al., 2022). In line with the conceptual definition and underlying theoretical assumptions, we decided to base our initial set of items on the Schwartz Value Survey (SVS, 57 items), developed by S. H. Schwartz (1992).

A literature search conducted in 2020 served as the basis of identifying instruments that measure values relevant to the context of scientific work. We searched for reviews of validated measures of work values using the search terms work value combined with scale, measur*, instrument, inventory, questionnaire, model, or validity or validat* in the following databases: Web of Science, APA PsycArticles, APA PsycInfo, ERIC, SCOPUS. We only included studies conceptualizing work values as psychological constructs and excluded constructs not in line with our preliminary value definition (for example, we excluded social work values, occupational work values, and work ethic values (i.e., Confucian, Islamic, protestant)). Because synthesizing the large number of different conceptualizations of work values was beyond the scope of our research, we limited our search to sources that provide summaries of or comparisons between existing and widely used measures.

Four such sources were reviewed (see listed below). Due to the limitations of the other three studies, we only included Leuty and Hansen's (2011) examination of the overarching work values between three instruments. The authors found six common factors of work values through exploratory factor analysis: working environment, competence/having challenging work, opportunities for status and income, autonomy, organizational support/culture, and relationships. Earlier studies (Berings et al., 2004; Rounds & Armstrong, 2004) compared several measures to demonstrate that some values were systematically captured across many instruments, but relied on anecdotal information rather than empirical validation (Leuty & Hansen, 2011). Although this limitation was addressed by Macnab &

Fitzsimmons (1987), their findings are 35 years old and might need to be replicated, especially in light

of the fact that the usefulness and generalizability of their results has been criticized. As Leuty and

Hansen (2011) point out, some of the scales Macnab and Fitzsimmons used have become less relevant

over time, their sampling was non-representative sampling in their study, and there has been a lack of

further content validation (Leuty & Hansen, 2011).

Table 2

Definitions of preliminary dimensions based on S. H. Schwartz's motivational types (1992)

Dimensions	Original definitions (Schwartz, 1992)	Reframed definitions
Self-direction	Independent thought and action: choosing, creating, and exploring (freedom, creativity, independent, choosing my own goals, curiosity)	Freedom of thought and action: determination of research tasks, creating, and exploring own research topics
Stimulation	Excitement, novelty, and challenge in life (exciting life, varied life, daring)	Being drawn to excitement, variety, novelty, and challenge in research
Hedonism	Pleasure and sensuous gratification for oneself (pleasure, enjoying life, self-indulgent)	Seeking to take pleasure and gratification within the realm of research
Achievement	Personal success through demonstrating competence according to social standards (ambitious, capable, influential, successful)	Scientific success through demonstrating competence according to academic standards, feelings of achievement and being a competent researcher
Power	Social status and prestige, control or dominance over people and resources (social power, wealth, authority)	Scientific status and prestige, control or dominance over other researchers and research resources
Security	Safety, harmony and stability of society, relationships, and self (social order, national security, family security, reciprocation of favors, clean)	Safety within the research environment
Conformity	The restraint of actions, inclinations, and impulses that are likely to upset or harm others and violate social expectations or norms (politeness, self-discipline, respect for elders, obedient)	Conformity to scientific norms, restraint of actions that might upset or harm others, abiding by social norms within the research environment
Tradition	Respect, commitment and acceptance of the customs and ideas that traditional culture or religion provides (respect for tradition, modest, humble, accepting my portion in life, devout)	Modesty about achievements and role in forming science, respect, and acceptance of scientific traditions
Benevolence	Preservation and enhancement of the welfare of people with whom one is in frequent personal contact (loyal, responsible, honest, helpful, forgiving)	Preservation and enhancement of the welfare of colleagues
Universalism	Understanding, appreciation, tolerance, and protection for the welfare of all people and of nature (equality, unity with nature, wisdom, world of peace, world of beauty, social justice, broad-minded, protecting the environment)	Understanding, tolerance, and appreciation of socially relevant issues, sense of need to contribute to sustainability and social research

During our search for work value instruments we found that Schwartz's value instruments have been cited as either a work value measures (e.g., Berings et al., 2004) or as the basis for developed work value measures (e.g., Albrecht et al., 2020; Avallone et al., 2010; Consiglio et al., 2017; Ros et al., 1999). We included the 11-factor model of work values (Albrecht et al., 2020, see Figure 2 for the 11 factors) that addressed several limitations of earlier personal value-based research.

Finally, we also included the only validated measure of scientific work values known to us, which was based primarily on work values (English et al., 2018) to supplement instruments based on personal values.

4.2.2. Interviews

To understand how researchers interpret personal value items within the context of science we set up two consecutive studies: a qualitative, interview-based inquiry to establish how researchers understand value items; and a quantitative survey to determine what relevance researchers assign to different versions of value items.

We conducted semi-structured interviews to study how researchers understand generic value items. Our primary aims were to see if the wording, clarity, and form of items related to personal values are adequate; to check whether some value items might be too ambiguous or irrelevant for our purposes; and to identify any values that might be relevant to researchers but are not represented in the Schwartz Value Survey set of personal value items. The project was registered in the study proposal and ethical form approved by the TU/e's Ethical Review Board (ID: 1074, see the project's OSF repository).

We recruited six participants. The sample size estimation was based on feasibility considerations and methodological recommendations on saturation for qualitative studies (Guest et al., 2006; Saunders et al., 2018). As our initial research questions were generic at this stage and we intended to follow-up any results with several other steps of research, the sample size was determined based on the lowest saturation point estimate of six participants presented in several sources within the qualitative methodology literature (Marshall et al., 2013). We used a convenience sample that consisted of six PhD candidates (all employed by a Dutch university, four female).

During the interviews, participants were asked about their impressions concerning the 57 values listed in the Schwartz Value Survey (Appendix 1). Some values like cleanliness were deemed difficult to understand in the context of motives for researchers. Others, such as reciprocation of favors, respect for tradition, mature love, detachment, and unity with nature, were deemed completely irrelevant. Although participants reflected on how most values were easy to understand, many ambiguities in interpretations surfaced. For example, even though participants did not deem wealth as irrelevant, there were several comments on how spiritual matters are more important to researchers and why wealth is irrelevant or at least a bizarre motivation to do science. Still, some reflected on a different aspect of wealth: financial stability. We also found ambiguities in interpretations of other self-enhancement values besides wealth. Some commented on how some self-enhancement values would be inappropriate for researchers or could only serve as perverse incentives leading to scientific misconduct. Others thought of more science-specific meanings, such as satisfying a need for authority by leading research teams.

With regard to values missing from the original list of items, participants noted that the list of values seemed comprehensive, yet some additional values emerged. Participants mentioned the following topics: 1) reasons for (going back to) doing research or choosing academia instead of another work environment, related to the intrinsic value of doing research, meritocracy, importance of relevant outcomes, and community; 2) a need for personal development, growth, learning, and having a good personal image; 3) being part of the research community and having social interactions with other researchers was identified as an additional value. A sense of belonging was covered in the values list but was framed more specifically by participants.

In sum, many personal values were deemed relevant in the context of doing research. A first outcome of this study was that the original wording of values can give rise to ambiguities in understanding items. This highlighted the need for further developing items after reevaluating the original set of values used in this study. If, for example, social recognition will be used and defined as the original item was (i.e., respect, approval by others), associations with academia will be less salient than if the description would include research-specific terms (e.g., respect and approval of the

scientific community). If the values were to be rephrased, some value items could have separate

meanings attached to them and could be added in more than one format. As another example, the

original value related to honoring of elders could be construed literally as honoring of parents and

family heritage, or could be rephrased for the academic context as an appreciation of senior

researchers. As a next step, we refined the value items used in our interviews and developed a new list

of values by eliminating items deemed irrelevant by interviewees, adding values mentioned by

participants, and rewriting items with ambiguous meanings (see examples of interview quotes and

transformation steps in Appendix 3).

4.2.3 Survey

To further examine how personal values are understood in the context of science, we

conducted a quantitative survey (as part of a different study). Our aim was twofold: first, to further

evaluate irrelevance and see if science-specific phrasings were deemed more relevant, especially in

value domains associated with more ambiguous interpretations. Second, we wanted to get a sense of

what participants deem as values in science in comparison with what researchers can be assumed to

value based on extant research (e.g., English et al., 2018; Knafo & Sagiv, 2004).

For this, we included a set of 60 values (Figure 3) displayed after prompting answers with the

following question: "What do scientists value? How important do you think the following values are

for scientists? Think about values that you think scientists value, values that are important for doing

science." We asked participants to provide answers using a 7-point Likert scale similar to the ones

often used in value scales ranging from 1- Extremely unlikely (for a value that could motivate some

researchers but is unlikely to be important for most) to 7- Extremely likely (for values that are likely to

be important for most). Participants could also indicate if they thought that a value was completely

irrelevant for researchers.

We opted to use the convenience sample of PhD candidates invited to a larger survey. Exact

recruitment and participation steps for this survey study are described in Kis et al. (2022). We attached

our value questions as a last section to the set of questions described in that paper and informed

participants that the last section is optional and unrelated to prior sets of questions. Because we

received sufficient responses to this optional part of the study, we discuss the results here.

From the complete sample size of the longer survey study ($N = 391$), a total of $N = 255$ PhD

candidates (36% women, less than 1% gender variant/non-conforming) provided responses to the

section on values. Respondents had an average age of 28.8 years, 45% of the participants were Dutch,

34% indicated belonging to an ethnic minority, and 24% to a racial minority. As we sampled PhD

students from Eindhoven University of Technology, most respondents indicated technology as their

main research area (58%), followed by much less respondents engaging in physical sciences (19%),

social sciences (10%), life and biomedical sciences (10%), and arts and humanities (4%). Frequency

of perceptions about values as a factor of assigned importance and irrelevance are displayed in Figure

3. Figure 4 displays an ordered list of value domains based on frequency perceptions.

Figure 3

Perceptions about the importance of values

Figure 4

Ordered list of value domains as a factor of rate of participants answering at least "more or less likely" and "irrelevant" to connected value items (order based on Figure 3)
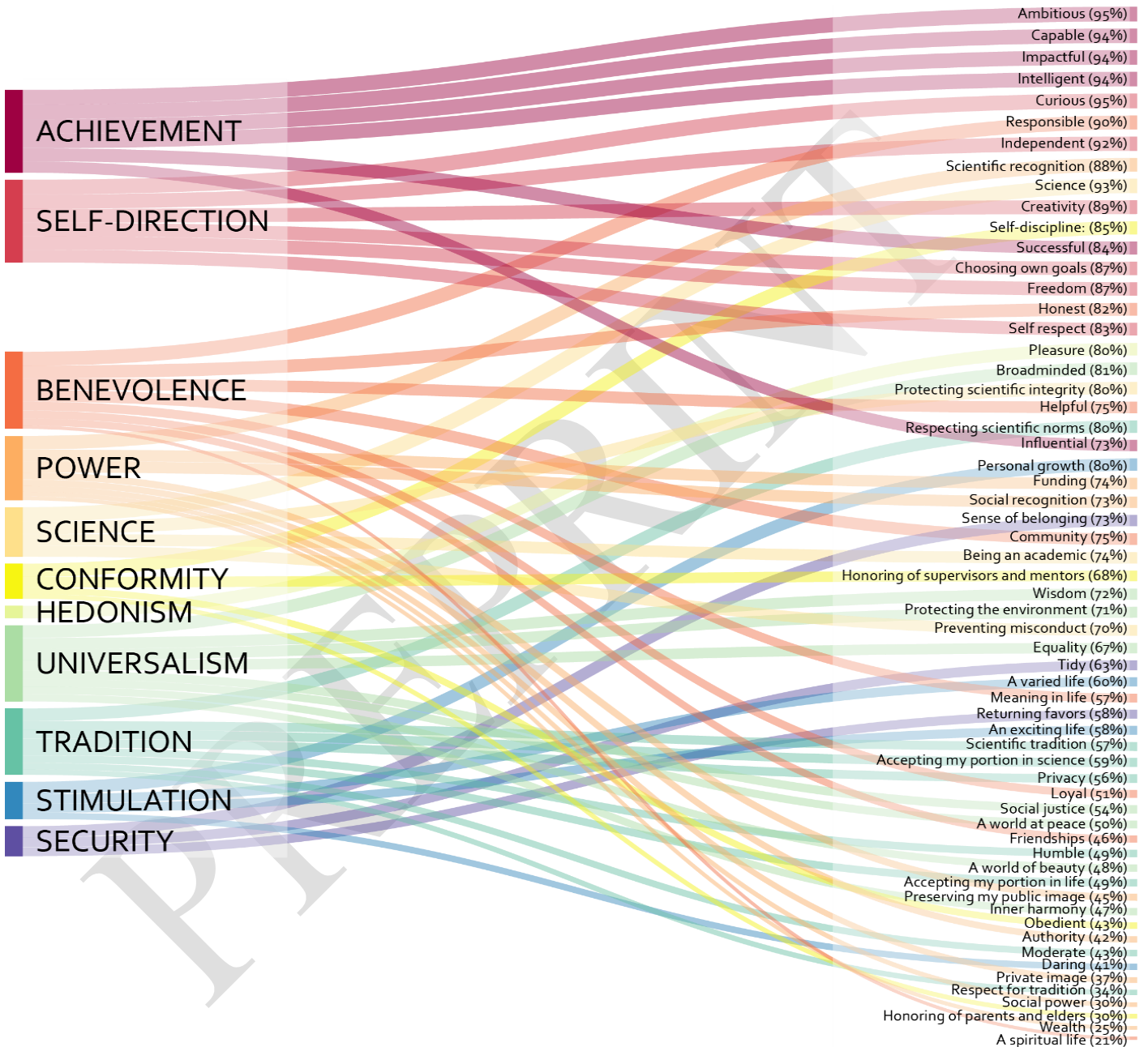
In line with the literature review and the interviews we conducted, achievement, self-direction, and some benevolence and universalism values were rated highly, while most values related to tradition were rated low in terms of their importance to researchers. However, values rephrased to the scientific context and related to hedonism or security were often deemed at least more or less likely to be important to researchers by most participants. Outcomes related to self-enhancement values were

ambivalent, but an underlying logic emerged: generic versions of power values (e.g., wealth, social recognition, or social power) and some achievement values (e.g., influential) scored much lower than their science-specific versions (e.g., funding, scientific recognition, or impactful). Unlike the original items, some of the science-specific versions of power and achievement values were rated important by a vast majority of participants.

This difference in the perceived relevance of generic and science-specific power and achievement values in particular calls into question the current portrayal of the values researchers deem important. While extant value research seems to explicitly (e.g., Knafo & Sagiv, 2004) or implicitly (e.g., English et al., 2018) suggest that researchers are less concerned with values related to pleasurable experiences or values reflecting ambitions for social or material influence, our outcomes suggest that science-specific distinctions of such items can paint a very different picture of researchers and values relevant in the context of research. Given this outcome, we decided to reevaluate our approach.

4.3. Conceptualization

In line with our approach of fusing personal and work values and based on the results outlined above, we updated the preliminary definitions and delimitations of the construct and dimensions.

4.3.1. Definition

We define academic research values as "principles which serve as a basis of evaluating outcomes of scientific work-related actions, guide the selection of scientific work goals, and represent the relative importance assigned to various academic job aspects related to research activities. They serve as guiding principles in the decisions of a researcher or groups of researchers in the academic work setting and are less broad than personal values, but still represent motivational goals that transcend specific work situations. Similar to personal values, academic research values are desirable in the sense that they represent important and worthy causes to researchers." Throughout this process, we use the term scientific work values following the terminology of the literature. However, after conceptualization, we decided the term "academic research values" better reflects our delimitation of the construct (i.e., researchers working in an academic setting).

4.3.2. Dimensions

Final dimensions were created in alignment with value categories incorporated in the measures

we reviewed (Figure 5 and Appendix 4).

Figure 5

Main personal, work, and scientific work value categories in relation to our final dimensions
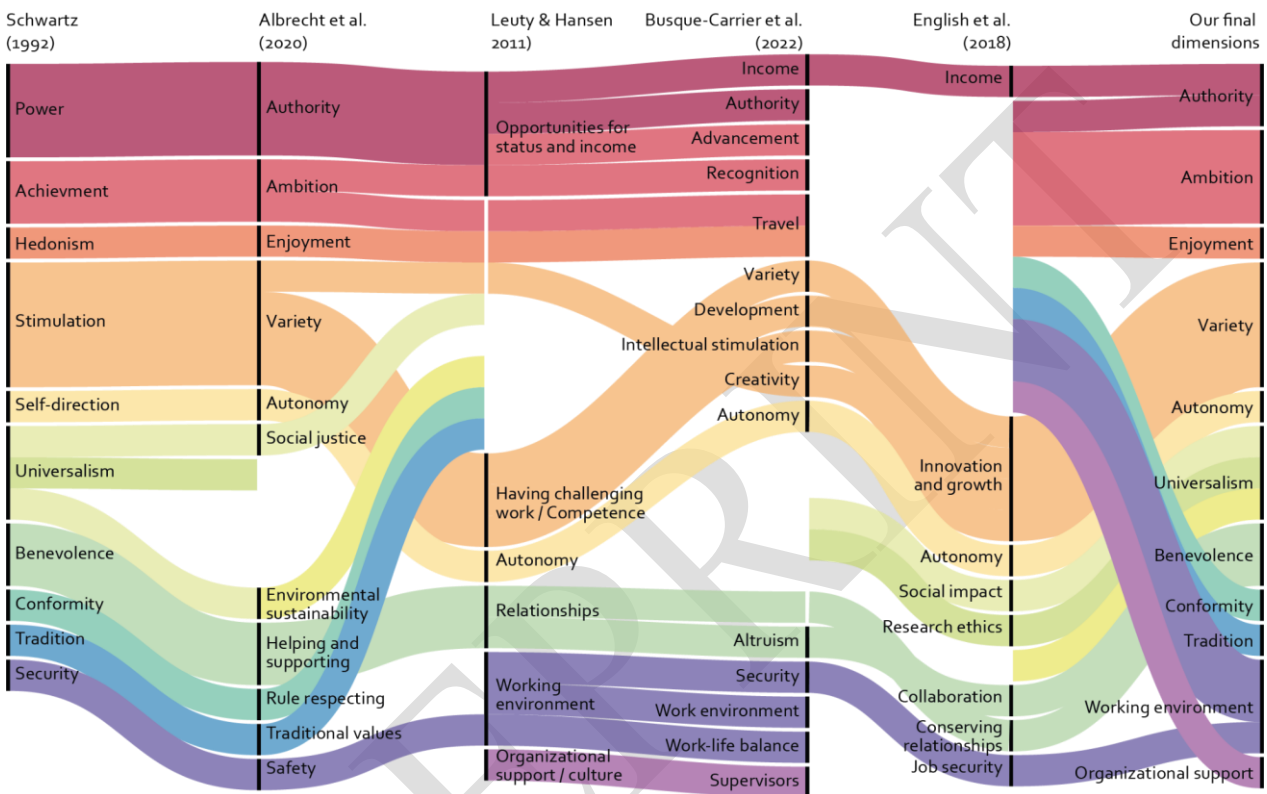
4.3.3. Item characteristics

Based on a summary of all sources reviewed so far and the redefining of our construct, we

made decisions about item characteristics (i.e., wording, form, and response types), as described in the

next paragraphs. In the final step of our research, we generated a set of items (**11 dimensions, 36 sub-**

themes, 246 items) reflecting the outcomes of our inductive and deductive methods (Table 3).

Table 3

List of refined dimensions, definitions, themes, and example items

| Dimensions	Definitions	Themes	Example items
Ambition	Career success through demonstrating competence according to academic standards, feelings of achievement and being a competent researcher	Career, Competence, Achievement	To win grants, scholarships, and scientific awards To be highly cited To believe in my own value as a researcher and feel self-respect
Authority	Scientific status, wealth, and prestige, control or dominance over other researchers and research resources, the importance of having a good public image as a researcher	Dominance over others, Dominance over resources, Influence, Prestige, Salary	To make decisions about who does what in a research project To have direct influence over funding decisions To have respect and attention for my research To lead a prestigious research group To know that my pay compares well with that of other workers
Autonomy	Freedom of thought and action: determination of work tasks, creating, and exploring own research topics	Freedom of thought / Intellectual autonomy, Freedom of action / Practical autonomy	To be able to set my own research agenda To determine how I spend my workday
Benevolence	Being committed to the welfare of other researchers and emphasizing the importance of dependability and relationships within the research community	Caring for others, Dependability, Relationships	To help the people in my research community To be on good terms with colleagues To have good interactions with fellow researchers
Conformity	Conformity to scientific norms and codes of conduct, restraint of actions that might upset or harm others, abiding by social norms within the work environment	Scientific norms, Social norms, Codes of conduct	To work with researchers who respect scientific norms To not speak up against more senior researchers To return favors to collaborators and colleagues
Enjoyment	Seeking to take pleasure and gratification within the realm of scientific work, enjoying doing research	Pleasurable activities, Enjoying research	To go on nice conference trips To take pleasure in the company of interesting, smart people To enjoy my work
Organizational support	Fairness, support, and clarity within the research organization	Fairness, Support, Clarity	To know that the research institution handles processes fairly To feel supported by the university I work at To work in an environment in which norms and rules are clear
Tradition	Modesty about achievements and role as a researcher, respect, and acceptance of scientific traditions	Tradition, Modesty	To do scientific work which would be traditionally approved of To be modest about my scientific achievements

Universalism	Assigning importance to research that has a positive social impact, sense of need to contribute to sustainability and prevent unethical or immoral research behaviors, and being tolerant to different approaches	Social impact, Sustainability, Tolerance, Research ethics	To better the world with my research To make sure that the outcomes of my research do not have harmful consequences for nature To be willing to consider other scientific perspectives To protect scientific integrity
Variety	Being drawn to innovation, variety, novelty, and challenge in research, emphasizing the importance of personal growth and learning	Variety, Novelty, Challenge, Growth	To do varied work To encounter exciting new ideas To uncover hidden truths To become the best researcher I can be
Working environment	Personal safety and comfort within the working and broader scientific environment, a sense of job security	Safety at work, Safety and wellbeing, Job security and stability	To work in an environment free from abusive relationships To have well equipped infrastructure at my disposal (e.g., library, lab equipment) To not be a subject of personal attacks for my research To have a job that provides steady employment

We developed item proposals that are testable by experts for content validity and cover all identified dimensions and themes based on the data collected so far. We arrived at this item pool by conducting three synchronous electronic brainstorm sessions (as recommended in Maaravi et al. (2021) involving the five researchers within our team, who were in various career stages (a PhD candidate, an assistant professor, two associate professors, and a full professor) and had different disciplinary expertise. To cover a broader and more comprehensive set of topics than our own theoretical view of the construct, as stated by best practice guidelines (Boateng et al., 2018), we aimed to create a pool of 60 to 250 items. Undesirable items that might not be a good fit with the identified domains will be eliminated by successive evaluation.

To avoid construct underrepresentation – i.e., not capturing important aspects of a construct due to a narrow focus (Boateng et al., 2018) –, we based our discussions on insights from all previously mentioned sources as depicted in Figure 6, and generated science-specific formats where we could. We did not add new dimensions unrelated to the extant literature and aimed to only include items based on the definitions of the value dimensions to avoid construct-irrelevant variance. We excluded generic personal values such as "mature love" or "spiritual life" because of the diverging interpretations of interview participants and diminished relevance ratings by survey participants. During item generation, we grouped items around themes to provide a better overview of the types of values included in each dimension.

We generated items based on three sources. Items were either 1) rephrased versions of the generic values based on our deductive methods, or 2) included as is or rephrased based on value items included in all reviewed value instruments as listed in Section 4.2.1, or 3) logically generated based on the definitions of the 11 dimensions. For example, based on the results of the interviews and the survey, we included a range of science-specific self-enhancement values not represented in English et al's Values in Scientific Work scale. This process resulted in a total of 246 item proposals spread over 11 dimensions and 36 themes. Details of our decision process for each item is available in Appendix 3, and the final set of items are listed in Appendix 5.

Figure 6

Item proposal generation sources
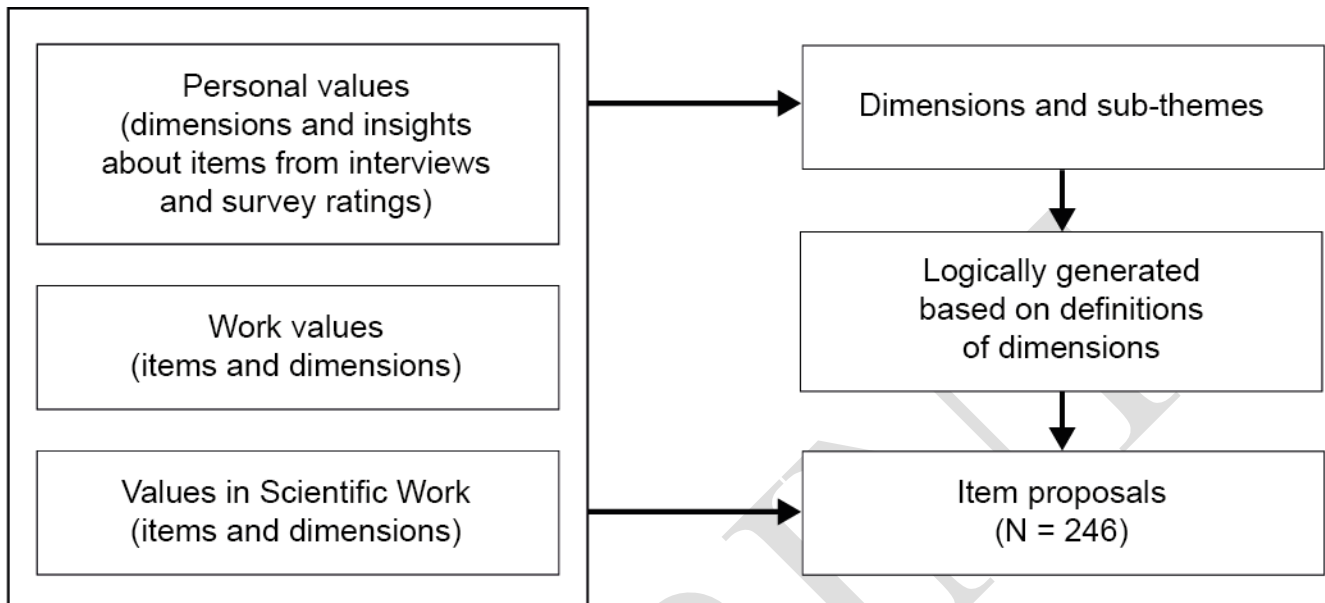
In terms of item wording, we implemented a specific (e.g., "To lead a prestigious research group") rather than a generic phrasing of item proposals to decrease the ambiguity of items. Nuances of question and item formulation such as deciding between a direct (i.e., thinking about values a person finds important – As a researcher, it is important to me…) and indirect phrasing (i.e., thinking about resemblance to a researcher with such values - How much like you is this researcher?) as well as response options (e.g., number of options of a Likert scale) require further methodological discussions.

Readability was checked by applying the Flesch Reading Ease (FRE) and Flesch-Kincaid (F-K) Grade Level formulas which have been demonstrated to be valid and reliable (Kincaid et al., 1975) in Microsoft Word to the complete list of value item proposals. Both scores (FRE: 64.3 and F-K grade level: 6.5) indicated that reading difficulty of the item proposals was plain or easy to read English and below college level.

Finally, we revisited the literature to account for important new studies since our initial review. While when we started our project we did not find any comprehensive reviews of work value instruments nor a single instrument based on the entirety of the work values literature, a recently published study filled in this gap by providing a summary of the most important work value domains

and items in the form of the Integrative Work Values Scale (Busque-Carrier et al., 2022). Although their instrument was developed in French, the authors gave definitions and an English example item for each value domain they included in their scale. A comparison of these results and our value domains, themes, and items suggested that we did not leave out any major work value aspects now present in the literature (see Appendix 6).

5. Discussion

The aim of this paper was to add to the discussion about the conceptualization and measurement of academic research values. To our knowledge, this is the first attempt at conceptualizing academic research values based on an integrated perspective of the most broadly used personal and work value measures. We integrated insights from the personal, work, and scientific work values literature as well as inputs from researchers, and presented initial steps of developing value items for measurement purposes. At the end of this process, our conceptualization and initial set of items cover eleven dimensions of academic research values. We included value dimensions such as autonomy, variety, enjoyment, ambition, authority, conformity, tradition, benevolence, and universalism based on the framework described by S. H. Schwartz (1992) and as implemented in the work context by Albrecht et al. (2020). In addition, we included values from major work value measures based on Leuty and Hansen (2011) that tapinto working environments and organizational support. We also incorporated value items presented in the Values in Scientific Work scale developed by English et al. (2018) and reevaluated our results based on the most comprehensive review of the work values literature as of yet (Busque-Carrier et al., 2022). We designed scale items to be relevant and understandable for researchers working in an academic setting, regardless of discipline, career stage, or nationality, with a working level of English.

Our results suggest that achievement, self-direction, and certain benevolence and universalism values are easily recognizable for researchers even in their non-specific formulations. Almost all of our participants agreed with the importance of values associated with being ambitious, capable, intelligent, creative, independent, honest, responsible, or curious. Since many of these values are embedded within the beliefs held about the "positive" sides of the personality and motivations of

researchers (intelligent, honest, curious, independent – see for example: Tintori (2017), Johnson and Dieckmann (2020)) or oft-cited within codes of conduct, research integrity courses, and discussions about the responsible conduct of research (honest, responsible) as well as prior measures of scientific values (Demirutku & Güngör, 2021; English et al., 2018; Knafo & Sagiv, 2004), this result is probably not surprising. However, the results of our line of research pertaining to less examined values in the scientific context seem relevant to several ongoing discussions.

Although the next phases of measure development could still reshape our current set of items, there are substantial differences between our set of values and those of others. Most notably, our set of items put a larger emphasis on the importance of ambition and authority values specific to scientific work in academia. Our results suggest that self-enhancement values that are phrased to be more recognizable within the scientific context such as having a scientific impact are indeed deemed more relevant by researchers. In comparison, in their study of what individuals in different occupations value, Knafo and Sagiv (2004) found no correlation between power and achievement value priorities and the investigative occupational environment (in which they included researchers). The Values in Scientific Work scale developed by English et al. (2018) also dismissed the importance of ambition and authority for researchers. They included values emphasizing the importance of a good income but disregarded other possibly relevant self-enhancement values within these clusters. Given our theoretical and empirical findings (especially the results of our survey) and an ongoing wider conversation about the importance of collaboration versus competition within science, we find it especially beneficial to study these values in the context of academic research.

Another unique feature of our approach is the integration of a comprehensive set of work values within our instrument. While prior discussions about scientific values almost completely ignored the importance of safe, secure, and well-organized work environments, related needs have been regarded as important factors and included within their instruments by many work-value scholars. This difference between the conceptualization of scientific and generic work values could simply stem from the relative lack of research on scientific work values specifically. It could however also reflect a disconnect between perceiving academic research as a vocation and a job, rather than

(solely) a calling. Only discussing and prioritizing values connected to scientific norms and thought processes would largely disregard the lived experiences of modern-day academics. Such experiences are embodied in a growing line of empirical and theoretical studies, opinion pieces, and non-peer reviewed sources discussing academic pressures, precarious or toxic work environments, and scholars leaving academia in connection with these institutional challenges (some recent examples include: Kis et al., 2022; McKenzie, 2021; Pelletier et al., 2019; Pruit et al., 2021; Skakni et al., 2019). This discussion underlines the importance of studying work values reflecting needs connected to safe, secure, and healthy work environments. In addition, these organizational characteristics can reflect the needs of a more diverse group of researchers and promote the understanding of how we can increase the sustainability of academic career paths.

Finally, our conceptualization of the value dimensions relevant for researchers seems to be in line with a range of findings about the motivations and personality of researchers. For example, value dimensions and their definitions that we presented in this paper largely overlap with the motivational factors discussed by summaries provided by Johnson and Dieckmann (2020) as well as Jussim et al. (2019). More in particular, in their review of motivations for doing scientific research Johnson and Dieckmann (2020) list items such as assigning importance to making money, gaining power and fame, being liked and respected, being independent, doing good science, and helping society and others. In their Social Psychological Model of Scientific Practices, Jussim et al. (2019) include items such as fame, job security, promotions, respect, and being paid well as personal motivations of researchers. While mostly not from a motivational perspective, the role of curiosity, creativity, and intelligence in scientific practice are also debated in detail in the psychology of science literature (Feist & Gorman, 2013).

5.1. Benefits of studying academic research values

The question of what we should value in terms of the competitive versus collaborative nature of science has been extensively debated as of late. One recent example of this debate proximate to our team is when the chief of the executive board of the Netherlands Organization for Scientific Research compared science to elite sport and scientists to top athletes, competing for attention, impact, and new

records (Levi, 2021), many Dutch researchers disagreed (van Pelt, 2021). Responders classified Levi's claims as out of date and out of touch with the ongoing discussions about the harmful effects of competition within academia (Oostendorp, 2021). Indeed, even though academic leaders often make such comparisons to sports or gaming (Ellemers, 2021), several researchers call attention to the harms of the competitive nature of the academic reward system - and the narratives still promoting it (Anderson & Ronning, 2007; Eftekhari et al., 2021; Ellemers, 2021; Fang & Casadevall, 2015; Tiokhin et al., 2021). In this line of research, competition is cited to be harmful to a range of aspects of the responsible conduct of research, including integrity, credibility, reliability, openness, transparency, and cooperative knowledge generation.

Values can add to this discussion about the possible effects of competition within science. The values literature notes that competition and unethical behaviors are influenced by self-enhancement values (power, achievement), while self-transcendence values (benevolence, universalism) facilitate cooperation and prosocial behavior (Sagiv & Roccas, 2021) and are negatively associated with unethicality (Feldman et al., 2015). In organizations, employees who assign a higher value to self-enhancement are more likely to compete and care more about status and prestige, while those who value self-transcendence are more likely to engage in altruistic behavior and decide to cooperate rather than compete (Arieli et al., 2020). In addition, drawing attention to preferable values can facilitate behaviors consistent with the value in question (Arieli et al., 2014; Sagiv & Roccas, 2021).

Based on these results, academic research values might have the potential to be important drivers of behavior change. Influencing or activating certain values can lead to a change in associated behaviors. If we understand which values influence ethical choices in research practices (i.e., research-related behaviors on the spectrum ranging from ethical to unethical – including actions associated with responsible conduct of research as well as scientific misconduct and questionable research practices), we might be able to develop better behavior change interventions to facilitate good and discourage bad practices. Within the scientific context Bruton et al. (2020) call attention to institutional and career-oriented incentives such as competition underlying the use of questionable research practices. And while codes of scientific conduct offer a range of virtues, norms, and values in support of research

integrity, they suffer from terminological challenges and an irreducible pluralism in what they

prescribe (Peels et al., 2019), making the understanding of what is valued in science a complex and

often cognitively demanding endeavor. Here we aimed to describe the initial steps of constructing a

measure that can aid the scientific community in understanding what researchers think is valued

within science connected to what they value as individuals in science. Such an effort can facilitate a

simplified, honest conversation about what we as a community should or should not value in science

or in a researcher.

Similarly to how the personality traits of researchers can help raise awareness of the role of

individual differences in the research process (Tijdink et al., 2016), understanding their own values

might provide researchers with insights about their own internal psychological processes.

Understanding what researchers value and how their values influence their research-related behaviors

can aid them in making more self-conscious decisions and gaining more control over their actions

within the scientific process. Such understanding can be converted into more awareness of risk factors

of questionable practices, but also might reveal potential opportunities of finding value-congruent

ways of engaging in responsible conduct of research or good scientific citizenship.

Finally, values have been found to explain a range of attitudes and behaviors set in the work

environment. As summarized by English et al. (2018), individuals tend to choose and stay more

satisfied in vocations that are aligned with their values. When the values of employees match the

values of the environment in which they work, they are more satisfied with their jobs and are more

likely to identify with, commit to, and stay employed at the organization (Arieli et al., 2020; Edwards

& Cable, 2009). Value congruence is also beneficial for the subjective well-being of employees and

can be beneficial for employee performance as well (Arieli et al., 2020). Value misfit with the

organization can leave employees feeling out of place, stressed, and unfulfilled by their work, it can

lead to lower engagement, performance, and organizational commitment, as well as greater intention

to quit and employee turnover (as outlined by Albrecht et al., 2020; English et al., 2018; Vogel et al.,

2016). As an example, in the context of academic research values this could translate into recognizing

misfits between the values central to cooperation seeking researchers (i.e., those building collaborative

science) and the values they perceive to be reinforced or rewarded within science. By understanding the career effects of such a value (in)congruence, we will be able to understand how detrimental valuing competition might be to the careers of some researchers. We might also be able to increase their work satisfaction, well-being, and productivity by providing them with incentives aligned with their values.

5.2. Limitations

The current study provided an initial set of academic research value items that can serve as a basis for content validity testing and evaluation of psychometric properties. Our outcomes seem comprehensive when measured against the sources we incorporated. However, and as noted throughout this paper, in our research we only included the personal, work, and academic research values literature that defines values as psychological constructs. We also excluded many instruments measuring such values and only relied on widely used instruments selected based on a combination of validity, relevance, and connectedness (i.e., connectedness between different lines of the value literatures) considerations. Still, based on the comparison to the most exhaustive work values instrument published as of yet (see Appendix 6) and the overlaps between our value dimensions and the literature on the motivations of researchers discussed above, our results seem comprehensive enough.

While we tried to decrease the arbitrary nature of our choices to a minimum and include empirical results in our process following best practice recommendations, a further limitation stems from the convenience samples of our inductive methods. We based our decisions on the perceptions of PhD candidates. This reliance on a non-representative, relatively small, and in many regards homogeneous sample could have biased our approach. Still, this sampling strategy was justified by our aim of developing a scale with value items that even the least experienced researchers can relate to and the intended outcome of these initial investigations (i.e., gaining a preliminary understanding of the specificity required in measuring our construct). Future research steps related to item selection and validation will need to involve a more diversified sample of the target population. Whether these

choices resulted in a comprehensive and valid set of items is to be tested in the next phases of measure development.

6. Conclusion

Future research and discussion are needed before an agreement can be made about what researchers value and an academic research values scale might become a valid and reliable instrument. As outlined in our paper, a next step is content validation, ideally by involving evaluations of experts and members of the target population. After a pre-validated set of items emerge, the next steps of the measure development process can be conducted in accordance with best practice recommendations (Boateng et al., 2018). Due to the complexity of this construct, we anticipate that validation efforts will happen in the future on sub-scales and the entire scale will be built up in time. Full scale validation is an ambitious next step, especially if the aim is to represent values relevant to a diverse set of researchers across a broad range of characteristics including discipline, academic status, age, gender, nationality and ethnicity, culture, and so on. While such efforts will be labor-intensive and expensive, the return of this investment for funders seems worthwhile.

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