

# Statistical positivism versus critical scientific realism. A comparison of two paradigms for motivation research: Part 2. A philosophical and empirical analysis of critical scientific realism

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Theory & Psychology  
2018, Vol. 28(6) 737–756  
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DOI: 10.1177/0959354318816829  
journals.sagepub.com/home/tap



## Abstract

In this two-part publication (see Chirkov & Anderson, 2018), we compare two paradigms—statistical positivism and critical scientific realism—in their application to research on academic motivation. In the first part, the propositions of statistical positivism and their applications to psychological research are presented. An empirical study in this part combined self-determination and achievement goal theories and built a statistically integrated model of motivation of 385 college students using path analysis. Part 1 ended with a critical analysis of this statistical model and the knowledge about motivation that it provided. In the second part, the propositions of critical scientific realism are articulated. An empirical study utilizes these propositions and initiates realist interviewing of 12 purposefully selected students. Using within- and between-case analyses, a model of a motivational mechanism of successful university students is proposed. The authors conclude that the continued use of statistical positivism generates minimal new knowledge about the mechanisms of academic motivation. This paradigm should be replaced with the realist one and a case-based methodology, which have a better chance to advance research and improve understanding of academic motivation.

## Keywords

academic motivation, case-based approach, critical scientific realism, statistical positivism, variable-based approach

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This is the second part of a critical examination of two paradigms—statistical positivism and critical scientific realism—as they apply to research on academic motivation. In Chirkov and Anderson (2018), we examined the historical and philosophical bases of positivism as well as its statistical form. Subsequently, an empirical study based on the propositions of this paradigm was reported. The authors concluded that the statistical model generated through that study was erroneously believed to represent a mechanism of academic motivation. The authors specified that, by applying the statistical positivism paradigm, they were able to generate a depersonalized, a-contextual, and ahistorical aggregate of variables connected by the statistical associations that reflect nothing more than these variables' covariances. Finally, they affirmed that despite the efforts and resources they put into conducting that study, the model that they created has limited value and provides little to no contribution to scientific knowledge.

In the current article, the paradigm of critical scientific realism is suggested as an alternative to statistical positivism. This paradigm is analyzed, and then an empirical case-based study guided by its propositions is presented. The goal of this study was to demonstrate how the realist case-based approach may be more productive than the quantitative statistical methodology to uncover mechanisms of academic motivation. In conclusion, the realist paradigm in its application to motivation research is analyzed.

## **Critical scientific realism as a viable alternative to statistical positivism**

Are there alternatives to the statistical positivist paradigm? Many researchers have looked for them in qualitative research by using the *constructivist* and *postmodernist philosophical paradigms* (Denzin & Lincoln, 2012). Initially, these qualitative methodologies were perceived as promising ways to overcome the deficiencies of positivist research; however, ultimately, they have come under severe criticism because they have failed to provide substantial progress in developing scientific knowledge (theories) in psychological and social sciences (Hammersley, 2008; Toomela, 2011). Many philosophers of science see an alternative to both the positivist/quantitative and postmodern/qualitative paradigms in the *realist philosophy*.

*Realism* has a long history in the philosophy of science (Psillos, 2005). Modern philosophers used it with different adjectives: scientific (Boyd, 2002; Chakravartty, 2013), transcendental (Bhaskar, 1975/2008), critical (Bhaskar, 2017), and critical scientific (Niiniluoto, 1999). We decided to go with the “critical scientific” by combining the elements of critical and scientific versions of realism. Many scholars consider it one of the leading philosophical paradigms that should guide scientific research in the natural, social, and psychological sciences (McMullin, 1992). Below, we present the basic propositions of realism, contrast them with statistical positivism's corresponding propositions presented in Chirkov and Anderson (2018), and tie them to motivation research. We mostly rely on the works of Bhaskar (1975/2008, 1979/2015); Boyd (2002); Danemark, Ekstrom, Jakobsen, and Karlsson (2002); Manicas (2006); Manicas and Secord (1983, 1984); and Sayer (1992, 2000) in presenting this paradigm.

## Main propositions of realism pertaining to motivation research

The goal of science in general and psychology in particular, is to discover and investigate the mechanisms of various phenomena; in psychology specifically, researchers aim to uncover the mechanisms of psychological functioning in their cognitive, motivation-emotional, and sociocultural aspects. Such mechanisms constitute the essence of a psychological phenomenon under investigation. These mechanisms should be interpreted as the laws of the phenomenon and should be used to explain it (Bunge, 1997, 2004):

No law, no possible mechanism; and no mechanism, no explanation. No wonder then that the hallmark of modern science is the search for lawful mechanisms behind the observed facts, rather than the mindless accumulation of data and the mindless search for statistical correlations among them. (Bunge, 2004, pp. 207–208)

When these mechanisms are validated by empirical evidence, verbally articulated, and logically connected to other mechanisms, they acquire the status of scientific theories that hold until their propositions are falsified by new evidence. All scientific knowledge (theories) according to this paradigm is falsifiable.

The primary goal of research in motivation psychology is to discover the motivational mechanisms of human actions and experiences (Dweck, 2017). These mechanisms are comprised of forces and powers that are generated by various components of psychological functioning: emotions, cognitions, social expectations, and cultural prescriptions (Gove, 1994; Ryan, 2012). Interactions among these components generate forces that initiate, direct, maintain, and terminate motivated actions. These forces may be conscious or unconscious, and they are either available or not available to conscious reflections of individuals. However, they are the real and determining powers that exist independently of our theorizing about them. The goal of motivation psychology is to discover these forces and verify their mechanisms of functioning empirically.

Realist researchers start by investigating the empirical level of a phenomenon to identify its patterns of empirical regularities. Empirical regularities of different natures are manifestations of their underlying mechanisms, and the discovery of these regularities constitutes the first step in uncovering these mechanisms. Realist research is guided by *deep ontology*, meaning that researchers strive to go beyond these regularities to investigate the level of unobservable but real mechanisms. This breakthrough from empirical regularities to causal mechanisms is executed by rational reasoning in the form of *abduction* or *retroduction* (Bhaskar, 1975/2008; Douven, 2011; Hanson, 1958; McMullin, 1992; Peirce, 1960). Abstraction and the conceptualization of these hypothesized mechanisms (Danemark et al., 2002; Sayer, 1992) constitute a necessary condition for successful retroduction. Psychological mechanisms should be inferred from the empirical regularities, but not directly observed in them. That is why in realism, the researcher's creative mind is responsible for scientific discoveries, not statistical programs.

Operational definitions should be applied only to empirical constructs. Theoretical constructs should not be operationalized; they should be used as elements of retroductive thinking to hypothesize the components of the mechanisms under investigation. Consider

the Freudian constructs of *libido*, *id*, and *super-ego*. The researcher considered human functioning by using these constructs but never actually operationalized or measured them. A lack of measurement instruments does not preclude realist researchers from being thorough, insightful, and scientific. In contrast, by removing the veil of psychological enumeration and measurement, realist researchers look for more productive ways of accessing the real structures and powers of human motivation.

Causal psychological mechanisms work within individuals and should be studied by analyzing individual cases of motivational functioning in different settings: academic, work, health institutions, and others. The manners in which these mechanisms operate strongly depend on the context and history of people's lives and actions. In their investigations, realists look for case-based regularities and start their investigations by discovering patterns in them. The variable-based approach is considered unacceptable in realist research because it destroys the systemic nature of mechanisms and substitutes real relations with statistical abstractions. Statistical associations may have limited value for realists to explore potential empirical-level patterns. Nevertheless, realists deny their value in investigating intra-individual mechanisms. Realist experiments play a crucial part in verifying causal mechanisms, but the thinking about such experimentation differs from the neo-Galtonian form of experimentation (Danziger, 1990). Realist experimentation should be guided by realist ontology and retroductive thinking (Manicas & Secord, 1983; Pawson & Tilley, 1997).

Realist researchers do not expect that the causal relations among components of mechanisms will be directly revealed by some sort of magic manipulation, either statistical or more sophisticated; for example, through fMRI imaging. These relationships can only be inferred by researchers and then tested in experiments through a set of hypotheses. When Darwin hypothesized that the mechanism of natural selection was responsible for the biodiversity on planet Earth, he had never expected this mechanism to be directly observable, because the process of natural selection occurs over millions of years. Despite this lack of direct access to or the possibility of quantifying this process, his theory of evolution is considered one of the most powerful scientific theories ever proposed (Ayala, 2009).

*Purposeful sampling* constitutes an important aspect of the realist methodology. Instead of selecting participants either by chance (a probability sampling) or by accessibility (a convenient sampling), realist methodologists purposefully select strategically important cases (Miles, Huberman, & Saldana, 2014; Yin, 2017). The ultimate goal of this selection is to choose cases that represent a diversity of the contexts and manifestations of the hypothesized mechanisms under investigation. Such sampling is also labeled *theoretical* or *conceptual* because the selected cases have to represent a researcher's hypothetical theoretical/conceptual constructions of possible mechanisms (Chirkov, 2016). Instead of sampling people to generalize their results to a population, realist researchers sample different instances of the same motivational mechanisms to describe their invariant and flexible aspects to extend these mechanisms' understanding.

The most typical criteria for such purposeful sampling is selecting *extreme cases* and comparing them to determine unique and common features in the phenomenology and ontology of the motivational functioning. Because of this comparative mode, extreme cases provide more information about underlying mechanisms than do averaged data

based on randomly or conveniently selected participants (Easton, 2010; Flyvbjerg, 2006; Smith, Harré, & Langenhove, 1995). Another advantage of purposeful sampling is that these cases (individuals) are nested in their sociocultural contexts; thus, researchers have an opportunity to study the embedded nature of their motivational functioning in depth. Such investigations provide rich data for a theoretical or *ampliative induction* of possible mechanisms, which can be contrasted with the *enumerative* or *statistical induction* (Chirkov, 2016; Eisenhardt, 1989; Yin, 2017) that is practiced by statistical positivists. This theoretical/ampliative induction and generalization allows researchers to amplify their knowledge about motivational mechanisms beyond empirical regularities, hypothesize their structures, and test these hypotheses on purposefully selected cases. Subsequently, they can extend this understanding to broader instances of motivational functioning, thus extending and validating their theories of human motivation.

*Abduction* and *retroduction*, as opposed to induction or deduction, are the basis for the advancement of knowledge. “*Abduction* is a way of thinking that occurs when a researcher starts with a problem and empirical evidence regarding it and then suggests a hypothesis of why this problem exists and how the empirical evidence can be explained” (Chirkov, 2016, p. 109). “*Retroduction (retro- induction – thinking back from empirical evidence to their causes)* was initially used as a synonym for abduction, but later became associated with hypothesizing about causal mechanisms and generative powers of different ... processes” (p. 110). These two concepts reflect the rational insight into the unobservable but real mechanisms of various phenomena, including motivational ones. They are driven by discovered empirical regularities as well as the abstraction and conceptualization about a phenomenon. By applying abduction and retroduction, researchers strive to determine the best explanation of a phenomenon at the existing level of knowledge about it (that is why they are often called an *inference to the best explanation*; Douven, 1999). However, as soon as new facts and new hypotheses about the mechanisms emerge and are validated, the old knowledge is improved and extended, thus securing the advancement of knowledge toward a complete understanding of psychological reality.

Researchers are not “research workers”; they are discoverers and inventors because they try to get to the unknowns that exist in the depths of the human psyche. Driven by these propositions, our research moved to a realist investigation of the academic motivation of university students.

## Empirical study

In the current study, we pursued the same goal of integrating two motivational theories to discover the motivational mechanisms of academic behavior that we executed and discussed in Chirkov and Anderson (2018) and implementing the propositions of the realist paradigm. Primarily, we emphasized the case-based approach, purposeful sampling, realist interviewing, and we developed a basis for retroduction by implementing within- and between-case analyses. Although some of these procedures were borrowed from other researchers (Danemark et al., 2002; Edwards, O’Mahoney, & Vincent, 2014; Miles et al., 2014; Stake, 2006; Yin, 2017), they have never been applied in their entirety to motivation research. Therefore, our second goal was to systematize an application of case-based realist interviewing to motivation studies and make this method usable by

other researchers. A detailed description of this methodology is provided in Anderson and Chirkov (2016). It is important to address some limitations of our method, as it only partially adopts the propositions of realism. A primary limitation is that it is based entirely on the self-report of purposefully selected participants. We agree with Langenhove (1995), who admitted that “according to Kant, introspection could only give knowledge of appearances, while the real world remains hidden: ‘I know myself by inner experience only as I *appear* to myself’ (1974: 22)” (p. 14). Our goal in developing realist motivational interviewing was to extract maximum information from participants’ verbal accounts of their motivation and then, by systematically using within- and between-case analyses, develop hypotheses about possible causal relations among consciously reflected motivational constructs and build a hypothetical model of academic motivation for further empirical verification of these hypotheses. The second shortcoming, as it may be seen by some researchers, is a limited possibility of generalization from a relatively small number of participants. By pursuing the idea of discovering intra-individual mechanisms of academic motivation, our goal in this study was to extract relations among the motivational constructs that may serve as a basis for hypotheses about these motivational mechanisms. We planned to discover them from the interviews of 12 purposefully selected successful students. These relations, being verified through a rigorous between-case analysis, serve as a first step for retroducting the motivational mechanisms and ultimately developing a theory of academic motivation. This logic is similar to the logic of biologists who study a limited number of cells to discover their metabolic mechanisms, and then explore whether the same mechanisms apply to other similar cells. Based on this reasoning, a *theoretical generalization* will happen when we apply the discovered relations to different cases of academic performance and observe if the same mechanism applies to them too. These later steps were not executed in this study.

## Method

**Participants.** The same students who were surveyed in the study reported in Chirkov and Anderson (2018) were asked to participate in follow-up interviews for additional course credits. We used the results of the survey for purposefully selecting participants for the current study. Of the 120 willing students, a purposeful sample of 86 students was invited to participate in the interviews. The selection of participants was based on the survey scores for intrinsic, autonomous, and controlling motivations; four participants were initially selected to reflect each motivation type. In addition, we attempted to evenly distribute gender, studying the four individuals (2 females, 2 males) who scored the highest on intrinsic motivation (i.e., two standard deviations above the mean) and relatively low on the other forms of motivation (i.e., below the means) as representatives of highly intrinsically motivated people. Similarly, four highly autonomously motivated and four highly controlling motivated individuals were invited to participate. If they declined, the participants with the next highest scores were invited, and so on, until four participants were chosen for each motivation type.

**Interview questions.** Realist research is comprised of two levels of analysis: componential and structural.<sup>1</sup> The goal of the *componential analysis* is to extract and describe the main

components of hypothesized motivational mechanisms while the goal of the *structural analysis* is to establish relations among these components. Because our investigation was theory driven, the 10 components in our study were the main constructs of achievement goal theory (AGT) and self-determination theory (SDT): two types of goals (performance and mastery), the satisfaction of two needs (autonomy and competence), three types of motivational regulation (controlled, autonomous, and intrinsic), and three outcome characteristics (well-being, dedication, and academic performance).

The first set of interview questions, *construct-focused questions*, were intended to elicit the interviewees' personal experiences and verbal formulations of each construct to extend the construct's existing phenomenological and theoretical understanding. These questions were followed by *relation-focused questions* intended to elicit the interviewees' perceptions of the relationships among constructs to infer the nature of these relationships (e.g., causal, positive, negative, or reciprocal). Questions were tailored to the participants' survey responses and left as open-ended as possible with the intention of probing to determine specific relationships *after* the participants had fully reflected on how they perceive two constructs to be related. An example of a construct-focused question is, "In your own words, why do you engage in academic activities?" Students scoring high on intrinsic motivation were then asked, "You indicated in the survey that you derive a lot of interest and enjoyment from your academic activities, could you describe this?" Similarly, students who scored low on intrinsic motivation were asked, "Some students indicate that they derive a lot of interest and enjoyment from their academic activities, but you did not—can you discuss this?" Examples of relation-focused questions and probes are: "Do you think that the goals you form in your courses are related to your motives for engaging in academic activities?" and "Can you give an example or describe a situation in which this has happened?" All the interviews were audio recorded, transcribed verbatim, and coded by the second author.

### Analysis of interviews

**Coding interviews.** The transcripts were coded for evidence of the presence or absence of each construct as well as the presence or absence of any of the potential relationships of interest. Although it was expected that the interview questions would elicit information about specific constructs, evidence of each construct and relationships between them was often present at many points during the interview. Color coding was used to signify different constructs and relationships. Often, the same text fragment received multiple codings, as exemplified in Table 1. The researcher used *MaxQDA*, a qualitative analysis software, to do the coding and a preliminary analysis of the interviews.

The inter-rater reliability of the coding of the four transcripts (A2, A4, C2, and C4) was conducted by three volunteer research assistants. The training of the raters involved reading and SDT and AGT literature, providing the theoretical definitions of all 10 constructs, and receiving in-person instructions on how to use different coding categories. In addition, the raters were given a coded transcript to review and refer to while coding. Each rater coded a transcript in private and created a corresponding within-case matrix. The second author then compared the text fragments extracted by each rater to the text fragments she had extracted for all the cells of the matrices. When any portion of the

**Table 1.** An example of componential and structural coding.

Interview excerpt

*Researcher:* You indicated on the survey that you feel socially pressured to engage in academic activities, who or what is pressuring you?

*Interviewee:* Well, it's just that I was a smart kid, well, smart in high-school so I got higher marks so it was always people asking me, "where are you going to school next year," not, "are you going to school next year" and things like that.

Coding	Text fragment	Justification
Componential coding for controlling motivation	"People asking me, 'where are you going to school next year,' not, 'are you going to school next year'"	Reflects perceived societal pressure to attend university after high school
Componential coding for competence satisfaction	"I was a smart kid, well, smart in high-school"	Reflects how this student believed she was competent in high school
Componential coding for academic achievement	"I got higher marks"	Grades are indicative of one's achievement in a course
Structural coding for relationship between competence satisfaction and controlling motivation	"I was ... smart in high-school ... so it was always people asking me, 'where are you going to school next year,' not, 'are you going to school next year'"	Interviewee perceives that her competence in high school caused others to expect her to go to university, thus creating societal pressure
Structural coding for relationship between competence satisfaction and achievement	"I was ... smart in high-school so I got higher marks"	Interviewee perceives her high marks were a result of being competent in school
Structural coding for relationship between controlling motivation and achievement	"I got higher marks so it was always people asking me, 'where are you going to school ...,' not, 'are you going to school next year'"	Interviewee perceives that her high achievement caused others to expect her to go to university, thus creating social pressure

extracted text fragment was the same for both the raters and the researcher, it was counted as a match. All the research assistant codings that were not originally replicated by the researcher were considered, discussed with the raters, and included in the remaining analysis if the researcher deemed them appropriate for the analysis.

*Preparing within-case matrices.* All codings for each interviewee were then extracted and combined into a *within-case matrix* (one for each interviewee). Each within-case matrix contained three columns: Column 1 named the "Construct" or "Relationship" being analyzed; Column 2 contained all the text fragments coded for that particular construct or relationship; and Column 3 contained the researcher's comments and analyses. In our study, 12 participants were interviewed, and there were 10 constructs and 42 potential relationships; thus 12 matrices were created, and each contained 52 rows. Once populated with transcript texts and their analyses, these matrices ranged from 5 to 17 pages.



The completed matrices can be found in Anderson (2015), or they may be solicited from the authors.

### *Within-case analysis (WCA)*

Once the within-case matrices were populated with codings (i.e., text fragments), each row of the matrix was analyzed using standardized criteria and procedures. The *componential analysis* involved analyzing how the constructs are perceived and articulated by the participants while the *structural analysis* involved analyzing how the constructs are perceived to be related by the participants.

**Componential WCA.** The componential within-case analysis was conducted on each cell of a matrix pertaining to the analysis of constructs (i.e., the first 10 rows in this study). This analysis involved determining: (a) what key words were used by the interviewees to express a high or low level of this construct, (b) what appears to facilitate the presence of this construct, (c) what appears to impede the existence of this construct, (d) to what degree do participants appear to experience this construct (high, moderate, or low), and (e) any additional comments or insights. Table 2 presents an example of componential and structural within-case analysis.

**Structural WCA.** The structural within-case analysis was conducted on each cell that represented the presence or absence of a relationship between constructs. First, the relationship was labeled using consistent description terms. We used six primary and eight secondary types of relationships to label each relationship cell of each matrix. Examples of classification of relationships are provided in Table 3.

**Reporting WCA results.** Results of both the componential and structural analyses were reported in a verbal summary; the structural analysis results were also presented graphically in the form of *perceived causal maps*. Similar to cognitive maps representing mental models (Carley & Palmquist, 1992) or causal maps (Miles et al., 2014), these maps are graphic reconstructions of participants' experiences of relationships among the components of their motivation. We called them *perceived causal maps* because they represent the interviewees' perception of the causal forces that motivate them in their academic behaviors. The real causal relations must be inferred by researchers based on both within- and between-case matrices and maps and then verified by other empirical methods. The summaries and perceived causal maps are provided in Anderson (2015).

Although the within-case analysis also has practical purposes (e.g., for academic counseling), in realist research, it is only the first step in discovering students' motivational mechanisms. The between-case analysis offers a second crucial step toward this discovery.

### *Between-case analysis (BCA)*

The between-case analysis involved combining the corresponding cells of each participant's within-case matrix into a combined matrix and then assessing the consistencies

Table 2. Example of componential and structural within-case analysis.

Constructs	Text excerpts	Analysis
Intrinsic motivation	<ul style="list-style-type: none"> <li>- I love learning and reading is one of my favourite pastimes, so it just – it's one of the things I like to do most</li> <li>- being like wow I never knew that before, that's just incredible, like learning all this new stuff, I love it</li> <li>- there was actually one thing that I just found really interesting ...</li> <li>- if I have to be here for 6 years, I'm okay with that, I love it here</li> <li>- I feel like after I have a good class and I feel engaged really well, I feel like I could like take on an army ... it's great ... I feel like if I wasn't, I wouldn't be so happy and wanting to participate in anything if I wasn't enjoying my courses!</li> </ul>	<p>KEYWORDS for intrinsic motivation present:</p> <ul style="list-style-type: none"> <li>- I love learning</li> <li>- reading is one of my favourite pastimes</li> <li>- it's one of the things I like to do most</li> <li>- that's just incredible, like learning all this new stuff, I love it</li> <li>- it's so interesting, learning what [researchers] did</li> <li>- I love it here / I love it, like you get to do [readings]</li> <li>- it's great</li> <li>- [I'm] so happy and wanting to participate in anything</li> <li>- [I'm] enjoying my courses</li> </ul> <p>FOSTERED by:</p> <ul style="list-style-type: none"> <li>- course content that is new and stimulates new thoughts and ideas</li> <li>- being an active or auditory learner</li> <li>- having professors who are engaging and "add more to [the course] than what the textbook brings"</li> </ul> <p>OTHER COMMENTS:</p> <ul style="list-style-type: none"> <li>- does not expect intrinsic motivation to fade over duration of university: "if I have to be here for 6 years, I'm okay with that, I love it here"</li> <li>- feels that all other students should share her love of university and interest in it: "that's how it should be" CONCLUDED "LEVEL": HIGH</li> </ul>
Relationships	Text excerpts	Analysis
Competence Satisfaction / Academic Achievement	<ul style="list-style-type: none"> <li>- I was a smart kid, well smart in high-school so I got higher marks</li> <li>- Definitely [competence is related to my grades] when I get kind of lower marks I'm like I suck at everything, I can't do anything, but then when I get my marks that are decent then I'm like, I'm doing okay and I can do this</li> <li>- In most of my classes I haven't really hit the full 20% drop so that makes me feel like I'm doing pretty good [so that is why I feel competent]</li> </ul>	<p>RECIPROCAL RELATIONSHIP</p> <p>Competence -&gt; Achievement (positive relationship)</p> <ul style="list-style-type: none"> <li>- obtaining a low grade hinders competence satisfaction and obtaining a high grade or demonstrating high achievement promotes competence</li> </ul> <p>Achievement -&gt; Competence satisfaction (positive relationship)</p> <ul style="list-style-type: none"> <li>- she believes that high achievement in high school was the result of being a competent student (however, she does not indicate that lower achievement in university is the result of being incompetent)</li> </ul>

**Table 3.** Examples of types of relationships and their descriptions for structural coding.

Primary labels	Description
NO DATA	Student did not discuss relationship or lack of relationship between the two constructs
NO RELATIONSHIP	Evidence that no relationship exists between the two constructs
CONCEPTUAL SIMILARITY	A participant does not appear to distinguish between the constructs; he/she considers them to be the same
CONTEXTUAL	Both constructs exist in the same context but do not necessarily influence each other in any way
RECIPROCAL	Constructs are related such that Construct A influences Construct B and Construct B also influences Construct A
UNIDIRECTIONAL	Constructs are related such that Construct A influences Construct B but Construct B <i>does not</i> influence Construct A
Secondary labels	
Positive	As in correlation
Negative	As in correlation
Conditional	Relations depending on the state and level of one of the constructs
Facilitating; impending or mediated	When relations are mediated by a third construct
Causal	Existence or non-existence of one construct can logically be thought to directly cause the existence or non-existence of the other

and differences between participants. Similar to the within-case analysis, the between-case analysis contained both componential and structural aspects.

**Componential BCA.** To conduct the between-case componential analysis on our data, all within-case componential analyses were copied into a set of second-order matrices so that within-case results from all 12 interviewees could be seen at once. Specifically, each cell of the second-order matrices contained the within-case results of one student while the whole matrix contained comparable results from all students. Because the interviewees were selected to represent each of the three forms of motivation, while balancing gender, each matrix contained 12 cells ( $3 \times 4$ ) such that each column reflected a specific type of motivation and the rows differentiated genders (e.g., the top two rows are female students and the bottom two rows are male). We created a unique matrix for each step of within-case componential analysis: (a) a matrix for the terms used to describe the presence of the construct, (b) a matrix for the terms used to describe the absence of the construct, (c) a matrix for the factors that foster the construct, (d) a matrix for the factors that hinder the construct, and (e) all additional comments made during the within-case analysis. These matrices were fashioned for all constructs, thus resulting in 50 unique 12-celled matrices (10 constructs  $\times$  5 steps of within-case analysis). Color coding helped researchers identify consistencies among participants. In Table 4, each column contains participants of a specific motivation type.

**Table 4.** An example of between-case componential analysis of controlling motivation.

	Intrinsic interviewees	Autonomous interviewees	Controlling interviewees
1	<p>I <b>should</b> [attend classes] because I mean what else would I be here for?</p> <ul style="list-style-type: none"> <li>- “they’d be <b>disappointed</b> and shocked”</li> <li>- “classes that you <b>have to take</b>”</li> <li>- “<b>you pay all this money</b>”</li> </ul>	<ul style="list-style-type: none"> <li>- respect for like my <b>parents</b> who are <b>paying for my university</b></li> <li>- there’s also a <b>guilt factor</b></li> <li>- I’m <b>letting them down</b> if I didn’t go</li> <li>- the <b>social pressure</b> of it</li> <li>- I also feel like <b>my friends</b> would be like “well what are you doing here?”</li> <li>- [teachers say] <b>you should</b> come to lectures</li> <li>- you just <b>need an education to get a good job</b></li> <li>- it’s <b>what I have to do</b></li> <li>- [my parents] <b>wouldn’t support me not getting one</b></li> <li>- <b>pressured to be into</b></li> <li>- more <b>parental pressure</b> to do well in classes</li> <li>- I <b>wouldn’t be able to let my parents down</b></li> <li>- I figured I <b>always had to go</b></li> <li>- I <b>felt guilty</b></li> <li>- <b>because my friend did</b></li> <li>- <b>always have to live up to his expectations</b></li> <li>- <b>pressures</b> me to finish</li> </ul>	
2	<ul style="list-style-type: none"> <li>- these habits have already been like <b>pushed</b> into me</li> <li>- <b>my parents and others think it’s important that I do well</b></li> <li>- <b>people are concerned</b> about me doing well in life</li> <li>- I <b>think people think lower of people who do not pursue secondary education</b></li> <li>- [students who do better than me] would just <b>bother me to the extreme</b> ... that kind of motivates me to do better than they are</li> </ul>	<ul style="list-style-type: none"> <li>- I <b>need to get good grades</b></li> <li>- <b>my parents have always kind of pushed it</b></li> <li>- <b>paying a lot of money to be here</b></li> <li>- <b>pressured</b> by family and people I know</li> <li>- <b>something I have to do</b></li> <li>- <b>people have expectations of me</b></li> <li>- <b>certain prerequisites one has to take</b></li> </ul>	

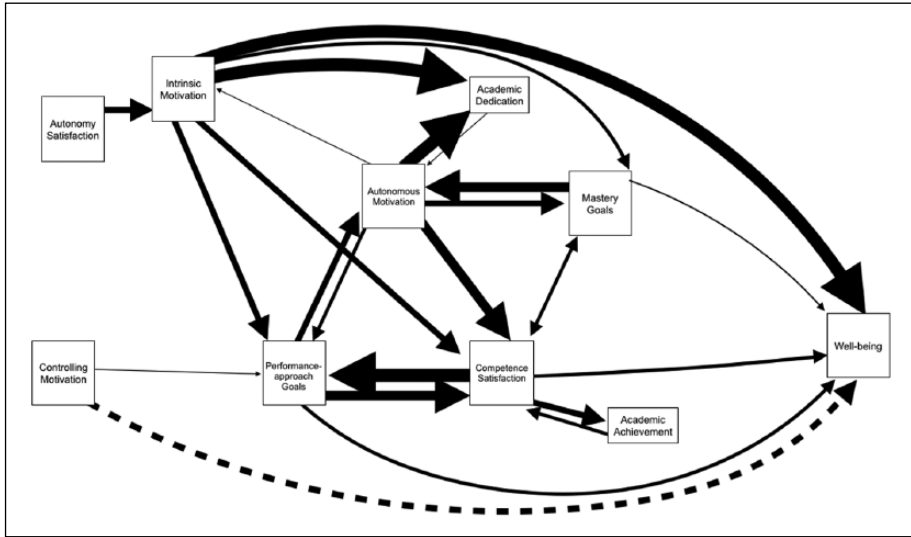
The final product of this analysis is a thorough description of the constructs supported by all interviewees. This information provides a broad and relatively universal presentation of the students' experiences of motivational constructs, including their presence and absence together with the factors and conditions that facilitate or hinder the functioning of these motivational constructs. This componential BCA resulted in a written summary that contained integrated descriptions of all the constructs and the corresponding conditions that interacted with these constructs. Full summaries can be found in Anderson (2015), or they may be directly requested from the authors.

*Structural BCA.* The between-case structural analysis involved determining which of the relationships between constructs were consistently perceived by students and how these relationships tended to be described by students, including their directions and functions. Thus, we determined the consistencies and differences between participants' experiences of each relationship (e.g., Do all students perceive that intrinsic motivation leads to a high level of well-being? Do they experience this relation as unidirectional and causal? What variations of this relation were discovered in the sample?).

Similar to the between-case componential analysis, the first step in the between-case structural analysis was to combine the within-case analysis from all participants into a series of second-order matrices: one matrix for each potential relationship of interest. As was the case above, each cell of these matrices included data from one participant (i.e., the corresponding cell within the third column of within-case matrices). Color coding helped researchers identify consistencies among participants.

After second-order matrices were developed, suitably arranged, and color coded, we provided detailed descriptions of the relationships among the constructs for all participants. As in the WCA, we developed perceived causal maps to graphically represent the emerged integrated model. The causal map was abstracted to depict only those relationships perceived by a majority of interviewees; it is shown in Figure 1. The development of this map is considered an important step in the realist motivational analysis as it allows researchers to extract and to theoretically justify the relatively invariant aspects of the hypothesized motivational mechanisms.

*Interpretation of the case-based integrated model.* The importance of the autonomy need satisfaction and controlling motivation for structuring academic motivation becomes clear, as these were the only constructs that were not perceived to be influenced by other constructs. This suggests that the degree to which one feels pressured to engage in academic activities and to be oneself are the two major components that shape the motivational mechanism. Indeed, the students perceived the considerable conceptual similarity between low autonomy satisfaction and high controlling motivation; thus, these constructs may even reflect ends of a continuum as opposed to entirely distinct entities. When students feel free to make their choices and be themselves, they personally decide to enroll in programs in which they are interested, which leads to intrinsic motivation when they are engaging in their courses. This intrinsic motivation directly increases their well-being, dedication, and sense of competence as well as their desire to set and their ability to obtain mastery and performance goals. In contrast, students who feel pressured



**Figure 1.** A perceived causal map of relationships among the constructs developed based on BCA. Notes: - - - - negative relations; \_\_\_\_\_ positive relations; thickness of the arrows reflects a number of interviewees who supported this relation; the thickness ranges from \_\_\_\_\_ supported by one interviewee to \_\_\_\_\_ supported by nine interviewees.

to attend university and who feel forced to engage with their courses experience poor well-being and focus solely on their performance goals.

The presence or absence of external pressures, self-determination, and personal interests appear to trigger the academic motivation mechanism; however, the core of this mechanism appears to be the complex inter-relationships among two achievement goals, autonomous motivation, and competence satisfaction. Indeed, these four constructs have strong reciprocal relationships, such that mastery and performance goals both enhance and are enhanced by autonomous motivation and competence satisfaction. Specifically, once students are autonomously motivated, they develop a stronger desire to set both forms of achievement goals; having set these goals, they are more likely to achieve them when they are autonomously motivated. Learning the material and doing well in the courses further enhances students' autonomous motivation, which strongly relates to feelings of competence and efficacy in their academic activities. Forming and obtaining achievement goals causes students to feel more competent, which further improves their ability to achieve goals in the future. We hypothesize that these four constructs and their reciprocal relations constitute a continuous cycle of academic motivation for successful students.

Enhanced academic performance is a direct offshoot of improved competence satisfaction, while greater dedication is a direct offshoot of autonomous motivation. The more students experience competence and proficiency in their classes, the higher the grades they achieve; this reciprocally reinforces their feeling of expertise. Moreover, the more students feel free to choose their courses and to direct their academic life, the greater their intention to stay in university and to continue education. Furthermore, both goal types and competence satisfaction directly influence students' well-being. These influences mean that students' feeling of wellness is determined by having a high interest

in academic courses, successful performance, a feeling of mastering the subjects and a feeling of competence in the subjects and the academic routine. While attending university and choosing courses, one of the factors that most frequently promotes autonomy satisfaction is students' conduciveness toward future-oriented career goals and their desire to have an interesting and rewarding job that they will be happy with (not shown on the figure, but this is well represented in the results of the componential analysis).

### **Critical reflections on the case-based integrated model**

The important question is, what type of reality does this model represent? This map is based on the experiences of individual students who were embedded in their social environments and had personal histories and is constructed through systematic within-case and between-case comparisons and analyses. Thus, we consider that it represents the invariant aspects of the intra-individual mechanisms of the academic motivation of successful students, the students who stay in university and demonstrate high intentions to succeed and to continue their education. Many psychologists have emphasized that the primary unit of analysis in psychology should be the individual human being (Allport, 1962; Barlow & Nock, 2009; Carlson, 1971; Hermans, 1988; Valsiner, 1986). Our model returns individual persons to the primary object of psychological investigation, without jeopardizing the scientific vigor and quality of the results.

We are aware that this model was built on self-reports and, at its basis, represents students' conscious and reflected experiences of academic functioning. To overcome these personal idiosyncrasies, we implemented a between-case analysis where we looked for the invariant relations among seemingly experienced constructs. As such, we treated this model as a hypothesized intra-individual motivational mechanism that serves as a first step in building a theory of academic motivation. In the future, this model should be verified and extended based on data from unsuccessful students and/or university drop-outs; in addition, it should be broadened to include data on international students and/or students in foreign universities, where there is evidence of a potentially different structure of motivation (e.g., in Asian universities, students may have different motivational tendencies; Jang, Reeve, Ryan, & Kim, 2009).

In our interviews, the operationalization of the constructs was inevitable because our study was theory-driven; we wanted to be confident that all participants described and talked about the same components of their motivational experience. In contrast to the positivist operationalizations imposed on participants, we tried to extract full descriptions of these constructs from the interviewees, including keywords and phrases that reflected the existence, absence, and quality of the constructs. The researchers' operationalizations were used in the initial steps of the interviews, and they were then extended by the participants' own descriptions of them. Therefore, important advantages of the suggested approach are the close attention to the phenomenology of students' motivational experience and the openness to new ways of describing these experiences of the constructs.

The units of our analysis were individuals and their experiences of motivation in a particular context and at a particular time of their lives. This case-based approach is more suitable for understanding motivation than are various statistical strategies that have

produced variable-based aggregated data. A strong move to case-based methods is evident in the social and psychological sciences (Bromley, 1986; Byrne & Ragin, 2009; Flyvbjerg, 2006; Gomm, Hammersley, & Foster, 2000; Ragin & Becker, 1992; Smith et al., 1995). These methods not only return living individuals to the attention of psychologists, but they also constitute a better foundation for establishing causality, understanding the mechanisms, and, ultimately, theory building (Eisenhardt, 1989; George & Bennett, 2005; Hammersley, Gomm, & Foster, 2009). It is important to note that realism constitutes a robust philosophical foundation for productive case-based research (Easton, 2010). In addition, the purposeful theoretical sampling of strategically important cases allowed us to avoid the pitfalls of probabilistic and convenience samplings.

As this model demonstrates, we were able to identify several types of relationships among the constructs, including causal and reciprocal—relationships that were unattainable using statistical analysis. Although the facts of causality among the components of the model should be continuously verified and tested, it is highly probable that, for example, intrinsic motivation serves as a causal factor for students' well-being and dedication. We draw this conclusion because 9 out of 12 interviewees consistently stated that if they enjoy their courses and find them interesting (high intrinsic motivation), they feel good about themselves (well-being) and they want to continue their education (academic dedication). The question of why intrinsic motivation has such a powerful influence on these outcomes remains open. By continuing this line of inquiry through studying students with different levels and forms of intrinsic motivation in different conditions, researchers could provide a far deeper insight into this issue than they could by using any form of statistical analysis.

The systemic and interdependent nature of the mechanism of academic motivation is evident in the reciprocal relations among autonomous motivation, competence satisfaction, and both types of achievement goals. Neither of these motivational components works unidirectionally or independently in predicting other components or outcomes: they are interrelated, and their role in academic functioning depends on their complex interactions with the other three constructs as well as on the influences of the constructs outside of this 4-component motivational core. Thus, the rich systemic nature of motivation presents itself, and it is supported by relations that have been experienced and lived through by our participants. These systemic relations characterize a more satisfactory representation of academic motivation than unidirectional and formal associations among the variables in the statistical analysis. Much more work is required to clarify the dynamics and conditions of this systemic functioning, but with this model, we are closer to such an understanding than with the model based on the path analysis.

Although we extracted this model from only 12 Canadian-born students from a mid-size university, we can theoretically generalize the hypothesized mechanisms beyond the original sample of interviewees. We can hypothesize that similar dynamics among the same constructs may unfold in high-school students or international students, or that similar mechanisms may work to motivate physical exercise or sports participation. The replication or non-replication of this model on other participants will tell researchers about other components and other relationships that may be comprised in this mechanism. This may lead to a fuller representation of the hypothesized model and, finally, to the development of an integrated theory of academic motivation. Furthermore, when the



hypothesized mechanism receives substantial empirical support, it will become well suited for individual and group academic interventions as well as for counseling students with educational difficulties. These difficulties may emerge because of the malfunctioning of motivational mechanisms for those students for a variety of reasons, conditions, and circumstances. Analyzing cases of motivational malfunctioning may not only validate the proposed understanding of the academic motivation mechanisms, but it may also contribute to a deeper understanding of the conditions and factors that affect, both positively or negatively, this mechanism's functioning. Thus, the theory of academic motivation becomes a subject of a dialectical involvement with it: on the one hand, this theory drives new research and practical interventions while, on the other, it is continuously verified and enriched by the new factors, conditions, and components that emerge with the new cases.

We are fully aware that the presented example of realist research has several weaknesses and limitations. First, it still relies on self-report; in future studies, these reports should be complemented by data from observations of students in real academic environments. Second, all the interpretations may be treated as subjective as they strongly depend on the personality and inquisitiveness of a researcher. We do not see this as a real weakness because a more elaborate inter-rater reliability procedure may create more confidence in the extracted relations. Also, as the history of science demonstrates, scientific discoveries are made by unique and creative individuals; there is nothing wrong with this dependency, as these unique personalities are capable of making real discoveries. Third, this study was based on the constructs extracted from the two primary theories of motivation, the AGT and SDT. This reliance on preconceived theories has influenced the content of the extracted model of academic motivation. In future studies, more constructs from other motivation theories should be included. Finally, we did not execute the full-fledged retrodution into the nature and mechanisms of motivation, and our integrated model still represents empirically verifiable intra-individual regularities. This model may be used as a step toward further inference into unobservable motivational mechanisms.

## General conclusion

In this two-part publication, we contrasted two scientific paradigms—statistical positivism and scientific realism—and, based on them, two methodological approaches—variable-based and case-based—to studying the academic motivation of university students. Its ultimate purposes were to extend the philosophical and methodological frameworks of modern motivation research and to help researchers move beyond the suffocating grip of statistical positivism. In Part 1 (Chirkov & Anderson, 2018), we discussed the problems related to the use of statistical positivism and illustrated them with an empirical example. In Part 2, we provided a viable alternative to researchers in the form of the realism-driven case-based approach and illustrated it with an empirical study. A continuous comparison of these two paradigms and approaches supplied readers with rich information to think about when applying them to their research. If we inspired researchers to seriously consider these two options and to think carefully before using them, we deem our objectives to be achieved.

## Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

## Note

1. Realist research may also include *processual analysis*, wherein researchers hypothesize and empirically verify the dynamics and processes through which these structures work to produce various motivational experiences and actions. We did not conduct this third level of analysis in our study.

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