

## Exploring the Complexity of Introjected Regulation in Self-Determination Theory

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**Abstract**

Within Self-Determination Theory, introjected regulation is characterized by internal rewards, ego-involvement, and concern with oneself or perceived approval from others and is associated with feelings of pride, shame, or guilt. Researchers have recently proposed a differentiation between positive and negative introjected regulation. This study aims to ensure complete coverage of the theoretical construct by considering both positive and negative dimensions of introjected regulation, as well as approval from self and others. A cross-sectional study of university students ( $N = 409$ ) from Central Europe revealed that a factor model with four introjected regulation dimensions (positive, negative, focus on self-approval, and approval from others) fits the data well. This model outperforms one-factorial, two-factorial (positive and negative introjection), and a hierarchical solution. There are negative or positive associations of negative introjection and positive other-approval with subjective vitality. These preliminary results provide initial empirical evidence that the theoretically postulated assumptions should be considered when evaluating introjected regulation, and may stimulate theoretical debates.

**Keywords:** Self-Determination Theory, motivation, introjected regulation, CFA, ego involvement.

**Introduction**

Self-Determination Theory [1,2] offers a comprehensive framework for understanding human motivation and behavior, emphasizing the intrinsic tendencies towards growth and fulfillment. Within this theoretical framework, introjected regulation occupies a pivotal position, representing a form of extrinsic motivation where individuals have internalized certain behaviors or goals, albeit not entirely congruent with their authentic desires. Despite its significance, the conceptualization and measurement of introjected regulation has posed challenges in empirical research. One prominent issue in the study of introjected regulation pertains to its presumed unidimensional nature. Traditional approaches often treat introjected regulation as a singular construct, failing to capture its multifaceted nuances [3]. Consequently, studies relying on such simplistic conceptualizations have yielded inconsistent results [4-6], hindering our understanding of this motivational construct within the context of SDT. To address this limitation, recent research has endeavored to differentiate between positive and negative aspects of introjection [7-10]. By distinguishing between these dimensions, scholars have aimed to elucidate the complexities inherent in introjected regulation and its impact on motivational processes. Although this approach has led to greater consistency in empirical findings, it does not completely fulfill the theoretical foundations of SDT.

At the core of SDT lies the notion that introjected regulation entails behaviors driven by a desire for approval, whether from oneself or others [11]. This fundamental premise underscores the significance of understanding the underlying motivations and psychological dynamics associated with introjected regulation. The dichotomous classification of introjected regulation into positive and negative forms disregards these

fundamental theoretical assumptions, and therefore limits our insights into its motivational mechanisms.

**Types of motivation in Self-Determination Theory**

According to SDT [1,2,12], intrinsic and extrinsic reasons for behavior lead to differential performance and well-being because intrinsic and extrinsic motivations are characterized by differing internalization processes, defined as “the active assimilation of behavioral regulations that are originally alien or external to the self” [13]. The quality of internalization can vary, leading to different qualities of motivation. Therefore, within SDT, motivation is considered as a multidimensional construct represented by distinct types of motivation on a continuum from self-determination to heteronomous control [8,1]. The spectrum of motivation types spans from amotivation-indicating a complete lack of motivation to intrinsic motivation, which is purely autonomous and is considered as the prototype of self-determination. Intrinsic motivation entails engaging in activities purely for their own sake, driven by interest and enjoyment, such as children's play and exploration, providing inherent satisfaction and joy [14,2]. Between amotivation and intrinsic motivation lies extrinsic motivation. When extrinsically motivated, individuals could be driven by specific reasons or external outcomes or motivation can also be autonomously enacted [2]. Hence, extrinsic motivation is considered heterogeneous and comprises four types that vary along their perceived locus of causality and their perceived autonomy [2,10]. External regulation is a controlled form of motivation and concerns behavior driven by externally controlled rewards or the avoidance of external punishments [2]. Thus, external regulation represents a qualitatively poor form of motivation because it is associated with feeling externally controlled to do something [15,10]. Introjected regulation (IJ) is slightly self-determined and involves reasons for action that are only

partially internalized [1]. In other words, IJ represents a greater internal perceived locus of causality than external regulation and represents a state driven by internal dynamics related to self-esteem, such as pride-seeking or the avoidance of negative emotions, such as anxiety, guilt, shame or failure [16,2].

In addition to these controlled types of motivation, extrinsic motivation also includes more autonomous types of motivation, namely identified and integrated regulation. In identified regulation, a person identifies with an activity or task and evaluates it as personally meaningful and valuable. The person will experience a high degree of volition to act, but unlike intrinsically motivated behavior, the behavior may not be enjoyable for its own sake, it is still instrumental [2,10]. The most autonomous form of extrinsic motivation is integration “in which the enactment of a behavior is assimilated into the individuals’ sense of self” [16] and is congruent with other interests and values [2]. However, a meta-analysis by Howard et al. (2017) [8] failed to find evidence that integrated regulation is distinguishable from identified regulation. Integration is too similar to identified or intrinsic motivation and cannot be separately measured, which is why it is not considered in this current study. In general, integrated regulation is mostly excluded when measuring autonomous forms of motivation due to a lack of discriminant validity; thus, it is a theoretical construct and difficult to operationalize [4].

### Introjected Regulation

IJ is characterized by ego involvement [17] because the person aims to gain and maintain approval from the self and others [15]. Two main aspects of ego involvement are currently distinguished [1], which are also central to the conceptualization of IJ in SDT: (1) Ego involvement is a striving based on threats by others, that is, that the ego is “on line with respect to evaluation by others” [1]. (2) However, ego involvement is also based on threats to self-esteem; one’s ego “is on line with self-evaluation” [1].

When individuals are introjectively regulated in terms of internal and intraindividual processes, they may, for example, want to prove something to themselves and others (approval) or would feel shame if they did not perform certain actions [11]. External factors, such as social expectations, pressure, and the desire to meet the standards of others or to gain their approval, are crucial for the development of IJ [15]. However, it is largely unclear (1) whether it makes a difference in explaining cognitive and affective outcomes whether a person seeks approval from self or from others and (2) whether the two dimensions of approval from self and approval from others can be described not only phenomenologically but also distinguished empirically.

Regarding the meaning and outcomes of IJ, the empirical evidence is rather inconsistent, with some studies showing negative associations with adaptive outcomes and some reporting positive associations with adaptive outcomes or no significant associations [4,5,6]. Due to the heterogeneous results regarding IJ, some authors distinguish between positive and negative IJ [7,18,8,9,10] and have tested whether positive and negative IJ constitute different dimensions [7,8,10].

There is empirical evidence that the more autonomous a motivational type is (e.g., intrinsic, identified), the more positively it is related to adaptive outcomes, such as subjective well-being, positive affect or deep cognitive processing [19]. In contrast, controlled types of motivation such as IJ and external

regulation, are positively related to maladaptive outcomes, such as negative affect, and are negatively associated with adaptive outcomes [7,20,15,5,10]. A meta-analysis by Howard and colleagues (2021) [15] demonstrated that the average relationship between IJ and adaptive and maladaptive outcomes lies at the intersection, with a 50 percent chance for either adaptive or maladaptive outcomes. This is unsurprising since IJ includes positive (e.g., pride) and negative (e.g., shame) aspects [4,5,11].

The distinction and imbalance of measurement becomes evident when examining existing scales that measure IJ. In the following, some of the best-known scales are listed as examples. The Academic Motivation Scale by Vallerand et al. (1992) [3] focuses only on positive aspects of IJ (e.g., “To prove to myself that I can do better than just a high-school degree”, p. 1008), whereas the scale from Mullan et al. (1997) [21] assesses only negative aspects of IJ. In contrast, there are The Sport Motivation Scale by Pelletier and colleagues (1995) [22] and the scale for introjection by Noels et al. (2003), Li (1999) [24] and Ryan and Connell (1989) [11], each of which captures positive and negative aspects of IJ. However, they do so with only one subscale containing the following items: e.g., “Because I will feel bad about myself if I don’t/ Because I’ll feel ashamed of myself if I don’t/ Because I want the other students to think I’m smart/ Because I want people to like me” [11]. The first two items here covers approval from self and the third and fourth item relates to approval from others. At this juncture, IJ is measured taking into account self- and other-approval [11], yet not analyzed in a differentiated manner but all in one scale without differentiating these various aspects. In our understanding of IJ, these aspects should not be conflated, as the multidimensional nature of IJ is not adequately acknowledged.

As demonstrated, the aforementioned scales do not distinguish between positive and negative IJ or between approval from self or others. They either measure positive or negative aspects separately or mix them together. While different facets of IJ are indeed assessed, they are not separately analyzed, which may lead to an information loss. Instead, they consider IJ to be one single type of regulation, with all items belonging to one subscale. Quite often, the operationalization of IJ within a study takes place solely through the negative aspect, which can cause correlations with negative outcomes [7]. However, outcomes of IJ may be more adaptive when the positive aspect is also considered [7]. Indeed, previous research has demonstrated that associations with outcomes differ for positive and negative IJ [7,4,9,25,26,5,10].

In a study by Ng et al. (2012) [5], for instance, IJ was negatively related to well-being but positively related to health behavior. However, IJ was also negatively related to depression and anxiety [5]. Gagné et al. (2015) [4] found that IJ was often positively related to adaptive outcomes such as affective engagement, self-reported job effort, vitality and healthy behavior. Therefore, these authors suggest that the positive and negative aspects of IJ should be separately measured. The results of a meta-analysis of different scales measuring all types of motivation also show that IJ is positively related to adaptive as well as maladaptive outcomes [15]. Howard and colleagues (2021) [15] conclude that this correlational pattern indicates the theorized double-sided nature of IJ.

Sheldon and colleagues (2017) [10] also differentiated between positive and negative IJ and found—as a result of multidimensional scaling—empirical evidence for that distinction, consistent with theoretical expectations that positive IJ is more autonomous than negative IJ. The correlations of positive IJ with subjective well-being, positive affect and self-congruence were positive, whereas negative IJ was negatively associated with subjective well-being and satisfaction with life [10]. Di Domenico et al. (2023) [18] also used multidimensional scaling to show that positive and negative IJ differ in autonomy. While SDT associates positive IJ with perfectionism, mood regulation, and creative engagement, negative IJ focuses on the approval of others and is associated with feelings of guilt and shame (Ryan, 2022) [27]. However, a closer look at the results of Assor et al. (2009) [7] and Sheldon et al. (2017) [10] reveals that the relationships and predictions are still not entirely coherent despite the distinction between positive and negative IJ.

The findings of the aforementioned studies confirm the distinction between positive and negative IJ and highlight the need for differentiation within IJ to prevent biased results: ego-involvement can be induced by the self (that is, through poorly internalized norms) or by others. Arguably, there is a difference between performing a behavior to approve one's self and doing something to impress others [28,29]. These ego-involving motives inherent in IJ play different roles, leading us to consider that differentiation between approval from self and approval from others may advance our understanding of this motivation type. As it is necessary to reflect all relevant aspects of IJ to avoid a loss of construct-relevant information and a reduction in predictive power, it might be useful to distinguish approval from self and approval from others when measuring IJ [15]. To date, however, no study has examined whether a differentiated consideration of all theoretically anchored aspects of IJ can explain the structure of this motivational type and improve its predictive power. Occasionally, the aspects of approval from self and approval from others are considered as conceptual features; however, no separate scales have been established [7, 11]. Thus, this study examines whether approval from self, approval from others and positive and negative IJ are empirically distinct constructs.

### The Present Study

The present study aims to critically examine the conceptualization and measurement of introjected regulation within the framework of SDT. By synthesizing existing literature and integrating theoretical insights, we seek to elucidate the complexities inherent in introjected regulation and its implications for human motivation and well-being. Through this endeavor, we aspire to foster a deeper understanding of this crucial construct, thereby advancing theoretical discourse. Therefore, the aim of this study is to investigate whether a complete coverage of IJ as described in theory, i.e., considering positive and negative IJ and approval from self and others, yields further theoretical insights regarding the content and structure of IJ. Considering theoretical assumptions of SDT and empirical findings, we expect that a distinction of positive and negative IJ, which additionally considers approval from self and others, may better reflect the structure of IJ than a unidimensional representation. Addressing this aim, we tested a model with a single-factor structure of IJ with all items loading on one factor [11]. In Hypothesis 1, we investigated whether distinguishing between positive and negative aspects of IJ provides a better fit

to the data than a one-dimensional model, aiming to replicate the findings of Assor et al. (2009) [7] and Sheldon et al. (2017) [10] regarding positive and negative IJ. Subsequently, and central to the present research, Hypothesis 2 posits that a four-dimensional model of IJ—incorporating both positive and negative aspects along with self-approval and other-approval—fits the data better than a unidimensional or two-dimensional model (positive vs. negative). Additionally, we explored whether the data support a hierarchical model of IJ and whether this model might be superior to other models. To the best of our knowledge, no studies have been conducted to empirically address the potential existence of further dimensions of IJ. We can assume that IJ is a heterogeneous construct, but we do not currently know whether the two types of ego-involvement (self- and other-approval), which are theoretically located, play a decisive role in determining IJ. In order to obtain evidence for the validity of the differentiated assessment of IJ, the best model will be used to assess the link between the multidimensional nature of IJ and the other motivation types within SDT. Results may suggest insights into the positioning of the four subcategories of IJ along the continuum of self-determination between autonomy and control. As the meta-analysis by Howard et al. (2021) [8] showed that IJ was positively related to both adaptive (e.g., vitality) and maladaptive outcomes (e.g., anxiety) and Sheldon et al. (2017) [10] showed different relationships of positive and negative IJ to subjective well-being, it is necessary to explore the relationships of all four aspects of IJ with other variables. We will extend these studies by investigating in Hypothesis 3, whether the theoretically situated aspects of approval from self and approval from others are differentially associated with subjective vitality in a sample of university students from Central Europe and we hypothesize that the positive self and other-approval of IJ are related positively with subjective well-being and the negative self- and other-approval IJ are negatively related.

### Method Sample

The sample comprised 409 university students ( $M_{Age} = 24.3$  years,  $SD_{Age} = 5.96$ , female = 84%) from two German ( $n = 212$ ) and two Austrian ( $n = 197$ ) universities. Most of them studied to become teachers (37,7%), followed by psychology (24,8%), educational science (17,1%), and law and economics (5,3%) students; 13.6% were studying other disciplines (literature, silviculture, media studies, medical science, and health management), and 1.5% did not report their field of study. Most of the students were undergraduates (79%), and 21% were in a master's program. The online questionnaire in German language was implemented using SoSci Survey [30] and made available to participants at [www.sosicisurvey.de](http://www.sosicisurvey.de). Participation was voluntary and completely anonymous. In the study, ethical standards were adhered to, and ethical approval for the study has been granted by the first author's institution.

### Instruments

**Motivation types.** Students completed the scales for the measurement of motivational regulation for learning (SMR-L [31], which measures external (e.g., "I study primarily because I cannot get a well-paid job without an academic qualification"), identified (e.g., "I am committed to my studies because it is very important for me") and intrinsic motivation (e.g., "I really enjoy learning in my studies") with three items each on a 7-point Likert scale ranging from *does not apply at all* (1) to *applies completely* (7). The reliability scores of all scales are in Table 2.

**Introjected Regulation.** The scale comprises 13 items; of these, seven were adapted from previous studies [7,10,31], and six were newly constructed (see information below). The stem for all items was “I complete tasks for my studies ...”. Five positive items with a focus on perceived approval from self (henceforth IJPS) were used from previous scales from Assor et al. (2009) [7], Sheldon et al. (2017) [10] and Thomas et al. (2018) [31] and address the aspect of feeling proud of ourselves and read as follows: (1) “because I want to show myself that I can be successful in my studies (IJPS 1); (2) “in order to feel proud of myself” (IJPS 2); (3) “because I want to feel good about myself” (IJPS 3); (4) “because I want to prove to myself that I am capable” (IJPS 4), and (5) “because it boosts my self-esteem”(IJPS 5). The following three items were used from previous scales from Assor et al. (2009) [7] and Sheldon et al. (2017) [10] to measure negative IJ with a focus on approval from self (henceforth IJNS): (1) “because I would feel ashamed of myself if I didn’t” (IJNS 1); (2) “because I would feel guilty if I didn’t” (IJNS 2). One additional item was newly constructed: (3) “because I put myself under pressure” (IJNS 3).

We newly constructed theoretically appropriate items to measure positive and negative IJ with a focus on perceived approval from others. Positive items with a focus on perceived approval from others (henceforth IJPO) describe the attainment of positive feedback from significant others and are clearly other-oriented rather than self-oriented. The item stem remained the same, and the endings read as follows: (1) “because important people to me should be proud of me (IJPO 1)”; (2) “because I don’t want to disappoint my social environment” (IJPO 2) (3) “because it’s what is expected of a good student” (IJPO 3). The negative items focusing on perceived approval from others (henceforth IJNO) were also newly developed. These items describe the avoidance of negative feelings such as shame or guilt toward others: (1) “because otherwise, I would feel ashamed in front of others” (IJNO 1); (2) “because otherwise, I would feel guilty towards other people” (IJNO 2). All items were rated on a 7-point Likert scale ranging from *does not apply at all* (1) to *applies completely* (7). More information regarding the validity of this newly developed subscale can be found in the results section.

**Subjective vitality** (Ryan & Frederick, 1997) [29]. Students’ level of energy and vitality in studying were assessed with six items (e.g., “I feel alive and vital in my studies”) on a 7-point Likert scale ranging from *not at all true* (1) to *very true* (7).

**Data Analyses**

Demographic characteristics were summarized using means and standard deviations for continuous variables, and frequencies for

categorical data. In the data set 20 missing values occurred. We used Little’s missing completely at random (MCAR) test (Little, 1988) [32] to assess if data were missing completely at random. Due to a non-significant test result ( $p = .651$ ) MCAR can be assumed, why 13 observations with missing values were deleted. The final sample includes 396 observations.

To investigate the structure of IJ, we ran several confirmatory factor analyses [33,34] using the diagonally weighted least squares (DWLS) estimation for ordinal data [35]. The assessment of model performance is based on different measures and their recommended adequate cut-off values: (a) Comparative Fit Index ( $CFI \geq 0.90$ ), (b) Tucker Lewis Index ( $TLI \geq 0.90$ ), Root Mean Square Error of Approximation ( $RMSEA \leq 0.08$ ) and (c) Standardized Root Mean Squared Residual [36-38].

In Model 1, IJ was modeled as one factor, in Model 2 as two factors (positive and negative IJ), and in Model 3, we modeled four factors for IJ (positive self: IJPS, positive others: IJPO, negative self: IJNS, negative others: IJNO). Item loadings on the IJ a priori motivation factor was freely estimated, and correlations between latent factors were permitted. In Model 4 we modeled a higher-order factor IJ and four sub-factors (IJPS, IJPO, IJNS, IJNO).

Finally, we tested the validity of the postulated dimensions computing a CFA with IJ as well as external, identified and intrinsic motivation. The aim of this approach was to test the theoretical associations with the other regulatory styles of SDT.

All statistical analyses were carried out with the statistical software R [39] using the packages lavaan [40], naniar [41] and psych [42]. For all inferential assessments, we set the maximum risk of an error of the first kind to 5%.

**Results**

**Main analyses**

When conducting the analyses for Model 1, the items IJPS 1 and IJPS 4 display high item intercorrelations (.801). A closer look at the items revealed, that both items address the aspect of ability or success (successful, capable) rather than an emotion that goes hand in hand with action. Since introjected behavior is defined more by internal processes that relate to self-esteem, such as pride-seeking, these two items were removed from the further analyses for reasons of content [16, 2]. Furthermore, the first CFA results of Model 1 also showed, that some item loadings were weak ( $<.46$ ; [43]). Therefore, those items were deleted from all models (IJPS 1, IJPS 4 and IJPO 3). The reported results refer to models without these three items. The model-fit statistics and information criteria are shown in Table 1.

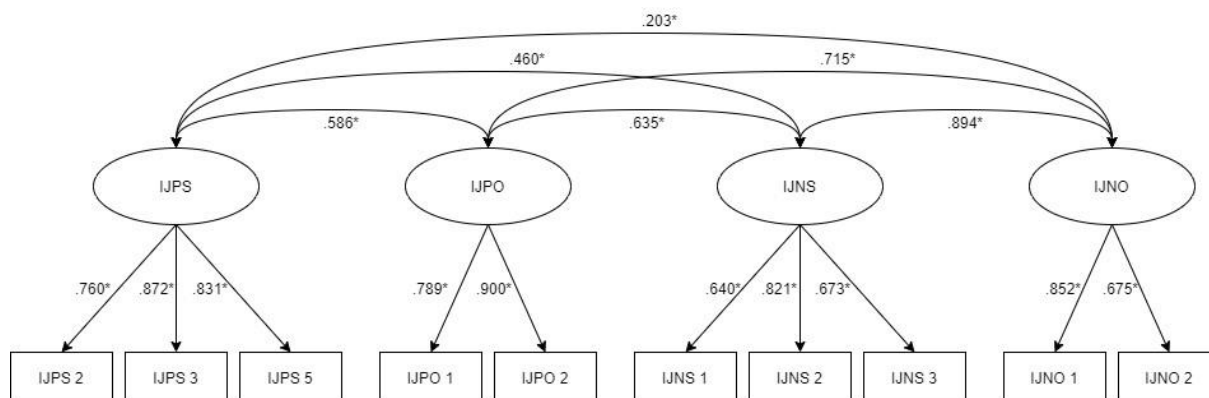
**Table 1:** Measurement models fit statistics.

Model	$\chi^2$	df	p	CFI	TLI	SRMR	RMSEA
M1: 1-factor CFA	854.80	35	< .01	0.888	0.856	0.16	0.24
M2: 2-factor CFA	436.62	34	< .01	0.944	0.926	0.12	0.18
M3: 4-factor CFA	102.05	29	< .01	0.990	0.984	0.06	0.08
M4: Hierarchical CFA	238.17	31	< .01	0.972	0.959	0.09	0.13
M5: 7-factor CFA	283.07	131	< .01	0.990	0.987	0.05	0.06

*Note.* M = Model, CFA = confirmatory factor analyses,  $\chi^2$  = robust chi-square test of exact fit, df = degrees of freedom, CFI = comparative fit index, TLI = Tucker-Lewis index, SRMR = standardized root means square residual, RMSEA = Root Mean Square Error of Approximation.

### Dimensionality

Model 1 with only one factor for IJ does not fit the data. Model 2, which distinguishes between positive and negative IJ has better fit indices, but does also not sufficiently confirm the data. Fit indices for Model 3 (Figure 1), which distinguishes between four types of IJ yielded good fit indices. In this model correlations between the subfactors IJNS and IJNO are, however, high, as already seen in the latent correlations (Table 2). Model 4, the hierarchical model, also did not represent the data satisfactorily.

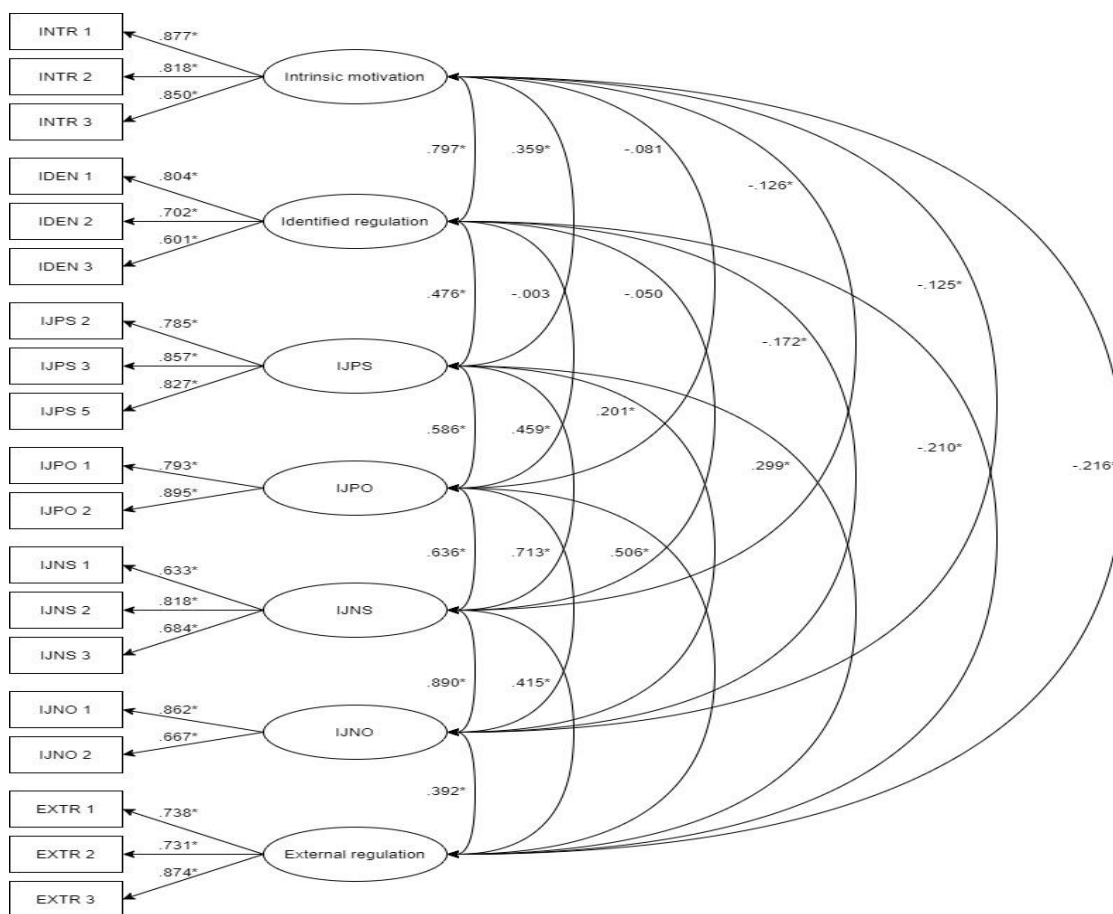


**Figure 1:** Factor loadings and correlations of Model 3 (4-factor-CFA). *Note.* IJPS = Introjected regulations positive self-approval, IJPO = Introjected regulations positive other-approval, IJNS = Introjected regulations negative self-approval, IJNO = Introjected regulations negative other-approval. \*  $p < 0.01$

### Validity

To examine the correlations of the IJ-subscales with intrinsic, identified, and external motivation, we computed a 7-factor CFA ( $\chi^2 = 283.07$ ;  $df = 131$ ;  $p < .001$ ;  $CFI = .990$ ;  $TLI = .987$ ;  $SRMR = .053$ ;  $RMSEA = .056$ ), indicating excellent fit for CFI, TLI and, SRMR, and adequate fit for RMSEA. As Figure 2

demonstrates, only IJPS correlates positively with intrinsic motivation and identified regulation. There is no significant correlation between IJPO and intrinsic motivation or identified regulation. Both negative aspects of IJ, IJNS and IJNO, correlate negatively with intrinsic and identified regulation.



**Figure 2:** Factor loadings and correlations of Model 5 (7-factor-CFA); *Note.* IJPS = Introjected regulations positive self-approval, IJPO = Introjected regulations positive other-approval, IJNS = Introjected regulations negative self-approval, IJNO = Introjected regulations negative other-approval. \*  $p < 0.01$

Descriptive statistics, reliabilities using McDonald's Omega [44], and latent correlations of the CFA with intrinsic motivation, identified regulation, and external regulation as well as four types of IJ and subjective vitality are presented in Table 2. All IJ dimensions are interrelated, with a high correlation between the two negative subfactors. All IJ dimensions are positively associated with external regulation, with the highest association between IJPO and external regulation. IJPS is

arguably the most autonomous subdimension of IJ. However, IJPS is still positively associated with external regulation. Notably, only IJPS positively correlates with intrinsic motivation, identified regulation, and with subjective vitality while the negative IJ dimensions negatively correlate with students reported subjective vitality and positively with external regulation.

**Table 2:** Descriptive Statistics of Measured Variables with Latent Correlations.

	M	SD	$\omega$	1	2	3	4	5	6	7
1 Intrinsic motivation	4.75	1.30	.87							
2 Identified regulation	5.50	1.03	.71	.89*						
3 IJPS	5.32	1.30	.83	.38*	.50*					
4 IJPO	3.99	1.63	.79	-.11	-.04	.63*				
5 IJNS	3.77	1.52	.73	-.15*	-.09	.51*	.75*			
6 IJNO	2.88	1.47	.69	-.17*	-.20*	.28*	.78*	.92*		
7 External regulation	4.16	1.58	.79	-.25*	-.25*	.36*	.58*	.49*	.46*	
8 Subjective vitality	4.82	1.25	.94	.40*	.38*	.16*	-.11	-.18*	-.21*	-.05

Note.  $\omega$  = McDonalds Omega, IJPS = positive introjected regulation self, IJPO = positive introjected regulation others, IJNS = negative introjected regulation self, IJNO = negative introjected regulation others. Latent correlations based on factor scores. N = 396. \* p < .05.

## Discussion

Previous research has shown that IJ is a heterogeneous construct associated with both adaptive and maladaptive outcomes. Furthermore, differentiating between positive and negative IJ yields more reliable results that align with theoretical assumptions. However, within Self-Determination Theory (SDT), IJ is further nuanced by the concept of ego-involvement [45]. Ego-involvement, in turn, encompasses self-approval and other-approval. Previous research, however, did not account for this multidimensionality and often measured IJ without distinguishing these aspects [11]. To adequately capture IJ in a way consistent with this theoretical framework, all these dimensions should be considered in measurements and analyses. Therefore, we conducted a study to explore the heterogeneous nature of IJ.

According to our first Hypothesis, we wanted to replicate the findings regarding positive and negative IJ obtained in previous research studies in a sample of Central European students [7,10]. In our study, neither a one-dimensional (one factor for IJ) nor a two-dimensional (positive and negative IJ) model of IJ satisfactorily represented the dimensions of IJ. Although our assumption that a one-dimensional model does not adequately represent IJ was confirmed, and we must reject the assumption that a distinction into positive and negative IJ fits appropriately. Our result in this regard did not confirm the findings of previous studies that demonstrated that a distinction between positive and negative IJ leads to results that adequately represent the theory [4,15,10]. As our item pool included the same items to measure positive and negative IJ as those used by Assor et al. (2009) [7] and Sheldon et al. (2017) [10], the result was quite surprising and indicates that the original processes for measuring IJ seem not to be optimal.

Assuming that each item assesses either positive or negative aspects of IJ and self-approval or other-approval, we investigated within our second Hypothesis whether four postulated dimensions of IJ could be confirmed within a CFA. After deleting three items with weak loadings from the original

model, our model showed satisfactory model fits, suggesting that self-approval and other-approval contribute to the dimensionality of IJ. These results showed that all aspects of IJ as described in the theory should be considered when measuring this type of motivation; otherwise, biased, indifferent, and difficult-to-interpret results with associations to adaptive and maladaptive outcomes will occur [4]. Addressing our research question, we also examined a higher-order factor model where two factors are calculated: one for IJ and one representing four sub-factors. The model is not completely validated by the data. This result shows that those four aspects of IJ variables are categorically different and contain unique properties and putting these types into higher-order factors seems not to be theoretically consistent [16]. The associations of IJPS and IJNS with subjective vitality are different. For example, IJPS correlates positively with subjective vitality and IJNS correlates negatively with it. This may be an indication that regulation-specific information will be excluded when constructing higher-order models [16]. Consequently, the findings of our study show that the four-factorial model (M3, Figure 1) for IJ is superior to all other models.

Correlations between the four aspects of IJ, along with their associations with the other regulation styles of SDT and subjective vitality as an outcome, provided initial insights into the conceptualization of these aspects. These findings revealed both commonalities and differences among the four aspects of IJ, partially supporting our third hypothesis. Regarding positive IJ, the findings of our study clearly indicate that IJPS is moderately associated with autonomous forms of motivational regulation. According to SDT, values and norms associated with an action regulated in a more autonomous way are more integrated into an individual's self than with the other forms of IJ [1]. In contrast, IJPO can be described as regulated in a more controlled manner. Referring to DeCharms (1983) [46], IJPO would be more likely to be associated with an external locus of causality. A rationale can also be found using the concept of ego involvement. Ego involvement (others) is a striving based on the threat of evaluation from others [1]. Accordingly, IJPO does not

correlate with the two autonomous forms of motivation (intrinsic and identified) and is even more positively related with external regulation than IJNO. On the basis of the correlative findings presented here, it is also necessary to ask the fundamental question of whether current IJPO items represent a positive form of IJ at all. Further empirical studies must be conducted to obtain clarity regarding this aspect. In particular, studies must be conducted in which the convergent and discriminant validity is examined with regard to relevant aspects such as satisfaction of the basic needs or positive affect.

Regarding negative IJ, both negative forms are negatively correlated with intrinsic motivation, and with subjective vitality, but positively with external regulation. It has to be noted, that IJNS and IJNO were highly correlated and showed comparable (negative) relationships with subjective vitality. The students do not appear to differentiate well between self-approval and other-approval in the context of negative IJ. However, results from confirmatory factor analyses supported the existence of separate factors for IJNS and IJNO. In this study, IJNO was measured with only two items, which should be expanded. The current correlation pattern suggests that further research is necessary to better understand the negative self and negative other components.

### Limitations

This study was the first empirical attempt to further differentiate IJ by including the aspects of self-approval and other-approval. It should be mentioned here that the results are preliminary and the scale needs to be cross-validated with a new sample by further studies. Some limitations are present that should be addressed in further studies. First, it is especially important that all four aspects of IJ are represented by a sufficient number of items. In this study, IJPO and IJNO were assessed with only two items each, which may not properly represent these scales' dimensions. Future studies should build on the knowledge gained here and put effort in scale development which represent these aspects of IJ. A second limitation is related on IJ structure and associations with relevant outcomes regarding the nomological network. There are concrete assumptions in SDT regarding how the degree of autonomy of a motivational type affects emotions, actions, and well-being. Therefore, the degree of autonomy should become apparent in the correlations with relevant outcomes. Third, although we tested different models, future research should try to place the four aspects of IJ within the traditional simplex model of SDT or by using multi-dimensional scaling to analyze the IJ ordering in the complete model of motivation types [10]. Future research studies should also conduct bifactor-ESEM analyses [47] to test the four aspects of IJ within the SDT continuum hypothesis of motivation [16,48]. This work was the first step in this direction. Fourth, as the relationship between IJ and adaptive and maladaptive outcomes depends on the student's age [15], further research should examine whether the four-factor model can be replicated with younger students. The generalizability of the current findings should also be investigated in contexts outside of the education system and different cultures. Last, although we rely on the theoretical background of SDT, it should be mentioned, that the study was cross-sectional and longitudinal research is needed to expand the current results in terms of directionality.

### Conclusion

It should be noted that the results of the present study are preliminary and represent an initial attempt to empirically validate the theoretically proposed four factors of introjected regulation. The current study demonstrates that a nuanced examination of all aspects of IJ, as theoretically grounded in SDT, can enhance our understanding of this type of motivation. The differentiation of four IJ dimensions may prove useful, offering additional explanatory value in research and potentially aiding in the more reliable assessment of motivational quality. Based on these findings, we can conclude that when we act out of introjected motivation, it matters whether we do something for ourselves or for others. It is possible that the inconsistent results regarding IJ stem from the fact that empirical studies sometimes focus on self-approval, sometimes on other-approval, and sometimes on both aspects.

### Author contributions

**Conceptualization:** Sonja Bieg; **Methodology:** Sonja Bieg, Almut E. Thomas, Florian H. Müller and Carina Spreitzer; **Formal analysis:** Carina Spreitzer; **Data curation:** Sonja Bieg, Almut E. Thomas and Florian H. Müller; **Writing – original draft preparation:** Sonja Bieg; **Writing – review and editing:** Sonja Bieg, Almut E. Thomas, Carina Spreitzer and Florian H. Müller. All authors read and approved the final manuscript.

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#### Funding

No funding was received for conducting this study. The authors have no competing interests to declare that are relevant to the content of this article.

#### Competing interests

On behalf of all authors, the corresponding author states that there is no conflict of interest.

#### Data availability

The datasets generated during the current study are available on RADAR, a Research Data Repository. The corresponding author will send the link to the data on request.

#### Ethics approval

The questionnaire and methodology for this study was approved by the Human Research Ethics committee of the University of Weingarten (15.03.2023).

#### Consent to participate

Informed consent was obtained from all individual participants included in the study.

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## Appendix

Introjected regulation items of the final version.

I complete tasks for my studies ...

1. *IJPS1 ... because I want to show myself that I can be successful in my studies.*
2. **IJPS2 ... in order to feel proud of myself.**
3. **IJPS3 ... because I want to feel good about myself.**
4. *IJPS4 ... because I want to prove to myself that I am capable.*
5. **IJPS5 ... because it boosts my self-esteem.**
6. *IJPO1 ... because important people to me should be proud of me.*
7. *IJPO2 ... because I don't want to disappoint my social environment.*
8. *IJPO3 ... because it's what is expected of a good student.*
9. **IJNS1 ... because I would feel ashamed if I didn't.**
10. **IJNS2 ... because I would feel guilty if I didn't.**
11. *IJNS3 ... because I put myself under pressure.*
12. *IJNO1 ... because otherwise, I would feel ashamed in front of others.*
13. *IJNO2 ... because otherwise, I would feel guilty towards other people.*

*Note:* Italicized items are not in the final version. Items in bold are originally from Assor et al. (2009) [7] and Sheldon et al. (2017) [10].

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