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EVALUATING THE DIMENSIONALITY OF THE RELATIVE AUTONOMY CONTINUUM IN US AND RUSSIAN SAMPLES[8]

We conducted a psychometric evaluation of the "relative autonomy continuum" postulated by Self-determination theory (SDT), a continuum whose validity has recently been questioned. We started by a) examining all of the RAI items we could find, across multiple published and unpublished scales; b) extracting the core repeating words and concepts via paired-item paraphrase analysis; and c) expressing all of the resulting concepts in 38 simple, clear new items. We administered the 38 items to multiple Russian and American samples, asking participants to rate their academic motivations. Initial psychometric analyses eliminated several items, leaving 35 items for analysis. The traditional RAI dimensions of amotivated, external, introjected, identified, and intrinsic were confirmed via confirmatory factor analyses, simplex congruency analyses, and multidimensional scaling (MDS) analyses. We also tested a sixth dimension first proposed by Assor, Vansteenkiste et al. (2009), positive introjection, and confirmed its location between negative introjection and identification on the relative autonomy continuum. In addition to confirming the predicted sequence of the items and the six subscales along a primary dimension, MDS analyses also identified a second dimension corresponding to the distance of the item from the center of the continuum, suggesting that using weighting procedures when constructing aggregate motivation scores may be justified. In an attempt to provide the field with a standardized relative autonomy index (SRAI) with known properties, that can be flexibly applied to assess motivation in any and every behavioral domain, we empirically compared several methods of scoring and analyzing the data, focusing on maximizing the associations between academic motivation and subjective well-being. These scoring methods included computing and analyzing each of the six subscales separately; computing and analyzing autonomous and controlled motivation separately; computing a relative autonomy score (autonomous minus controlled motivation); and computing relative autonomy scores in which greater weight is given to subscales nearer to the two extremes of

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the continuum. Weighted and Unweighted RAI scores predicted SWB equally, indicating that unweighted scoring, which minimizes the number of assumptions made, should be preferred. The positive effect of autonomous motivation was stronger than the negative effect of controlled motivation; intrinsic and introjected motivation were the strongest stand-alone predictors among the 6 sub-scales. "

Keywords: self-determination theory, autonomy continuum, motivation; questionnaires; validation; intrinsic motivation; extrinsic motivation; amotivation (cross-cultural, scale validation).

JEL Classification: Z

Theoretical background

According to Self-determination theory (SDT), all motivated behaviors are accompanied by a sense of why one is doing the behavior, reasons upon which people can report if asked. In other words, all behaviors come with a “perceived locus of causality” (PLOC). SDT further proposes that with proper assessment, all motivated behaviors can be located on an underlying autonomy continuum, somewhere between feeling a complete lack of self-determination (external PLOC or E-PLOC) to feeling completely self-determined (internal PLOC or I-PLOC). In effect, a PLOC assessment reveals whether or not a person believes in his or her own free will; such a belief has been shown to have large positive consequences, whether or not the belief is true in a philosophical or scientific sense (Ryan & Deci, 2006).

Although the PLOC concept is compelling and has garnered much research support over the years, some recent criticisms have emerged of the PLOC concept and of the autonomy continuum. This article aims to re-affirm the validity of these two concepts, and to extend our understanding of them. This article also aims to provide SDT researchers with a new, standardized, and domain-general relative autonomy index (DG-RAI), whose items were derived from a thorough content analysis of all existing RAI measures.

Figure 1. The autonomy continuum described in self-determination theory (after Ryan, Deci, 2000)

Behavior	Non-Self-Determined					Self-Determined
Motivation	Amotivation	Extrinsic				Intrinsic
Regulation	Non-regulat.	External	Introjected	Identified	Integrated	Intinsic
Perceived locus of causality	Impersonal	External	Somewhat external	Somewhat internal	Internal	Internal
Regulatory processes	Nonintentional, non-valuing, incompetence, lack of control	Compliance, external rewards and punishments	Self-control, ego-involvement, internal rewards and punishments	Personal importance, conscious valuing	Congruence, awareness, synthesis with the self	Interest, enjoyment, satisfaction

In order to understand the autonomy continuum it is useful to consider the diagram in Figure 1, and to also consider the evolution of the theory that led to this diagram. SDT began with the discovery of the “undermining effect” (Deci, 1971, 1972), in which the introduction of an external incentive reduced people’s desire to keep doing a formerly enjoyable behavior. In terms of the diagram, external motivation (near the left extreme of the continuum) was found to be negatively associated with intrinsic motivation (at the right extreme), presumably because salient incentives tend to induce E-PLOC which interferes with I-PLOC. The undermining effect was shown for several other contextual factors besides external incentives, including pressure, deadlines, controlling language, and surveillance. These factors all have in common the fact that they can undermine people's sense of autonomy, inducing an E-PLOC.

However, the distinction between intrinsic motivation (doing a behavior because the doing is itself the reward) and external motivation (doing a behavior only to get a reward or avoid a punishment after the behavior is over) proved too simple; further research showed that there are other, more intermediate forms of motivation between these two extremes, as shown in the Figure 1. Ryan and Connell (1989) officially introduced the autonomy continuum idea in a study of children's academic and prosocial motivation, demonstrating via simplex correlational analysis that external, introjected, identified, and intrinsic motivations could be arranged along a continuum of autonomy or internalization, ranging from low to high, respectively. In a simplex structure adjacent constructs tend to be positively correlated, while non-adjacent constructs tend to be non-associated with each other, and constructs at the polar extremes (here, external and intrinsic motivations) tend to be negatively correlated with each other.

As shown in Figure 1, the four motivations identified by Ryan and Connell (1989) can be mapped onto the autonomy continuum as follows: External motivation (approaching rewards or avoiding punishments) has the highest E-PLOC, because it typically comes with a feeling of being compelled or induced to act by an external contingency. Introjected motivation (proving oneself worthy or avoiding guilt) has become partly internalized into the self, with some degree of I-PLOC because the person induces him or herself to act. Identified motivation (acting to express values) has been fully internalized into the self, thus no induction is required; however, such behavior may not be enjoyable for its own sake, and thus still has some E-PLOC. Intrinsic motivation has the highest I-PLOC, because the person enjoys and wants to do the behavior. External and introjected motivations (at the left) are called "controlled" motivations, and identified and intrinsic motivations (at the right) are called "autonomous" motivations. External, introjected, and identified motivations are all "extrinsic" motivations because behavior itself is not the reward in these three cases. Identified motivation is unique because it is an extrinsic motivation (i.e. it is not done for the sake of the experience itself), but nevertheless, it is also an autonomous motivation (because there is full internal assent to doing the behavior). Identified motivation represents psychosocial maturity, in which an individual willingly takes on potentially non-enjoyable tasks (i.e. changing baby's diaper) because it expresses an important personal commitment (i.e., keeping baby healthy and happy).

The PLOC continuum provides a powerful ordering concept, which can help researchers to make sense of many different theoretical perspectives upon motivation. Behaviorist perspectives insist that all behaviors have (in reality) an external locus of causality, because they are controlled by external incentives (no matter how people perceive their causality). Psychodynamic and Freudian perspectives emphasize introjections and internal struggles, in which healthy or societallyapproved behavior is often conflicted, driven by guilt and the superego. Existential and humanistic perspectives emphasize the importance of identifying with what one does, acting in good faith and with full commitment even in the face of uncertainty and absurdity. Personality developmental perspectives emphasize the importance of children internalizing the cultural prescriptions and norms they encounter, on their way to adulthood. Cognitive developmental perspectives emphasize the importance of exploratory and search behavior (i.e. intrinsically motivated play) for neural and intellectual development. In a sense, the SDT autonomy continuum concept not only re-capitulates people's personal journey towards mature agency and citizenship; it also re-capitulates the development of motivation theories during the 20th century, towards an adequate conception of people's dialectical struggle for self-determination in the face of biological and social constraints.

However, there are number of disagreements regarding the PLOC continuum concept, involving issues that are both conceptual and methodological. We consider these issues next, because this article attempts to resolve many of them. One measurement issue is that there are a wide variety of scales in use to assess PLOC and the autonomy continuum. The SDT website contains (8) different scales, and many more different sets of items have been generated by researchers uniquely for a particular study (Chemolli & Gagné, 2014; Assor, Vansteenkiste, & Kaplan, 2009; and others). At times several different scales are even used within the same multi-study research article (Assor, Kaplan, Kanat-Maymon, & Roth, 2005). In part this unseemly diversity may be justified by the widely different domains in which relative autonomy has been assessed (e.g. academic motivation, relationship motivation, work motivation, sport motivation, leadership motivation); perhaps it is necessary to uniquely tailor the items for each domain of assessment. However we do not think this is the case, instead believing that a common core of item meanings should be extractable from the entire set of accumulated measures, and that these core meanings might be stated simply enough to be broadly applicable within *any* behavioral domain. Creating such a standardized PLOC scale was a primary goal of our research.

A second and more important issue concerns the meaning and validity of the autonomy continuum. Positions on this issue go to both extremes. On one extreme, researchers debate the question of which weighting scheme should be used to combine scores derived from different regions of the autonomy continuum. For example, researchers often compute a single "relative autonomy index" (RAI) by subtracting controlled motivations from autonomous motivations, using the formula (identified + intrinsic – introjected – external). In making this computation, should the extremes of the continuum (reflecting extra I-PLOC or extra E-PLOC) receive extra weighting, and if so, what should the weighting coefficients be? This debate takes the validity of the relative autonomy continuum for granted, and simply asks about the best technical procedure for locating a person on that continuum. The current article addresses the weighting issue explicitly, by comparing the effects of weighted and un-weighted RAIs upon the important outcomes of subjective well-being and trait autonomy.

On the other extreme of the validity question is the recent article of Chemolli and Gagné (2014), which argued that RAI scores should not be used at all. Drawing on Guttman's (1954) radex theory concerning the structure of tests, they argued that there are irreducible qualitative differences between the various forms of motivation discussed above, and thus that Relative Autonomy Index scores are based on the 'untenable' assumption that 'a person is situated in one location on the continuum even though this "position" is derived from scores on multiple locations on this continuum' (p. 578). Instead, Chemolli and Gagné (2014) advocate using the individual motivation subscale scores individually, or if necessary, to summarize subscale information using polynomial regression or person-based profile analyses, rather than using the conventional difference score approach.

Although Chemolli and Gagné (2014) presented analyses purportedly supporting their arguments, we disagree with their interpretations of those analyses. Their primary argument against the existence of an autonomy continuum was the finding based on the polytomous Rasch model that the structures of the Multidimensional Work Motivation Scale and the Academic Motivation Scales were not unidimensional. However, the very fact that the items operationalizing the autonomy continuum have a multi-dimensional structure, as shown in numerous CFA studies recovering the various subscales (i.e. intrinsic, identified, introjected, external; see Vallerand, 1992, means that these items violate the assumption of local independence made by one-parameter IRT models (Hambleton, Swaminathan, Rogers, 1991). (Also, the non-equal factor loadings across items found in CFA studies indicate that the other Rasch model assumption, that of *equal discrimination indices*, may not hold either). Thus, we believe that the analyses carried out by Chemolli and Gagné were not sufficient to support conclusions about the theoretical validity or practical utility of the RAI scores.

To explain the structure of the scales operationalizing the autonomy continuum, it is essential to review the concepts of Guttman's (1954) radex theory. A radex is a theoretical structure of intercorrelations between the scores of tests differing on two dimensions: the *kind* of ability (having a circumplex structure), and the *degree* of complexity (having a simplex structure). The concepts of simplex and circumplex were introduced by Guttman (1954) to describe different types of order in a set of correlated variables. A simplex[9] pattern describes an ordering of scales in a correlation matrix where the coefficients decrease from the diagonal (which means that each variable shares more variance with its neighbor variables than with non-adjacent variables). Such

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[9] Guttman (1954) differentiated many specific types of simplexes, here we will use the term "simplex" as a general description of this family of models. More specifically, the scales forming the autonomy continuum are expected to form a quasi-simplex.

chains can vary in their length. A circumplex pattern describes an ordering of scales in a correlation matrix where the coefficients decrease and then increase as one moves away from the diagonal (the same shared variance principle applies and there is still only one dimension of order, but it is circular, rather than linear).

Early models for simplex and circumplex did not allow for negative correlations between variables and relied on prior knowledge of the ordering of variables. An important step in this area was made by Browne (1992), who developed a procedure to derive an empirical ordering of variables on a circumplex without any a priori hypotheses. He also showed that a simplex can be viewed as a special (incomplete) case of a circumplex, because any subset of adjacent, positively correlated variables within a circumplex form a simplex.

In terms of factor analysis, the relative autonomy continuum is a second-order structure involving a quasi-simplex pattern of correlations between oblique first-order factors (subscales)[10]. For the RAI approach to be valid, a clear autonomy continuum should emerge as the strongest ordering principle at this second level of analysis, even if other dimensions also exist (as some studies suggest: Roth et al., 2006). Based on this "linear continuum of subscales" idea, we also propose that RAI measures provide efficient indicators of the overall quality of a person's motivation in domain X, indicators that are robust to the minor variations in subscale configurations and results that can emerge across differing samples, behavioral domains, and cultures. We will try to prove this by showing that RAI explains nearly the same proportion of variance of the measures of well-being and trait autonomy as do the individual subscales comprising it.

In the current research we employed a full Multi-Dimensional Scaling (MDS) analysis to establish empirical order in a set of items and scales comprising the autonomy continuum. We expected to discover the autonomy dimension that was uncovered by Roth et al. (2006; a finding that was not mentioned by Chemolli and Gagné, 2014). We also used a more confirmatory approach outlined by Browne (1992), which allowed us to model a simplex pattern with negative correlation coefficients as a special type of circumplex model. In contrast to MDS, this approach allows not only to derive an empirical ordering of variables from the data, but also to test the goodness of fit of the resulting model. Finally, we also used latent variable approach with an autoregressive model to confirm that the associations between the first-order factors would fit a quasi-simplex pattern.

An additional criticism of the RAI concept by Chemolli and Gagné (2014) concerned SDT researcher's typical practice of using difference scores when computing a single relative autonomy index. It is true that using difference scores to combine unrelated or poorly related items is highly

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[10] In a principal component analysis, a correlation matrix with a simplex pattern can be represented by two orthogonal factors with loadings on the two factors satisfying a linear relationship (see McDonald, 1980; Browne, 1982). Thus, two strong principal components observed by Chemolli & Gagne (2014) may actually constitute evidence in favour, rather than against a second-order simplex structure.

problematic. However, if the scores being subtracted are subscale scores locatable on opposite sides of a second-order simplex structure, as is the case with the relative autonomy continuum, then computing differences between aggregate subscale scores is conceptually similar to recoding reverse-worded items before computing a particular subscale score. Like many prior SDT researchers, we believe that quantifying the configural relations among subscales could give valid and important information about the person's entire motivational system.

Thus, we aim to compare the validity of different approaches to computing the individual scores. We will compare the effects of weighted and un-weighted RAI scores, upon well-being relevant outcomes. We will also compare the effects of comparing separate "autonomous" and "controlled" motivation scores, rather than taking the further (RAI) step of subtracting controlled from autonomous. We will also examine the associates of each PLOC subscale separately. Is enough unique information provided at the sub-scale level to justify reporting results at the subscale level, or perhaps *only* at the subscale level?

Our criterion variable in all of these tests will be the predictive associations of the various motivation variables with subjective well-being and trait autonomy. Roth et al. used a similar strategy, of correlating the different RAI motivations with positive affect. Roth et al. (2006) found that correlations with positive affect became stronger the closer the form of motivation was to the extremes of the PLOC continuum; most strongly negative for external motivation, and most strongly positive for intrinsic motivation. For this reason, we expect the measure derived from the RAI scoring method to be most strongly associated with the satisfaction and well-being outcomes, compared to any of the single subscales that comprise it. Such a finding would further suggest that computing a RAI is the preferred methodology for researchers. The finding would also make sense because allowing a scale to include its own reverse-worded items within itself of course improves the strength of the scale.

Another important recent issue concerns the question of how many different forms of motivation there are. Still most standard is the set of four motivations first examined together by Ryan and Connell (1989): namely, external, introjected, identified, and intrinsic. However, there are at least two other forms that have been repeatedly studied during the last 25 years: amotivation, in which there is no intentional regulation of one's motivated behavior, akin to a helpless behavioral style; and integrated motivation, in which one's various identified motivations have been all integrated with each other, at a higher level. There is a growing consensus that integrated motivation is very problematic to measure, and of questionable validity (Roth et al., 2009; Gagné et al., 2014). Thus we did not attempt to assess integration motivation within our own project. However we did include amotivation items in our project, assessing behaviors performed without intentionality ("I don't know why I do it, maybe I should stop"). We thought amotivation would provide a valuable counter-point to the rest of the items, which all reference intentional motivations, of varying degrees of internalization. We hypothesized that MDS analyses would show that the amotivation items anchor the leftmost extreme of the autonomy continuum, representing the least amount of autonomy and the most E-PLOC. External motivation should be more autonomous than amotivation (i.e. to the right of amotivation on the continuum), because an externally motivated person at least has a stable conscious intention to approach the reward or incentive, which the amotivated person does not.

In addition to these six traditional forms of motivation, several additional forms have been proposed in recent years. Assor, Vansteenkiste, and Kaplan (2009) differentiated introjected motivation into two types: approach (approaching self-worth) and avoidance (avoiding loss of self-worth), finding different patterns of effects for the two measures and finding evidence that approach-introjection lies *between* avoidance-introjection and identification on the PLOC continuum. Gagné et al. (2014) distinguished both approach and avoidance forms of both external and introjected motivation in their scale development research, but as was their intention, their factor analytic results did not reflect these approach and avoidance differences.

We conducted a study aiming to develop a new measure operationalizing the autonomy continuum in two different cultures. We expected the structure of the autonomy continuum to be the same across cultures, confirming the robustness of the underlying second-order structure with respect to universal human motivations.

Empirical study

We began by assembling a list of every RAI item we could find, from both published and unpublished scales. Two of the authors then conducted a paraphrase construction analysis (Kuiken & Wild, 1988), in which they separately examined every possible pair of items to determine whether the same idea was being expressed by both items. Where this was judged to be the case (typically when the same primary word was being used in both items), a simplified paraphrase was created to summarize the shared content of the two items. After making all judgments and paraphrases independently, the analysts met to resolve discrepancies and to work towards a master paraphrase list. Some of the source items were never matched with another item. Some source items were matched with other source items despite purportedly coming from different RAI subscales (i.e., one from the intrinsic motivation subscale in one inventory, and the from the identified motivation subscale in another). This illustrates the considerable conceptual looseness we found at the boundaries of many of the scales; our MDS analyses were designed, in part, to securely locate the items with respect to each other on the RAI.

Thirty-five items resulted from this initial process. In Study 1 we administered these 35 items to multiple American and Russian samples, in the context of asking participants to rate their academic motivations. We also measured participant's Subjective Well-Being (SWB: positive affect, life-satisfaction, and low negative affect), because RAIs have often been used in the past to predict SWB (Sheldon, 2014). We intended to use SWB as a metric to compare the different computational and scoring methods. Which ones do predict SWB most efficiently? As discussed above, Roth et al. (2006) used positive affect as a criterion for comparing the predictive powers of different RAI subscales; herein, we used the complete SWB measure employed by many researchers (cites), although we also examined the SWB components separately.

Method

Participants

Participants included 4 samples, 2 comprised by US university students from the University of Missouri (Samples 1 and 3), and 2 comparable Russian student samples from universities in Omsk, Tomsk (Sample 2), Biysk, and Moscow (Sample 4). The respondents who gave the same answer to all the UPLOC items and those with more than 3 missing responses were excluded. The resulting sample sizes and demographic data are shown in Table 1. The percentage of missing data was very small (0.23%), and we used EM imputation to replace the missing answers for exploratory analyses.

Table 1. Demographic composition of the samples

Sample	Stem	N	Gender (% Female)	Age, M (SD)
1. US	Why did you choose this major?	142	74.26	20.35 (4.01)
2. Russia	Why did you choose this major?	243	84.77	18.57 (1.24)
3. US	Why do you go to class?	326	53.68	19.14 (0.99)
4. Russia	Why do you go to class?	254	72.83	18.93 (1.23)

Instruments

In order to validate the new measure, we used three existing measures of subjective well-being and trait autonomy: Positive and Negative Affect Schedule (Watson, Clark, Tellegen, 1988; Russian version by Osin, 2012), Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985; Russian version by Osin & Leontiev, 2008), and Index of Autonomous Functioning (Weinstein, Przybylski, & Ryan, 2012; Russian version prepared for this study using translation / back-translation committee approach).

Data analysis strategy

The analysis involved several stages. At the first stage, we performed exploratory analyses using the data from the combined sample in order to establish the first-order structure of the initial item pool and to select the best indicator items. Because the items were expected to have a hierarchical structure, we used hierarchical clustering (Ward's method with Squared Euclidean metric on items standardized to z-scores by variable) to establish homogeneous parcels of items reflecting different facets of motivation. The advantages of this approach over exploratory factor analysis in situations where the variables have a higher-order structure were shown by Revelle (1979). To ensure the unidimensionality of the resulting item parcels and to select the best indicators for each construct, we performed principal component analysis within each parcel (in each of the 4 samples independently). We chose 4 items with the highest loadings to identify each construct and evaluated the internal consistency of the resulting subscales.

At the second stage, we looked for the second-order autonomy continuum in the resulting set of 24 best-loading items (both at the level of items and that of subscales). First, we used Guttman-Lingoes non-metric multidimensional scaling (MDS) implemented in Statsoft Statistica 6 (Guttman, 1968; Borg & Lingoes, 1987) based on the item and scale correlation matrices to visualize their structure (the correlation matrices were pooled across the 4 samples using Fisher transformation to reduce the potential bias resulting from non-equal means). Next, we evaluated the fit of the correlation matrix in each sample to simplex model by calculating congruence coefficients (Ryan & Connell, 1989). However, this approach assumes equal intervals between adjacent points on the autonomy continuum, which may be overly restrictive. To overcome this limitation, we used the CIRCUM software (Browne, 1992), which allows to test how well a correlation matrix can be represented by a single second-order dimension (simplex or circumplex). We used the chi-square statistic and RMSEA reported by the program to evaluate the fit of the model, taking into account the findings by Kenny, Kaniskan, and McCoach (2014), showing that higher RMSEA values are expected in models with few degrees of freedom.

At the third stage, we performed single-sample confirmatory factor analyses (CFA) in Mplus 7.31 using robust Satorra-Bentler chi-square (MLM estimator) to evaluate the fit of first-order measurement model structure. We followed by testing for the second-order simplex structure operationalized as autoregressive model (in line with Li & Harmer, 1996), in which each of the first-order factors was regressed on the previous one in the continuum, starting with amotivation. We used the CFI > .90, RMSEA < .08 as criteria of acceptable fit (Byrne, 2011). We proceeded by testing a series of multi-group CFA models, operationalizing configural, metric, and scalar measurement invariance of the first-order model across the situational and cultural samples to evaluate score comparability. We also tested for invariance of the second-order regression (simplex) structure. Because the chi-square difference test is overly sensitive in large samples, we mainly relied on the difference in practical fit indices (ΔCFI, ΔRMSEA < .01 following Cheung & Rensvold, 2002) to compare nested models.

Finally, at the fourth stage, we compared the validity of different ways to calculate the RAI by exploring their associations with various well-being indicators in the 2 cultures.

Results

1. Exploratory analyses

Hierarchical cluster analysis (see Figure 2) revealed 6 homogeneous groups of items, interpreted as intrinsic motivation, identified regulation, positive introjection, negative introjection, external regulation, and amotivation. The two higher-order clusters corresponded to autonomous motivation (intrinsic, identified) and controlled motivation (the other 4 types).

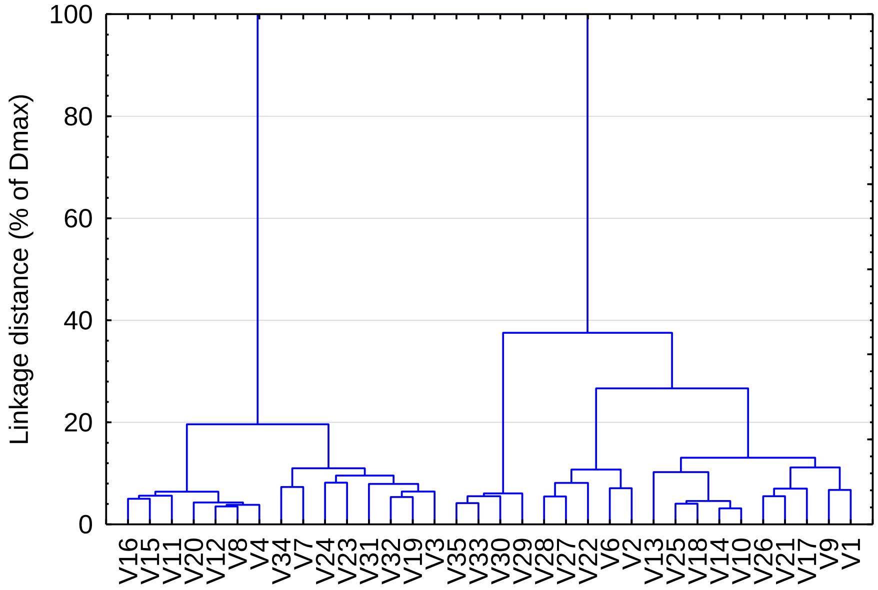

Figure 2. Dendrogram of the hierarchical structure of the 34 items

Only 3 out of 35 items were not classified in accordance with the theoretical expectations: two identified items (V15 “personally satisfying” and V11 “want to”) fell into the intrinsic cluster. One external item (V5 “money or some other reward”) fell into the identified cluster but was deleted for theoretical reasons which will be discussed later.

We proceeded by performing principal component analysis within each of the 6 clusters of items in each of the 4 samples independently. For each scale we aimed to select 4 items with the highest average factor loading across the 4 samples. In two cases we chose one item out of two to ensure better construct representation ("interesting" with λ=.80 over "exciting" with λ=.81 and "feel proud" with λ=.66 over "feel like an important person" with λ=.69). All of the items chosen for the final model had loadings above .50 in each of the 4 samples. The complete set of item factor loadings in the 4 samples are available upon request.

The descriptive statistics and reliabilities of the 6 resulting four-item scales are presented in Table . The alpha reliability coefficients for the scales were sufficient for research purposes. The differences in scale means associated with the stem were stronger than those associated with country.

Table 2. Reliabilities and descriptive statistics

Scale	Sample 1 (N=142)		Sample 2 (N=243)		Sample 3 (N=326)		Sample 4 (N=254)	
	M (SD)	α	M (SD)	α	M (SD)	α	M (SD)	α
Intrinsic	3.99 (0.80)	.87	3.98 (0.96)	.94	3.17 (0.77)	.80	3.46 (0.89)	.89
Identified	4.12 (0.78)	.86	3.94 (0.86)	.83	3.76 (0.65)	.73	3.78 (0.79)	.81
Pos. Introj.	3.62 (0.73)	.68	3.19 (0.93)	.76	3.66 (0.71)	.71	3.63 (0.87)	.82
Neg. Introj.	2.20 (0.96)	.86	1.67 (0.78)	.82	3.66 (0.79)	.77	3.21 (1.00)	.84
External	1.95 (0.92)	.88	1.71 (0.71)	.74	3.04 (0.77)	.61	3.10 (0.80)	.63
Amotivation	2.00 (1.01)	.91	1.83 (0.94)	.87	2.28 (0.97)	.87	1.98 (0.83)	.80

Note: *** p < .001, ** p < .01, * p < .05

2. Autonomy continuum (simplex + MDS)

We performed MDS at the item level using the pooled correlation matrix, comparing the fit of 1-dimensional and 2-dimensional models. The 1-dimensional model showed worse fit (stress .115, alienation .143), compared to the 2-dimensional model (stress .055, alienation .067). The coordinates of the 24 items on the first dimension of the 2-dimensional model and in the model with a single dimension were very similar (r=.987, p<.001). In the 2-dimensional model, the items were ordered in a semi-circle (shown on Figure 3). However, the coordinates of the items on the first dimension (or in the model with a single dimension) did not clearly differentiate the groups of items belonging to adjacent scales. In order to reflect the position of each item on the semi-circle, we converted the Cartesian coordinates into polar coordinates using the ATAN2 function. The resulting coordinates (shown in Supplementary Information) clearly differentiated the items belonging to different scales.

When we fit the pooled item-level correlation matrix using the CIRCUM software (with unconstrained communalities and angles, m=7), the results indicated acceptable fit. The fit of the model with item communalities constrained to equality was significantly worse, but still acceptable. Constraining angles to equal spacing led to a pronounced worsening of model fit. Because the individual sample sizes were too small to warrant a stable structure, we only present the findings based on the pooled correlation matrix (sample-specific results are available upon request).

Table 3. Fit indices for the circumplex models based on pooled correlation matrices (N=965)

Data	Model	Chi-sq. (df), p	RMSEA (90% CI)
24 items	Unconstrained circumplex	829.81 (222), p<.001	.053 (.049-.057)
	Equal communalities	1126.78 (245), p<.001	.061 (.058-.065)
	Equally-spaced 180°	1655.59 (245), p<.001	.077 (.074-.081)
6 scales	Unconstrained circumplex	20.88 (3), p<.001	.079 (.049-.112)
	Equal communalities	192.71 (8), p<.001	.155 (.136-.174)
	Equally-spaced 180°	185.01 (8), p<.001	.152 (.133-.171)

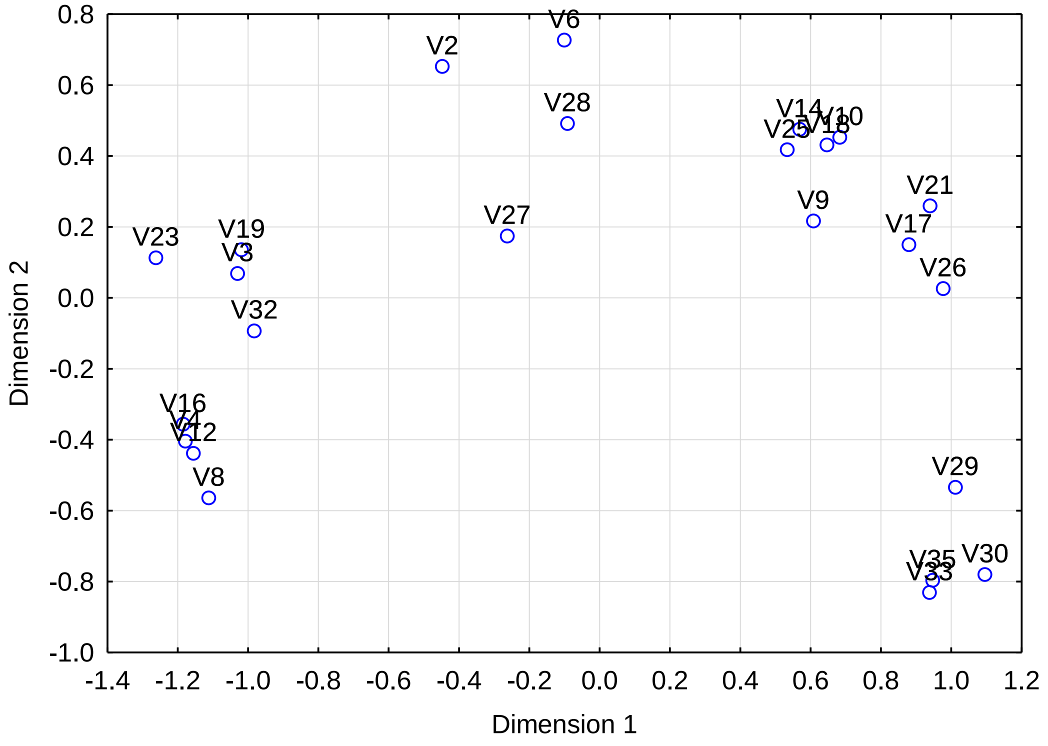

Figure 3. Results of multidimensional scaling at the item level.

We proceeded by investigating the structure at the scale level. The congruence coefficients across the 4 samples ranged from .62 to .84 (M=.75), corresponding to 38-71% of the variance explained by the simplex structure. In the pooled matrix, both the 1-dimensional and 2-dimensional models showed perfect fit (alienation and stress below .001). The resulting coordinates are shown in

Table 4. The 1-dimensional model failed to discriminate the first two scales, as well as the first dimension of the 2-dimensional model, but the sequence of scales in polar coordinates based on the 2-dimensional structure conformed to the theoretical expectations. The fit of the circumplex model (1 parameter of the Fourier function) to the correlation matrix (shown in Table 3) was acceptable. The communality estimates were sufficiently high, and non-overlapping confidence intervals for polar angles suggest a good separation of adjacent scales. The introduction of additional equal communality constraints led to a more pronounced worsening of the fit, indicating non-equivalence of contribution of the scales to the pattern.

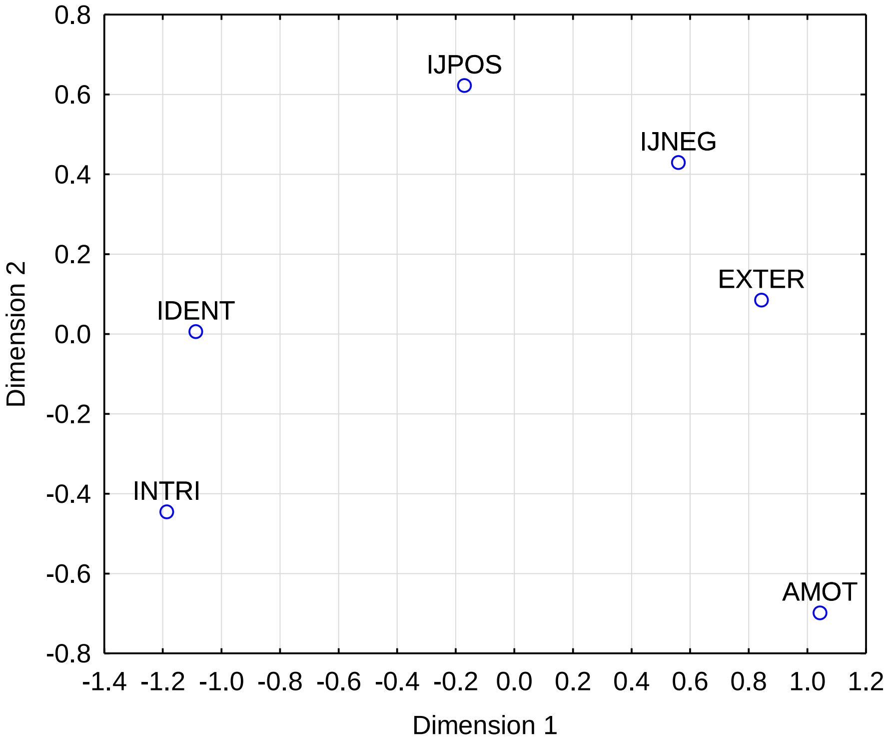

Figure. The results of MDS at the scale level.

Table 4. Coordinates of the scales based on MDS and circumplex model (N=965)

Scale	1 dimension	2 dimensions			Circumplex	
		Dim. 1	Dim. 2	Angle ϕ	Communal.	Angle
Intrinsic	-1.15	-0.98	-0.45	-2.00	.69	0 (0-0)
Identified	-1.15	-1.09	-0.12	-1.68	1.00	11 (5-16)
Introj. Positive	-.41	-0.51	0.54	-0.76	.64	63 (54-71)
Introj. Negative	.33	0.54	0.55	0.78	.85	103 (96-111)
External	.85	0.94	0.09	1.48	.76	133 (125-142)
Amotivation	1.54	1.11	-0.61	2.07	.86	184 (174-195)

Overall, the findings show that the UPLOC items and scales reveal the theoretically expected structure and their empirical sequence within this structure is in line with the predictions based on the autonomy continuum.

3. Confirmatory factor analysis

The fit indices of the theoretical 6-factor measurement model (1) indicated acceptable fit in samples 1 and 2 and marginal fit in Samples 3 and 4. There were significant and interpretable modification indices related to non-zero cross-loadings and item covariances. However, we did not include these modifications into the model in order to keep it more theoretically interpretable.

The difference in practical fit indices between the initial measurement model (1) and the model with a second-order simplex structure (2) was pronounced (ΔCFI>.01, ΔRMSEA>.01) in all samples. The investigation of modification indices related to second-order structure revealed significant modification indices concerning a suggested association between amotivation and intrinsic motivation (negative, except for Sample 3, where it was weak positive and only marginally significant). These indices were significant in all 4 samples, but much stronger in Samples 1 and 2, suggesting a substantive difference between the stems. The addition of these indices led to an improved fit of the resulting model (3) in Samples 1 and 2, where the resulting model (3) did not differ from measurement model (1) (ΔCFI<.01, ΔRMSEA<.01). The improvement of fit in Sample 3 and 4 was marginal and non-substantial, based on practical fit indices.

The invariance analyses based on the measurement model (models 4-6) supported the assumption of metric invariance, but the assumption of scalar invariance did not hold. The investigation of modification indices revealed some strongly non-equivalent intercepts (e.g., that for V21 “I will get in trouble if I don’t” for Sample 4, suggesting that Russian respondents were much more likely to agree with this item in the situation of choosing a major than respondents from the other 3 samples). The configural and metric invariance of the simplex structure (models 7-9) was marginal. Additional analyses indicated that the non-invariance was related to the stem, rather than culture (for instance, we found acceptable metric invariance for model 3 with fully constrained simplex in samples 1 and 2).

Table 5. The results of confirmatory factor analyses

Sample	Model	N	X2 (df)	CFI	RMSEA (90% CI)
1. USA	1. Measurement	142	374.13 (237)	.929	.063 (.050-.075)
2. Russia	1. Measurement	243	410.47 (237)	.941	.055 (.046-.063)
3. USA	1. Measurement	326	491.53 (237)	.900	.055 (.048-.062)
4. Russia	1. Measurement	254	468.71 (237)	.900	.063 (.054-.071)
1. USA	2. Simplex	142	442.45 (247)	.898	.074 (.062-.084)
2. Russia	2. Simplex	243	599.06 (247)	.881	.076 (.069-.084)
3. USA	2. Simplex	326	597.34 (247)	.862	.064 (.057-.070)
4. Russia	2. Simplex	254	549.78(247)	.869	.070 (.062-.078)
1. USA	3. Simplex + IM-AM link	142	391.34 (246)	.925	.063 (.051-.075)
2. Russia	3. Simplex + IM-AM link	243	438.00 (246)	.935	.056 (.048-.065)
3. USA	3. Simplex + IM-AM link	326	588.28 (246)	.865	.063 (.056-.070)
4. Russia	3. Simplex + IM-AM link	254	533.39(246)	.875	.068 (.060-.076)
Combined	4. Configural (model 1)	965	1708.70 (948)	.917	.058 (.053-.062)
Combined	5. Metric (model 1)	965	1851.75 (1002)	.907	.059 (.055-.064)
Combined	6. Scalar (model 1)	965	2284.05 (1056)	.866	.070 (.066-.074)
Combined	7. Configural (model 3)	965	1913.75 (984)	.899	.063 (.059-.067)
Combined	8. Metric (model 3)	965	2062.77 (1038)	.888	.064 (.060-.068)
Combined	9. Metric (model 3) + fully constrained simplex	965	2187.98 (1053)	.876	.067 (.063-.071)
1 + 2	9. Metric (model 3) + fully constrained simplex	385	875.49 (516)	.923	.060 (.053-.067)

4. Convergent and discriminant validity

Based on the scale coordinates obtained in MDS, we calculated the unweighted RAI using INTRI + IDENT + IJPOS – IJNEG – EXTER – AMOT, and weighted RAI: 3*INTRI + 2*IDENT + 1*IJPOS – 1*IJNEG – 2*EXTER – 3*AMOT. Because the number of scales contributing positively and negatively to the RAI was the same, the index based on centered scores was equal to that based on raw scores. The indices based on raw scores and z scores were highly correlated in both countries and for both weighted and unweighted indices (r > .95). As a result, we used the raw score versions for simplicity. In addition to the RAI, we also calculated a measure of profile elevation (acquiescence) as a mean score across the 6 scales.

Parallel to the RAI, we calculated individual scores based on the simplex/circumplex model, following the procedure described by Gurtman & Pincus (2003). We used the angular coordinates of scales (shown in the last column of Table 4 above) to derive the weights of individual UPLOC scale scores and calculate the X and Y planar coordinates pointing to the “predominant theme” of each profile (following the formulae 16.3 and 16.4 in Gurtman & Pincus, 2003). Then we converted these into polar coordinates, angle (phi) reflecting the predominant regulation in the individual motivational profile, and vector length (VL), reflecting the extremity of the profile. Lower values of the angular score are associated with higher degree of autonomous regulation.

The complete correlation matrices for the UPLOC scales, the RAI, and validation measures are given in Supplementary Information. The correlations between the different measures operationalizing the autonomy index are given in Tables X and X. The data indicate that the weighted and unweighted RAI are highly correlated with each other, as well as with the angular autonomy score phi (r > .95), suggesting their potential equivalence. The second dimension of the polar model (VL) is relatively distinct, but it is moderately to strongly correlated with mean score across the 6 scales, indicating similarity between these two measures of profile extremity. Vector length was also negatively correlated with the angular score, suggesting that individuals with lower autonomy have less strongly pronounced response patterns (this effect seems to be stronger in the Russian samples, suggesting a potential cultural difference). The correlations of VL with RAI, however, are stronger than with phi, suggesting that the variance captured by the RAI may be a combination of perceived autonomy and response extremity.

Table 6. Correlations between the different autonomy indices in samples 1 (above the diagonal) and 2 (below the diagonal)

	RAI	RAIW	Mean	Phi	VL
RAI	--	.99***	-.34***	-.96***	.45***
RAIW	.98***	--	-.31***	-.97***	.48***
Mean	.12	.12	--	.42***	.59***
Phi	-.91***	-.94***	.08	--	-.33***
VL	.71***	.73***	.70***	-.51***	--

Note: *** p < .001, ** p < .01, * p < .05

Table 7. Correlations between the different autonomy indices in samples 3 (above the diagonal) and 4 (below the diagonal)

	RAI	RAIW	Mean	Phi	VL
RAI	--	.97***	-.09	-.95***	.29***
RAIW	.98***	--	-.05	-.96***	.36***
Mean	.14*	.21**	--	.22***	.77***
Phi	-.95***	-.95***	-.07	--	-.15**
VL	.42***	.50***	.88***	-.33***	--

Note: *** p < .001, ** p < .01, * p < .05

The magnitude of the correlation coefficients of the RAI (see Supplementary Information) with the validity measures was similar to the highest correlations exhibited by individual UPLOC scales. In order to investigate whether the autonomy indices capture all the variance relevant to the type of regulation from the individual UPLOC scales, we performed a series of hierarchical multiple regression analyses. The RAI and profile elevation were entered at Step 1, followed by their interaction at Step 2 and 6 individual UPLOC scales at Step 3. Although the individual beta coefficients of UPLOC scales may not be trustworthy because of potential multicollinearity with the autonomy index, absence of a significant increase in explained variance would suggest that the autonomy indices capture the variance of the individual scales associated with perceived autonomy.

The results across the 4 samples are summarized in Table 8. The findings indicate that RAI is a more important predictor of well-being and autonomy measures than profile elevation, and together these two variables explain most variance of well-being measures. Although the six individual UPLOC scales showed incremental validity over the RAI and mean score, the additional proportion of variance they explained was relatively small, suggesting that the RAI is a useful heuristic measure of individual autonomy.

Table 8. Results of hierarchical multiple regression analyses

	SWLS	PA	NA	IAF_SCO	IAF_SUS
Sample 1					
Step 1, ΔR^2	.045*	.038	.169***	.154***	.214***
RAI, β	.166	.197*	-.224*	.441***	-.214*
Mean, β	-.077	.175	-.258**	.201*	.324
Step 2, ΔR^2	.037*	.005	.056**	.012	.024*
Step 3, ΔR^2	.060	.072*	.031	.077*	.016
Sample 2					
Step 1, ΔR^2	.093***	.115***	.066***	.111***	.096***
RAI, β	.303***	.328***	-.238***	.319***	-.253***
Mean, β	-.077	.055	.128*	.067	.209***
Step 2, ΔR^2	.000	.000	.001	.044***	.000
Step 3, ΔR^2	.045*	.053**	.004	.012	.046*
Sample 3					
Step 1, ΔR^2	.076***	.068***	.086***	.159***	.162***
RAI, β	.277***	.248***	-.285***	.396***	-.176***
Mean, β	.013	.103	.049	.097	.347***
Step 2, ΔR^2	.002	.001	.003	.003	.008
Step 3, ΔR^2	.024	.021	.038**	.076***	.040**
Sample 4					
Step 1, ΔR^2	.052***	.085***	.080***	.147***	.241***
RAI, β	.199**	.236***	-.280***	.324***	-.388***
Mean, β	.088	.142*	-.014	.163**	.362***
Step 2, ΔR^2	.003	.001	.003	.009	.002
Step 3, ΔR^2	.010	.027	.039*	.045*	.010

Note: *** $p < .001$, ** $p < .01$, * $p < .05$

Additional hierarchical regression analyses (not presented here for brevity) showed that the weighted version of the RAI and the angular measure of autonomy do not have advantage over the unweighted RAI in terms of variance explained.

Discussion

The purpose of this study was to reexamine the idea of the autonomy continuum using a new measure of intrinsic and extrinsic motivation (based on SDT). A new set of items was derived by synthesizing existing measures operationalizing the continuum. The results of the study support our hypothesis. The traditional RAI dimensions of amotivation, as well as external, introjected, identified, and intrinsic regulation were established using exploratory analyses and confirmed via confirmatory factor analyses. The data did not differentiate between integrated and identified regulations, in line with the existing studies. However, although we did not introduce any new item content, we found a new dimension of positive introjection in our data, supporting Assor et al. (2009) hypothesis about a positive type of introjected motivation. Confirmatory factor analyses showed structural validity of the resulting questionnaire and supported its metric invariance across the 2 cultures.

The exploratory MDS analyses and confirmatory analyses based on the circumplex model allowed to establish a second-order quasi-simplex structure. The coordinates of items and scales derived empirically from the data were in line with the predictions of SDT, showing the theoretically expected sequence of scales in the autonomy continuum from intrinsic regulation to amotivation. We established this sequence of scales empirically using two different methods, non-metric multidimensional scaling and circumplex analyses, and validated it using confirmatory factor analysis, successfully replicating the findings in two different cultures.

This research has several strengths, including the careful procedure of item creation and selection in two different languages. The main limitation of the study is that the findings are confined to the academic domain. Future research is needed to prove that proposed measure suits other domains of human functioning and that the structure replicates with different stems. Another limitation is the use of relatively small samples. Because large samples are needed to infer a reliable empirical structure, we had to pool different samples together for exploratory analyses, precluding the possibility of cross-validation. A new study aiming to replicate the structure in independent Russian and US samples is currently underway.

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Table SI.1. MDS and circumplex coordinates of individual items.

Item	Paraphrase	Scale	Dim.1	Dim.2	Angle ϕ	CIRCUM (CI)
V8	"fun"	Intrinsic	-1.11	-0.56	2.04	355 (353-358)
V12	"pleasure"	Intrinsic	-1.16	-0.44	1.93	358 (356-0)
V4	"enjoy"	Intrinsic	-1.18	-0.40	1.90	0 (0-0)
V16	"interesting"	Intrinsic	-1.19	-0.36	1.86	2 (0-4)
V32	"personal choice"	Identified	-0.98	-0.09	1.66	16 (13-19)
V3	"strongly value"	Identified	-1.03	0.07	1.50	13 (10-15)
V23	"meaningful"	Identified	-1.26	0.11	1.48	16 (13-20)
V19	"personally important"	Identified	-1.02	0.14	1.44	19 (15-22)
V27	"boosts my self-esteem"	Pos. Introj.	-0.26	0.17	0.98	84 (81-88)
V2	"want to feel proud of myself"	Pos. Introj.	-0.45	0.65	0.60	65 (60-69)
V28	"want to feel good about myself"	Pos. Introj.	-0.09	0.49	0.18	81 (77-84)
V6	"want to prove to myself that I am capable"	Pos. Introj.	-0.10	0.73	0.14	68 (64-72)
V14	"would feel ashamed if I didn't"	Neg. Introj.	0.57	0.48	-0.87	123 (120-126)
V25	"don't want to feel bad about myself"	Neg. Introj.	0.53	0.42	-0.91	113 (110-116)
V18	"would feel like a failure if I didn't"	Neg. Introj.	0.65	0.43	-0.98	126 (123-129)
V10	"would feel guilty if I didn't"	Neg. Introj.	0.68	0.45	-0.99	126 (123-129)
V9	"important people will like me better"	External	0.61	0.22	-1.23	133 (130-137)
V21	"I'll get in trouble if I don't"	External	0.94	0.26	-1.30	146 (143-150)
V17	"others will get mad if I don't"	External	0.88	0.15	-1.40	140 (137-143)
V26	"I don't have any choice"	External	0.98	0.03	-1.54	149 (145-152)
V29	"I once had good reasons, now I don't"	Amotivation	1.01	-0.53	-2.06	193 (190-196)
V30	"Honestly, I don't know why"	Amotivation	1.10	-0.78	-2.19	194 (191-197)
V35	"I used to know why, but I don't anymore"	Amotivation	0.95	-0.80	-2.27	196 (193-199)
V33	"I am not sure, I wonder whether I should continue"	Amotivation	0.94	-0.83	-2.30	196 (193-199)

Note: the items are sorted by the resulting angle, the sign of ϕ is inverted so that higher values reflect higher degrees of autonomy.

Table SI.2. Matrix of correlations, Samples 1 (N=142, above the diagonal) and 2 (N=243, below the diagonal)

combined	INTRI	IDENT	IJPOS	IJNEG	EXTER	AMOT	RAI	RAI2	phi	VL	SWLS	PA	NA	IAF_SCO	IAF_SUS	M	SD
INTRI	--	0.77***	0.21*	-0.3***	-0.25**	-0.48***	0.71***	0.75***	-0.67***	0.6***	0.15	0.18*	-0.06	0.24**	-0.05	3.99	0.80
IDENT	0.8***	--	0.24**	-0.31***	-0.34***	-0.55***	0.75***	0.77***	-0.71***	0.64***	0.06	0.14	-0.06	0.23**	-0.18*	4.12	0.78
IJPOS	0.21**	0.31***	--	0.24**	0.14	-0.04	0.2*	0.14	0.05	0.72***	0.06	0.24**	0.06	0.31***	0.21*	3.63	0.72
IJNEG	-0.12	-0.12	0.3***	--	0.79***	0.64***	-0.75***	-0.71***	0.81***	0.2*	-0.19*	0.05	0.39***	-0.14	0.5***	2.20	0.96
EXTER	-0.31***	-0.33***	0.21**	0.62***	--	0.66***	-0.79***	-0.77***	0.84***	0.09	-0.17*	-0.05	0.41***	-0.21*	0.47***	1.94	0.92
AMOT	-0.69***	-0.69***	-0.07	0.29***	0.47***	--	-0.85***	-0.88***	0.86***	-0.29***	-0.23**	-0.14	0.38***	-0.29***	0.4***	2.00	1.02
RAI	0.83***	0.86***	0.32***	-0.43***	-0.6***	-0.84***	--	0.99***	-0.96***	0.41***	0.19*	0.14	-0.37***	0.34***	-0.4***	5.67	3.53
RAI2	0.88***	0.87***	0.22***	-0.35***	-0.58***	-0.89***	0.98***	--	-0.97***	0.43***	0.19*	0.14	-0.36***	0.33***	-0.39***	11.98	7.65
phi	-0.82***	-0.78***	0.02	0.47***	0.65***	0.85***	-0.91***	-0.94***	--	-0.24**	-0.2*	-0.1	0.4***	-0.29***	0.45***	0.91	0.28
VL	0.75***	0.81***	0.66***	0.26***	-0.01	-0.61***	0.71***	0.73***	-0.51***	--	0.07	0.23**	0.02	0.34***	0.07	3.32	0.51
SWLS	0.32***	0.26***	-0.08	-0.18**	-0.23***	-0.27***	0.3***	0.32***	-0.32***	0.16*	--	0.41***	-0.55***	0.48***	-0.37***	3.64	0.74
PA	0.39***	0.32***	0.03	-0.07	-0.14*	-0.31***	0.33***	0.36***	-0.32***	0.29***	0.52***	--	-0.22**	0.34***	0.03	3.49	0.58
NA	-0.18**	-0.17**	0.05	0.18**	0.22***	0.23***	-0.23***	-0.24***	0.23***	-0.12	-0.49***	-0.5***	--	-0.35***	0.42***	2.48	0.78
IAF_SCO	0.29***	0.28***	0.15*	-0.11	-0.15*	-0.21***	0.31***	0.3***	-0.22***	0.25***	0.31***	0.36***	-0.28***	--	-0.13	3.95	0.58
IAF_SUS	-0.21***	-0.18**	0.19**	0.22***	0.25***	0.27***	-0.23***	-0.26***	0.27***	-0.07	-0.21**	-0.25***	0.28***	-0.13*	--	3.11	0.80
M	3.98	3.94	3.19	1.67	1.71	1.83	5.90	12.42	0.86	3.02	3.46	3.49	2.42	3.93	2.98		
SD	0.96	0.86	0.93	0.78	0.71	0.94	3.37	7.83	0.33	0.66	0.76	0.72	0.84	0.61	0.74		

Note: *** p < .001, ** p < .01, * p < .05

Table SI.3. Matrix of correlations, Samples 3 (N=311, above the diagonal) and 4 (N=239, below the diagonal)

combined	INTRI	IDENT	IJPOS	IJNEG	EXTER	AMOT	RAI	RAI2	phi	VL	SWLS	PA	NA	IAF_SCO	IAF_SUS	M	SD
INTRI	--	.3***	.15**	.11*	.21***	.16**	.35***	.41***	-.34***	.32***	.05	.09	-.05	0.05	0.03	3.16	0.77
IDENT	.7***	--	.49***	.5***	.09	-.33***	.57***	.59***	-.51***	.71***	.17**	.26***	-.2***	0.41***	0.08	3.77	0.66
IJPOS	.47***	.64***	--	.61***	.3***	-.06	.25***	.2***	-.01	.83***	.1	.14*	-.03	0.2***	0.29***	3.68	0.71
IJNEG	.26***	.43***	.56***	--	.29***	-.15*	-.02	.11*	.07	.85***	.02	.1	.12*	0.19***	0.31***	3.67	0.80
EXTER	-.1	.01	.26***	.51***	--	.41***	-.51***	-.46***	.57***	.41***	-.07	0	.12*	-0.09	0.24***	3.02	0.78
AMOT	-.15*	-.33***	-.09	.04	.27***	--	-.68***	-.75***	.71***	-.24***	-.26***	-.21***	.17**	-0.36***	0.23***	2.27	0.96
RAI	.68***	.69***	.42***	-.15*	-.54***	-.6***	--	.97***	-.95***	.28***	.27***	.24***	-.29***	0.38***	-0.2***	1.64	1.90
RAI2	.75***	.73***	.4***	-.01	-.48***	-.67***	.98***	--	-.96***	.35***	.27***	.25***	-.26***	0.39***	-0.2***	4.16	4.66
phi	-.67***	-.66***	-.24***	.17**	.57***	.6***	-.94***	-.95***	--	-.14*	-.26***	-.22***	.28***	-0.37***	0.27***	1.24	0.16
VL	.61***	.8***	.86***	.77***	.36***	-.26***	.41***	.49***	-.31***	--	.12*	.2***	-.02	0.3***	0.27***	3.44	0.57
SWLS	.25***	.2**	.1	.03	-.08	-.07	.22***	.23***	-.24***	.13*	--	.37***	-.4***	0.4***	-0.11*	3.42	0.76
PA	.32***	.24***	.16*	.03	-.08	-.01	.25***	.25***	-.23***	.17**	.48***	--	-.31***	0.36***	-0.13*	3.53	0.59
NA	-.24***	-.2**	-.09	.12	.18**	.02	-.29***	-.25***	.27***	-.04	-.41***	-.39***	--	-0.34***	0.29***	2.50	0.71
IAF_SCO	.36***	.38***	.22***	.16*	-.06	-.27***	.35***	.39***	-.39***	.33***	.3***	.35***	-.19**	--	-0.06	3.79	0.61
IAF_SUS	-.06	-.07	.15*	.36***	.42***	.26***	-.35***	-.31***	.37***	.18**	-.21**	-.17**	.32***	-0.1	--	3.09	0.76
M	3.49	3.80	3.64	3.22	3.08	1.96	2.67	6.44	1.17	3.43	3.52	3.63	2.28	3.78	3.02		
SD	0.89	0.77	0.87	1.01	0.81	0.83	2.60	5.93	0.21	0.71	0.68	0.62	0.72	0.62	0.79		

Note: *** p < .001, ** p < .01, * p < .05

Table. Zero-order correlations between the UPLOC measures and the validity indices (Sample 1, N=142).

	SWLS	PA	NA	IAF_SCO	IAF_SUS
Intr	.15	.18*	-.06	.24**	-.05
Ident	.06	.14	-.06	.23**	-.18*
IjPos	.06	.24**	.06	.31***	.21*
IjNeg	-.19*	.05	.39***	-.14	.5***
Exter	-.17*	-.05	.41***	-.21*	.47***
Amot	-.23**	-.14	.38***	-.29***	.4***
Rai	.19*	.14	-.37***	.34***	-.4***
RaiW	.19*	.14	-.36***	.33***	-.39***
Phi	-.2*	-.1	.4***	-.29***	.45***
VL	.07	.23**	.02	.34***	.07

Note: *** p < .001, ** p < .01, * p < .05

Table. Zero-order correlations between the UPLOC measures and the validity indices (Sample 2, N=243).

	SWLS	PA	NA	IAF_SCO	IAF_SUS
Intr	.32***	.39***	-.18**	.29***	-.21***
Ident	.26***	.32***	-.17**	.28***	-.18**
IjPos	-.08	.03	.05	.15*	.19**
IjNeg	-.18**	-.07	.18**	-.11	.22***
Exter	-.23***	-.14*	.22***	-.15*	.25***
Amot	-.27***	-.31***	.23***	-.21***	.27***
Rai	.3***	.33***	-.23***	.31***	-.23***
RaiW	.32***	.36***	-.24***	.3***	-.26***
Phi	-.32***	-.32***	.23***	-.22***	.27***
VL	.16*	.29***	-.12	.25***	-.07

Note: *** p < .001, ** p < .01, * p < .05

Table. Zero-order correlations between the UPLOC measures and the validity indices (Sample 3, N=311).

	SWLS	PA	NA	IAF_SCO	IAF_SUS
Intr	.05	.09	-.05	.05	.03
Ident	.17**	.26***	-.2***	.41***	.08
IjPos	.10	.14*	-.03	.20***	.29***
IjNeg	.02	.10	.12*	.19***	.31***
Exter	-.07	.00	.12*	-.09	.24***
Amot	-.26***	-.21***	.17**	-.36***	.23***
Rai	.27***	.24***	-.29***	.38***	-.20***
RaiW	.27***	.25***	-.26***	.39***	-.20***
Phi	-.26***	-.22***	.28***	-.37***	.27***
VL	.12*	.20***	-.02	.30***	.27***

Note: *** p < .001, ** p < .01, * p < .05

Table. Zero-order correlations between the UPLOC measures and the validity indices (Sample 4, N=239).

	SWLS	PA	NA	IAF_SCO	IAF_SUS
Intr	.25***	.32***	-.24***	.36***	-.06
Ident	.2**	.24***	-.2**	.38***	-.07
IjPos	.1	.16*	-.09	.22***	.15*
IjNeg	.03	.03	.12	.16*	.36***
Exter	-.08	-.08	.18**	-.06	.42***
Amot	-.07	-.01	.02	-.27***	.26***
Rai	.22***	.25***	-.29***	.35***	-.35***
RaiW	.23***	.25***	-.25***	.39***	-.31***
Phi	-.24***	-.23***	.27***	-.39***	.37***
VL	.13*	.17**	-.04	.33***	.18**

Note: *** p < .001, ** p < .01, * p < .05

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