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The Resistance to Change Scale: Assessing dimensionality and associations with personality and wellbeing in adolescents

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Abstract

Resistance to change (RTC) is the tendency to have a negative attitude toward change. It is a relevant construct in adolescence because change can be perceived as a challenge to the formation of an integrated independent identity: the primary developmental task of this period. Currently, there are no validated measures of RTC for adolescents. To address this research gap, we tested the psychometric properties of the Resistance to Change Scale in a sample of adolescents from Portugal. Confirmatory factor analyses supported modelling the RTC scale via a bifactor model. Statistical indices indicated that RTC scale scores were largely unidimensional. When this model was applied, RTC was positively related with trait reactance, negatively related with wellbeing, and linked to high Harm Avoidance and low Self-Directedness personality dimensions. The bifactor model was equivalent across gender and early vs. late adolescent groups. Our findings suggest that the RTC scale is a psychometrically sound and potentially useful tool for researchers and educators who wish to measure RTC in adolescents.

Keywords: Resistance to change; adolescents; psychometrics; bifactor model; Resistance to Change Scale.

The Resistance to Change Scale: Assessing dimensionality and associations with personality and wellbeing in adolescents

Resistance to change (RTC) describes the tendency to adopt a negative attitude toward changes to the status quo. This negative tendency is typically described as having multiple components (Piderit, 2000). These components, adopted from the tripartite view of attitudes (Ajzen, 2005), represent behavioral (intentional), emotional and cognitive dimensions. This conceptualization of RTC as multidimensional attitudes broadly unites the range of definitions offered by researchers in the past. Prior works have defined RTC as intentional acts of defiance and noncompliance (i.e. as a behavior; Ashforth & Mael, 1998). Other definitions have focused on emotional states, such as the frustration and anxiety that lead to undesirable behaviors in response to change (Argyris & Schön, 1978). Yet others have incorporated cognitive states such as ‘(un)readiness’ into their definitions of RTC (Armenakis, Harris, & Mossholder, 1993).

Using this tripartite conceptualization, Oreg and colleagues (Oreg, 2003, 2006; Oreg et al., 2008; Oreg, Nevo, Metzer, Leder, & Castro, 2009) have focused on individual differences in RTC as a derivative of personality (i.e. as a trait). Trait RTC embodies the personality-based factors that influence individuals’ typical responses to change in different contexts and across time. According to Oreg (2003), there are at least six dispositional sources of RTC including reluctance to lose control, reluctance to give up old habits, cognitive rigidity, lack of psychological resilience, intolerance to adjustment, and preference for low levels of novelty.

RTC has been considered most frequently in the context of adult employees’ resistance to change at work (Piderit, 2000). However, the relevance of this construct and the practical implications of understanding and measuring the behavioral, emotional and cognitive components of trait RTC are readily transferable to other contexts where change occurs, and in individuals occupying other developmental phases (e.g. adolescence). One context for which there has been little consideration of RTC, yet for which the implications are likely to be substantial, is the experience of school and education by adolescents.

RTC in Adolescents

Adolescence is a period of drastic cognitive, emotional, social and physical transformation (Milyavskaya et al., 2009; Steinberg, 2001) during which the primary developmental task is the exploration of one's independence and development of a coherent and meaningful sense of personal identity: Answering the question "Who am I?" (Erikson, 1968). The satisfaction of basic psychological needs has an important role in the accomplishment of this task and the avoidance of identity diffusion (Luyckx, Vansteenkiste, Goossens, & Duriez, 2009; Soenens & Vansteenkiste, 2011). Self-Determination Theory (SDT; Deci & Ryan, 2003) posits that individuals strive, across the lifespan, to meet three fundamental needs: *autonomy*, *relatedness* and *competence*. According to Luyckx et al., when autonomy is satisfied individuals are free to pursue their own interests, and thus more likely to explore all possible identity options and behave according to their individualized needs, which is beneficial to committing to a chosen identity. When competence is satisfied, leading to a sense of personal mastery, individuals are more able to engage in identity exploration. Finally, when relatedness is satisfied individuals may feel more able to commit to a chosen identity due to perceived support from significant others such as peers, family and teachers.

Many changes and transformations experienced across all contexts and domains in adolescence can be interpreted as threats to the satisfaction of psychological needs and, consequently, a challenge to the development of a well-integrated personal identity. Therefore, such changes can be conceptualized as stimuli that hold the potential to elicit resistance as individuals strive for need satisfaction. As Erikson (1968) puts it:

... should a young person feel that the environment tries to deprive him too radically of all the forms of expression which permit him to develop and integrate the next step, he may resist with the wild strength encountered in animals who are suddenly forced to defend their lives. (p.130)

Because individuals frequently experience change as they progress along their academic trajectories, school serves as an ideal context for studying RTC in adolescents. As adolescents transition through grades and between school systems (e.g. the transition from middle to high school), they typically experience multiple environmental and social changes that are out of their control (new teachers, new peers, and new facilities). As Eccles and Midgley (1989) note, many students experience a change in school social structure as they progress from smaller self-contained classrooms in primary school to larger middle schools, as well as an increase in grading rigor and reduced contact between students and teachers. Such changes may have a significant impact on the fulfilment of the three basic needs and thus lead to RTC. School transitions, for example, may compromise adolescents' needs for relatedness due to the disruption to peer groups and teacher-student relationships (Sirsch, 2003), and needs for competence as a result of increased work demands (Alspaugh, 1998).

Studies directly studying the effects of RTC in adolescents, particularly in the context of school, are scarce. Such research is sorely needed given that evidence implies, albeit indirectly, that adolescents with a disposition to resist change are at risk of negative outcomes. For example, the behavioural component of RTC can be conceptualized via a framework that differentiates between active (opposition, argument, obstruction, undermining, and stalling) and passive (refraining, waiting, ignoring, withdrawing, and avoiding) resistance (Bovey & Hede, 2001). Evidence suggests that the majority of adolescents who resist at school do so passively (Kearney, Plax, & Burroughs, 1991), meaning that resistance can manifest as disengagement with school. Research highlights that there are serious detrimental effects associated with disengagement such as poorer academic performance, increased absence and suspension (Wang, Fredricks, Ye, Hofkens, & Linn, 2017) and increased likelihood of school dropout (Archambault, Janosz, Fallu, & Pagani, 2009). In contrast to passive RTC, active RTC in the context of school can manifest as disruption and misbehaviour. Evidence has shown that misbehaviour at school is significantly associated with school dropout and lower graduation (Ou, Mersky, Reynolds, & Kohler, 2007; Rumberger & Lim, 2008). Understanding

dispositional resistance in adolescents from a tripartite perspective will be useful for enhancing the accuracy of teachers in predicting how students will respond to change and help inform interventions targeted at reducing the risk of negative outcomes in resistant adolescents. However, as a first step to achieving this it is necessary to have validated measurement instruments for assessing RTC in adolescents.

The Resistance to Change (RTC) Scale

The RTC scale was designed as the first direct measure of a generalized disposition to resist change. Its items were designed to capture the six dispositional sources of resistance outlined by Oreg (2003), although exploratory and confirmatory factor analyses revealed four personality-based influences on one's typical response to change: inclination to seek routines, emotional reaction to change, short-term focus, and cognitive rigidity. Studies by Oreg have demonstrated that the RTC scale has sound psychometric properties. First, the RTC scale has been consistently shown to have good-to-excellent internal consistency ($\alpha > .70$; Oreg, 2003; Oreg et al., 2008). Additionally, the four RTC subscale factors were found to have strong positive correlations with a second-order RTC factor ($r's > .63$), implying that they represent dimensions of the same RTC construct (Oreg, 2003). Finally, a series of theoretically anticipated associations between the RTC scale and individual-level traits has provided evidence of construct validity for the RTC construct (Oreg, 2003). These traits included; sensation seeking ($r = -.48$; Zuckerman, Kuhlman, Joireman, Teta, & Kraft, 1993), tolerance for ambiguity ($r = -.42$; Lorsch & Morse, 1974), risk aversion ($r = .47$; Slovic, 1972), dogmatism ($r = .53$; Troidahl & Powell, 1965), and openness to experience ($r = -.19$) and neuroticism ($r = .28$) personality dimensions (Saucier, 1994). In short, individuals who have a dispositional tendency to resist change appear to be less open to new experiences, less tolerant of ambiguity, more risk-averse, less interested in seeking new sensations, less emotionally stable (more neurotic), and more dogmatic. Crucially, all the above psychometric research was conducted using adult, typically university student, samples.

The Present Study

Currently, there are no measures of RTC validated for use with adolescents. Given this gap in the literature, the purpose of the study was to test the psychometric properties of the RTC scale, specifically the 17-item version adapted for an educational context (Oreg et al., 2008), in a sample of adolescents from Portugal.

The first aim of the study was to investigate the factor structure of the RTC scale by testing a series of competing models. A cross-cultural study of 17 countries and 4,201 undergraduate has championed a correlated four-factor structure for the RTC scale over an alternative three-factor structure (Oreg et al., 2008). Crucially, this study demonstrated that the RTC scale had cross-national measurement equivalence based on a correlated four-factor model. This included Croatia, which is similar to Portugal in terms of several cultural dimensions such as high collectivism and high power distance (Hofstede, Hofstede, & Minkov, 2010). Given this evidence, we anticipated that the correlated four-factor model might be a good representation of relationships between items in our Portuguese sample. We also tested a bifactor model. Past RTC studies have frequently calculated and interpreted a total RTC scale score (Oreg et al., 2008), which implies an assumption of unidimensionality (Brown, Finney, & France, 2011). By testing a bifactor model, it was possible to assess whether RTC scale items are truly unidimensional, and thus whether the practice of calculating and interpreting a total RTC scale score is appropriate.

Before educators and researchers can use the RTC scale to assess adolescents of different ages, both male and female, it is important to determine that the meaning of the RTC construct is equivalent across gender and different age groups. This is important given that research has revealed some gender differences in personality (Costa, Terracciano, & McCrae, 2001; Weisberg, De Young, & Hirsh, 2011) and that there may be a gender bias in items of scales measuring personality (Reise, Smith, & Furr, 2001). Additionally, adolescence is a key period of identity formation (Erikson, 1968) and personality typically develops and stabilizes across this period (Klimstra, Hale, Raaijmakers, Branje, & Meeus, 2009). Prior research (Oreg, 2003) claimed that the concept of dispositional resistance to change may in fact have the same

meaning for males and females, and different age groups, and that the RTC scale successfully measures this shared meaning, but no statistics were presented to support these claims. Given this lack of evidence and the novelty of our sample, the second aim of the study was to test for measurement equivalence across gender and younger vs. older adolescents using a multi-group confirmatory factor analysis method.

The final aim of the study was to determine if the RTC scale is a valid measure of RTC. A measure can be considered valid if it measures what it purports to measure (Borsboom, Mellenbergh, & Van Heerden, 2004). Evidence of validity, albeit indirect, can be obtained by testing whether test scores are related to other measures of theoretically related constructs (Cronbach & Meehl, 1955). We therefore assessed the associations between RTC scores and three constructs for which we anticipated theoretical overlap:

Psychological reactance. RTC overlaps substantially with the construct of psychological reactance (Beutler, Harwood, Michelson, Song, & Holman, 2011). Psychological reactance is defined as the dispositional tendency to consider situations as a threat to perceived freedoms, and to experience a motivational state to restore this freedom (Brehm, 1966; Rosenberg & Siegel, 2018). Evidence has converged on a conceptualization of reactance as a combination of negative cognition and negative affect (Dillard & Shen, 2005; Quick & Kim, 2009; Rains, 2013). Loss of control, which can be considered as conceptually similar to the loss of freedom central to Brehm's (1966) definition of reactance, is a major source of resistance (Oreg, 2003). Moreover, at least one measure of psychological reactance, the Hong Psychological Reactance Scale, includes items that explicitly refer to resistance (e.g. "Regulations trigger a sense of resistance in me"). Given this theoretical proximity, we hypothesized that measures of psychological reactance (Brehm, 1966) would share a positive association with the RTC scale.

Temperament and character. Prior research has linked a range of personality dimensions, including the Big Five personality dimensions (Costa & McCrae, 1992), with RTC (Oreg, 2003). We aimed to extend the nomological network surrounding RTC by examining its relation to the seven dimensions of the Psychobiological Model of personality (Cloninger, Svrakic, &

Przybeck, 1993)¹. Four of these dimensions capture the dispositional responses to emotional stimuli that determine habits and moods (temperament; Novelty Seeking, Harm Avoidance, Reward Dependence and Persistence). These four temperament dimensions correspond to four functionally distinct brain systems (e.g. behavioral activation system; Cloninger, 1994). The three remaining dimensions capture differences in higher-order sociocognitive processes (character; Self-Directedness, Cooperativeness and Self-Transcendence), and each exert a unique effect over the regulation and expression of the four temperament dimensions. Certain personality profiles, defined by specific combinations of the temperament and character dimensions, have been linked to maladaptive outcomes. Lower scores across character dimensions, for example, have been linked to reduced wellbeing (Cloninger & Zohar, 2011; Josefsson et al., 2011). The combinations of High Novelty Seeking and Harm Avoidance, and low Reward Dependence and Persistence, have been linked to higher levels of emotional and behavioural problems (Rettew, Althoff, Dumenci, Ayer, & Hudziak, 2008). The combination of high Harm Avoidance and low Self-Directedness in particular is associated with emotional instability. Indeed, this combination of dimensions has been shown to have substantial overlap ($r_s > .50$) with neuroticism (De Fruyt, Van De Wiele, & Van Heeringen, 2000). Because past research has shown RTC is positively, albeit weakly, correlated with neuroticism ($r = .28$; Oreg, 2003), we hypothesized that high RTC scores would be linked with high Harm Avoidance and low Self-Directedness. Given that dimensions of the psychobiological model correspond to individual differences in distinct psychobiological systems (e.g. dopamine system) and higher-order sociocognitive processes, an understanding of how these dimensions correlate with RTC will be a first indication of the core processes relevant to RTC.

Wellbeing. Finally, we were interested in exploring the associations between dispositional resistance to change and wellbeing, including its affective and cognitive components. Our justification for doing so was that RTC can be broadly conceptualized as a

¹ The Five Factor Model and the Psychobiological Model are conceptually distinct. However, research has shown that the dimensions of these two models share substantial overlap (De Fruyt et al., 2000; Ramanaiah, Rielage, & Cheng, 2002).

tendency for negative emotionality (e.g. negative emotional reactions to change) and negative cognition when confronted with change. Empirical findings support this conceptualization (e.g. Bovey & Hede, 2001). We thus expected that individuals with high RTC scores would be more likely to experience negative states and thus report reduced affective and non-affective wellbeing.

Methods

Participants and Procedure

The study included 327 adolescents (151 males, 176 females) from eight schools in the north of Portugal. Detailed characteristics of this sample are presented in (Moreira, Inman, & Cunha, 2019; Study 2), although briefly, these adolescents were from the 5th to 12th grades and thus represented a wide age range (10 – 17 years, $M = 14.2$, $SD = 2.2$). Most of the sample were Portuguese (98.1%), but a small proportion were Brazilian or from other European countries. The parents of these adolescents generally had a low education level, with 86.6% of mothers and 89.9% of fathers having a maximum of high-school education. All participants were required to return a signed informed consent form from their legal guardians prior to completing paper versions of all measures while being supervised by a member of the research team in a classroom context. Students were not rewarded or compensated for their participation.

Measures

Resistance. We translated the 17-item Resistance to Change (RTC) scale (Oreg et al., 2008) into Portuguese using similar procedures to those described by Mallinckrodt and Wang (2004). This involved back-translation and an examination of the items by members of the target population using a ‘think aloud’ procedure. All items are scored on a Likert-type scale ranging from 1 (*totally disagree*) to 6 (*totally agree*). Higher scores represent higher dispositional resistance.

Reactance. We measured psychological reactance using two scales validated for use in Portuguese adolescents. The first was the Portuguese version of the Hong Psychological Reactance Scale (HPRS; Moreira, Inman, & Cunha, 2019), which comprises 14 items (e.g. “I become angry when my freedom of choice is restricted”) scored from 1 (*completely disagree*) to 5 (*completely agree*) (original scale by Hong & Page, 1989). Moreira et al. showed that this scale is a reliable measure of a unidimensional reactance construct. In our study sample, the HPRS had good internal consistency ($\omega = .82$).

The second scale was the Portuguese version of the Therapeutic Reactance Scale (TRS; Inman, Sousa, Cunha, & Moreira, 2019; original scale by Dowd, Milne, & Wise, 1991). Based on the recommendation of Inman et al., we used three of the four TRS subscales; Conflict-Seeking (6 items; e.g. “Nothing turns me on as much as a good argument”), Preservation of Freedom (5 items; e.g. “I have a strong desire to maintain my personal freedom”), and Resentment of Authority (3 items; e.g. “I find that I often have to question authority”), scored from 1 (*totally disagree*) to 4 (*totally agree*). In the current sample, the Preservation of Freedom ($\omega = .74$) and Conflict-Seeking ($\omega = .79$) subscales had good internal consistency. The Resentment of Authority subscale had questionable reliability ($\omega = .68$), although this was deemed acceptable given the small number of items.

Temperament/character. The dimensions of the psychobiological model of Temperament and Character were assessed using the 127-item Portuguese version (Moreira et al., 2012) of the Junior Temperament and Character Inventory (JTCI; original version by Luby, Svrakic, Mccallum, Przybeck, & Cloninger, 1999). All items are rated on a Likert scale ranging from 1 (*completely false*) to 5 (*completely true*). These measure four temperament dimensions (Novelty Seeking, Harm Avoidance, Reward Dependence and Persistence) and three character dimensions (Self-Directedness, Cooperativeness and Self-Transcendence) (Cloninger et al., 1993). The values for omega for six of the seven JTCI subscales, based on the present sample, were deemed acceptable: Novelty Seeking ($\omega = .80$), Harm Avoidance ($\omega = .72$), Persistence (ω

= .74), Self-Directedness ($\omega = .80$), Cooperativeness ($\omega = .85$), and Self-Transcendence ($\omega = .72$). Reliability was poor for the Reward Dependence subscale ($\omega = .43$).

Affective and non-affective wellbeing. Consistent with prior studies interested in the higher-order dimensions of wellbeing (Cloninger & Zohar, 2011; Moreira et al., 2015) we used several scales to form composite indicators of non-affective and affective wellbeing.

Non-affective wellbeing. A composite non-affective wellbeing index was calculated as the mean score across measures of life satisfaction, satisfaction with social support, and quality of life:

Life satisfaction. Life satisfaction was measured using the Brief Multidimensional Students' Life Satisfaction Scale (BMSLSS; Seligson, Huebner, & Valois, 2003; Portuguese translation by Moreira et al., 2018), which has six items scored from 0 (*terrible*) to 6 (*fantastic*), that measure degree of satisfaction across six domains of life (e.g., "My family life is ...", "My satisfaction with where I live is ..."). These items had excellent internal consistency in our sample ($\omega = .86$).

Satisfaction with social support. Students' satisfaction with their social support was measured using the brief Satisfaction with Social Support Scale for children and adolescents which was originally in Portuguese (Gaspar, Ribeiro, Matos, Leal, & Ferreira, 2009), has 12 items (e.g., "I am satisfied with the amount of friends I have") scored from 1 (*totally agree*) to 5 (*totally disagree*). We recoded these items so that higher scores reflect higher satisfaction. This measure showed excellent internal consistency ($\omega = .89$).

Quality of life. Student mental health and wellbeing was measured using the Portuguese version of KIDSCREEN-10 (Matos, Gaspar, & Simões, 2012), a short version of the original 52 item KIDSCREEN (Ravens-Sieberer et al., 2005), which consists of 10 items (e.g., "Do you feel fit and well?") scored from 1 (*not at all*) to 5 (*extremely*). This scale had excellent reliability in the study sample ($\omega = .89$).

Affective wellbeing. Affective wellbeing was calculated using an adapted version of the Portuguese Positive and Negative Affect Scale (PANAS; Galinha & Pais-Ribeiro, 2005; original version by Watson, Clark, & Tellegen, 1988). The scale consists of 12 positive (e.g. enthusiastic) and 15 negative (e.g. sad) adjectives for describing emotions that participants score from 1 (*very slightly or not at all*) to 5 (*extremely*). We calculated affective wellbeing by subtracting the mean score for negative adjectives from the mean score for positive adjectives. In this manner, negative scores reflect a mostly negative emotional experience and positive scores reflect a mostly positive experience. This adapted version of the PANAS was shown to have excellent reliability in the study sample ($\omega = .96$).

Analyses

All analyses were conducted using R (R Core Team, 2017). As an initial step to evaluating item suitability, we examined a polychoric inter-item correlation matrix and calculated ordinal omega for each RTC subscale (Gadermann, Guhn, & Zumbo, 2012). Next, we used confirmatory factor analysis (CFA) to test three factorial structures outlined by Oreg et al (2008; Figure 1): *Model 1* - a correlated three-factor model; *Model 2a* - a correlated four-factor model; and *Model 2b* - a four-factor model with resistance to change higher-order factor. We also tested a bifactor model (*Model 3*) where a general resistance to change factor accounts for relationships among items while specific factors account for unique variance among the items after controlling for the general factor. Because our data was ordinal, we used a robust weighted least squares (WLSMV) estimator (Li, 2016). A full-information approach was used, meaning that models were estimated from the entire data set. We considered the following indices and thresholds for acceptable model fit: $\chi^2/df \leq 3$, CFI $\geq .95$, RMSEA $< .08$ and SRMR $< .10$ (Cangur & Ercan, 2015).

We evaluated scale unidimensionality in two ways (Reise, 2012; Reise, Moore, & Haviland, 2010). First, we compared standardized factor loadings for the general and specific factors of the bifactor model. Stronger loadings on the general factor compared to specific factors are an indication of unidimensionality. We also calculated Omega Hierarchical (ω_H ;

Zinbarg, Revelle, & Yovel, 2007) as a means to assess the proportion of variation accounted for by the general factor. ω_H scores $> .50$, and preferably $> .75$, indicate scores are a measure of a single construct (Reise, Scheines, Widaman, & Haviland, 2013). A small numerical difference between ω_H and ω (McDonald, 1999) indicates that systematic variance is mostly a result of the general factor.

To assess measurement invariance across gender we used a multi-group CFA approach where a series of increasingly restrictive models are assessed in terms of their effect on model goodness-of-fit (Bollen, 1989). The first stage assesses configural invariance, the extent to which the model fits across the global sample. The second stage assesses metric invariance, the extent to which items load on the factors similarly across groups. The final stage, tests whether sample means can be compared meaningfully across groups. Research suggests that invariance with ordinal data and WLSMV estimation should be determined using $\Delta\chi^2$ (Bowen & Masa, 2015; Sass, Schmitt, & Marsh, 2014). Non-significant changes to χ^2 between models, indicating model fit is unaffected by model restraints, demonstrate invariance.

Finally, we tested the validity of the RTC scale by assessing its surrounding nomological network. SEM was used to estimate the relationships between the RTC scale bifactor structure and composite indicators of trait reactance, temperament and character dimensions, and wellbeing (affective and non-affective), each in separate models. Following the work of Yost and Finney (2018), external variables were modelled as a latent factor with a single composite indicator. The unstandardized error variance of each composite indicator was calculated using the following equation: $(1-r_{xx}) \times \text{var}(x)$. r_{xx} corresponds to Cronbach's alpha for the composite score, and $\text{var}(x)$ is the variance. The latent factor representing the external variable was allowed to correlate with the general and specific factors. This approach provides an understanding of the relationship between external variables and the general factor isolated from the effects of specific factors.

Results

Correlations between items intended to load on the same subscale were mostly positive, with the exception of Item 4, which did not appear to correlate well with its intended subscale. Past studies using the RTC scale have removed this item to improve scale reliability (e.g. Turgut, Michel, Rothenhöfer, & Sonntag, 2016). Moreover, the other reverse scored item, Item 14, was positively correlated with its intended subscale, but showed negative correlations with items from other subscales. Because some researchers advise against including negatively worded items due to being psychometrically problematic (Carlson et al., 2011), and because these correlations indicated the reversed items in this scale may present issues, they were removed from all further analyses.

Following the removal of items 4 and 14, ordinal Omega values for three of the four subscales were acceptable: Emotional Reaction ($\omega = .77$), Short-Term Focus ($\omega = .77$), Cognitive Rigidity ($\omega = .70$). Omega for the Routine Seeking subscale ($\omega = .63$) was indicative of questionable reliability.

TABLE 1 ABOUT HERE

Tests of Factorial Structure via CFA

Model 1 (correlated three-factor model) had the least satisfactory fit to the data: $\chi^2/df = 2.42$; CFI = .930; SRMR = .066; RMSEA = .066, 95% CI [.055, .077]. Model 2a (correlated four-factor model) had better fit, although still fell short of all the desired heuristics for acceptable fit: $\chi^2/df = 2.19$; CFI = .944; SRMR = .061; RMSEA = .060, 95% CI [.049, .072]. The higher-order model (Model 2b) did not present an admissible solution. An inspection of the output for this model revealed that this was due to a negative error variance for the Short-Term Focus latent factor. This finding implies that the data were being overfactored by forcing a first-order factor that is not represented in the data (Chen, West, & Sousa, 2006). Given these results, Model 3 was an incomplete bifactor model with three, rather than four, specific factors. Because these specific factors are not conceptually or mathematically equivalent to the first-order factors in models 2a and 2b, they were assigned different labels. The items measuring Routine Seeking

capture a preference for predictability, and thus the specific factor representing common variance in these items was labelled *Consistency*. Items measuring Emotional Response include the words “stressed”, “stresses”, “tense” and “uncomfortable”, and we thus labelled the relevant specific factor *Stress*. Finally, items measuring Cognitive Rigidity capture an inability to be flexible with one’s views and opinions, and we thus labelled the relevant specific factor *Inflexibility*. This bifactor model had the best fit to the data, surpassing all the given heuristics for acceptable fit: $\chi^2/df = 1.86$; CFI = .962; SRMR = .054; RMSEA = .051, 95% CI [.038, .064].

FIGURE 1 ABOUT HERE

Assessment of Unidimensionality

The factor loadings and error terms for the bifactor model (Model 3) are summarised in Table 2. Five of the eleven items (items 1, 5, 6, 8 and 9) had larger standardized loadings on the general factor. Values for Omega and Omega Hierarchical were calculated as, $\omega = .85$ and $\omega_H = .70$, meaning 82% ($.70/.85 = .82$) of the reliable variance in RTC scores was due to the general factor. Crucially, the difference between ω and ω_H was small (.15), suggesting multidimensionality of scores does not obfuscate inferences from a total score.

TABLE 2 ABOUT HERE

Given the support for the bifactor model and evidence of scale unidimensionality, the following analyses were based on this model.

Measurement Invariance

Gender. The first step of testing measurement invariance is to establish the baseline configural model based on Model 3. This model had good fit to the data: CFI = .971, RMSEA = .040, SRMR = .066. For the second step, the metric model, with loadings constrained to be equal, was compared to the baseline configural model. The change in χ^2 was nonsignificant, $\Delta\chi^2(22) = 14.67$, $p = .876$, indicating the loadings between the two groups were equivalent. For

the third step, testing scalar invariance, the change in χ^2 was significant: $\Delta\chi^2(56) = 79.04, p = .023$. This finding implies that one or more thresholds was invariant across groups.

Age. The configural model for age (early vs. late adolescence) had good fit to the data: CFI = .962, RMSEA = .046, SRMR = .071. Constraining factor loadings to be equal across groups did not lead to a significant decrease in χ^2 , $\Delta\chi^2(22) = 22.26, p = .444$, supporting metric invariance across groups. Further, constraining thresholds to be equal also did not lead to a significant change to χ^2 , $\Delta\chi^2(56) = 55.03, p = .512$. We therefore concluded that the RTC scale had scalar invariance across age groups.

Convergent Validity

Table 3 presents the latent factor correlations between a series of external variables and the RTC general factor isolated from the effects of specific factors. Descriptive statistics for all external variables are presented in Supplementary Materials.

TABLE 3 ABOUT HERE

Psychological reactance. The RTC general factor was found to have a moderate positive association with composite indicators of trait reactance as measured by the HPRS ($r = .38$) and TRS ($r = .31$).

Temperament and character. The associations presented in Table 3 indicate that individuals who score highly for RTC are linked to a personality profile characterised by higher Harm Avoidance ($r = .26$) and Novelty Seeking ($r = .15$), and lower Persistence temperament ($r = -.16$). In addition, such individuals were also more likely to have low Self-Directedness ($r = -.29$) and high Self-Transcendence ($r = .22$).

Wellbeing. The RTC general factor showed a trend of being negatively associated with wellbeing. This association was weak and non-significant for non-affective wellbeing, but statistically significant for affective wellbeing ($r = -.22$).

Discussion

In the pursuit of developing interventions for helping adolescents deal with change at school, it is necessary that measurement instruments of RTC are validated in adolescent student samples. Given this need, the main objective of the present study was to test the psychometric properties of the RTC scale in a sample of adolescents. The study championed a bifactor model in which a common general RTC factor, representing a unidimensional construct explains common variance among scale items. This scale had at least metric measurement invariance between male vs. female and older vs. younger students. Moreover, the RTC measure was correlated with related constructs (e.g. trait reactance) in a theoretically consistent manner. In sum, the findings serve to validate the RTC scale for use with adolescents.

In order to establish structural validity, we tested a series of factor structures using confirmatory methods. Past research by Oreg et al has championed a four-factor structure of the RTC scale over a three-factor structure (Oreg et al., 2008). The present study also found superior fit for the four-factor structure (Models 2a and 2b) compared to the three-factor structure (Model 1), although it is noteworthy that the correlated four-factor model did not meet all the necessary thresholds for acceptable fit. Moreover, the four-factor model with second-order RTC factor did not present an admissible solution. In particular, negative error variance suggested that the short-term focus factor only reflects the higher-order reactance to change factor: the model was forcing factors not present in the data. The present study expands on current psychometric research of the RTC scale by being the first to test a bifactor model, and indeed this model had the best fit to the data. This model indicates that variance in the items of the RTC scale can be accounted for by a single RTC general factor, with some additional common residual variance being accounted for by three specific factors. As such, this model suggests that the RTC construct is unidimensional but, because of its conceptual breadth, can appear multidimensional when operationalized via the RTC scale.

Critically, support for a bifactor model is insufficient for calculating and interpreting a total RTC score given that calculating a total score confounds the variance associated with the general and specific factors (Brown et al., 2011). To deal with this issue, we followed the

proposals of Reise and colleagues (e.g. Reise et al., 2010) to assess the appropriateness of calculating a total RTC score. Via the calculation of ω and ω_H we demonstrated that 82% of the reliable variance in RTC scores was due to the general factor. This result implies that a total RTC score is acceptable to use and interpret in research. This outcome is critical given that past research using the RTC has frequently used total RTC scores (e.g. Oreg et al., 2008).

In addition to establishing its dimensionality, we sought to test whether the RTC construct has equivalent meaning across gender and different age groups. Before a construct can be meaningfully used to compare different groups of students, such as males vs. females or adolescents from different age groups, it is vital to determine that its meaning is invariant across these groups. Past work has claimed that the RTC factor structure did not differ across gender or age group (Oreg, 2003), although no hard evidence was presented. Using a multi-group CFA approach, we have shown that the RTC scale was indeed broadly equivalent across gender and age groups. In both instances metric invariance was established meaning that across groups the RTC items load on equivalent factors in a similar manner and with similar magnitude. In addition, scalar invariance was established across age groups. The implication of this finding is that the RTC scale can be used to measure reactance to change in different age groups of adolescents and that total RTC scores for these different groups can be directly compared.

To elaborate further on the psychometric properties of the RTC scale, we assessed the latent factor correlations between the RTC general factor from the bifactor model, and three constructs for which there were theoretical reasons to expect an association: psychological reactance, personality dimensions, and wellbeing. It is evident in past literature that some authors consider there to be a large conceptual overlap between resistance to change and psychological reactance (e.g. Beutler, Harwood, Michelson, Song, & Holman, 2011). Consistent with this conceptual overlap, our analysis indicated that resistance to change was positively correlated with two independent measures of psychological reactance, although the size of these associations was small. This result begs the questions of whether psychological reactance and RTC should be considered, as proposed in prior works, as highly related constructs.

We also examined the associations between the RTC scale and the dimensions of the psychobiological model of personality. The pattern of associations revealed suggested that resistance to change is linked to a particular configuration of personality traits. In particular, it was evident that high resistance to change was linked most strongly to high Harm Avoidance (tendency for negative affect) and low Self-Directedness (less developed higher-order cognitive processes linked to self-regulation). Oreg (2003) has shown a positive correlation between RTC and the neuroticism dimension of the Big Five personality model. It is well-established in research that neuroticism corresponds to high Harm Avoidance and low Self-Directedness (Cloninger, 2006; 2008; 2010; Moreira, et al., 2012; Zuckerman & Cloninger, 1996), and our results in adolescents are therefore consistent with those found by Oreg (2003) in undergraduates. Because these results are consistent with those of Oreg (2003) they also serve to validate the RTC scale in adolescents.

Finally, we examined the pattern of associations between the resistance to change subscales and two composite indicators of wellbeing, one affective and the other comprising indicators of health, social support and satisfaction with life. The present study indicates that high RTC is linked to lower wellbeing, and particularly its emotional component. Students with higher RTC scores were less happy. This finding serves as further evidence of construct validity for the RTC scale given that the items of this scale were designed to capture a lack of psychological resilience, which is associated with maladaptive cognitions and affect related to change.

Reactance/ Resistance: Related yet distinct constructs.

As referred to above, an unexpected finding of the present study was that the size of the association between psychological reactance and RTC was weak. This finding was surprising given that authors have highlighted the conceptual proximity between both constructs (Beutler et al., 2011). To understand the conceptual differences between reactance and resistance, we refer to the work of Beutler et al., which states “*resistance implies both a state-like and trait-like quality associated with psychopathology, while reactance is more often confined to state-like behaviour that occurs in normal personality expression...*” (2011, p. 135). One key finding

of the study was the RTC was linked to high Harm Avoidance (behavioural inhibition system), a trait linked to emotional instability and psychopathology (Cloninger, 1994; Svrakic, Whitehead, Przybeck, & Cloninger, 1993). In contrast, Inman and colleagues (2019) found that dimensions of trait reactance were linked to average-to-low Harm Avoidance scores. RTC and reactance seem, therefore, to be differentiated in terms of their associated emotional component and dependence on behavioural inhibition. Future research is necessary to elucidate the key differences (and similarities) between these two constructs.

Limitations

A key limitation of the present study (and indeed all past studies focused on the RTC scale, e.g. Oreg, 2003) is that it provided only circumstantial evidence of validity via presenting correlations between RTC scores and a limited number of related measures (reactance, wellbeing, and temperament and character dimensions). A stronger case for scale validity can be made in the future by further testing the relations between RTC scores and other related constructs such as trait anxiety (which is conceptually proximal to RTC because it is a trait-like variable linked to negative affect and cognitions). More critically, according to Borsboom et al. (2004), a measure is valid when, and only when, the underlying construct exist and when variation in the construct cause variation in test scores. As such, future psychometric investigations of the RTC scale needs to elucidate the mechanisms that underpin the causal effect of RTC on RTC scale scores, and demonstrate that an experimental manipulation of RTC leads to corresponding changes in its measure.

It is also noteworthy that the analyses were conducted with a relatively small sample size ($N = 327$). This is particularly relevant for the assessment of factorial structure via confirmatory factor analysis because inadequate samples sizes can lead to inaccurate model estimates. However, while the necessary sample size for a particular analysis is dependent on multiple factors, the sample size exceeds many rule-of-thumb guidelines such as $N \geq 200$ (Boomsma & Hoogland, 2001) and $N/\text{number of variables} \geq 10$ (Nunnally, 1967). Nonetheless,

future studies should consider retesting the psychometric properties of the RTC scale, and particularly the factorial structure, with larger samples.

Implications

Having a validated measure of dispositional RTC for use with adolescents will have several important implications, both in terms of research and practice. For the former, our study offers researchers a measure of dispositional RTC that can be used, for example, to examine how this construct relates to academic trajectories and wellbeing, and its interactions with school-level variables. Indirectly, researchers interested in the contextual antecedents to resistant behavior and controlling for individual differences now have a validated assessment tool. Furthermore, educators and therapists can now use the RTC scale to identify the individuals most at risk of resisting change (such as movement from middle school to high school), or not complying with treatment/therapy, and who may benefit most from interventions aimed at developing coping strategies. Moreover, our results provide some indication of the psychobiological processes that underpin resistance, and this information may be useful for developing interventions. Resistant individuals, particularly those scoring high on Routine Seeking, Emotional Reaction, and Short-Term Focus, are more likely to be characterised by less developed self-regulatory cognitive processes (low Self-Directedness and low Cooperativeness) and a higher tendency for negative affectivity (high Harm Avoidance).

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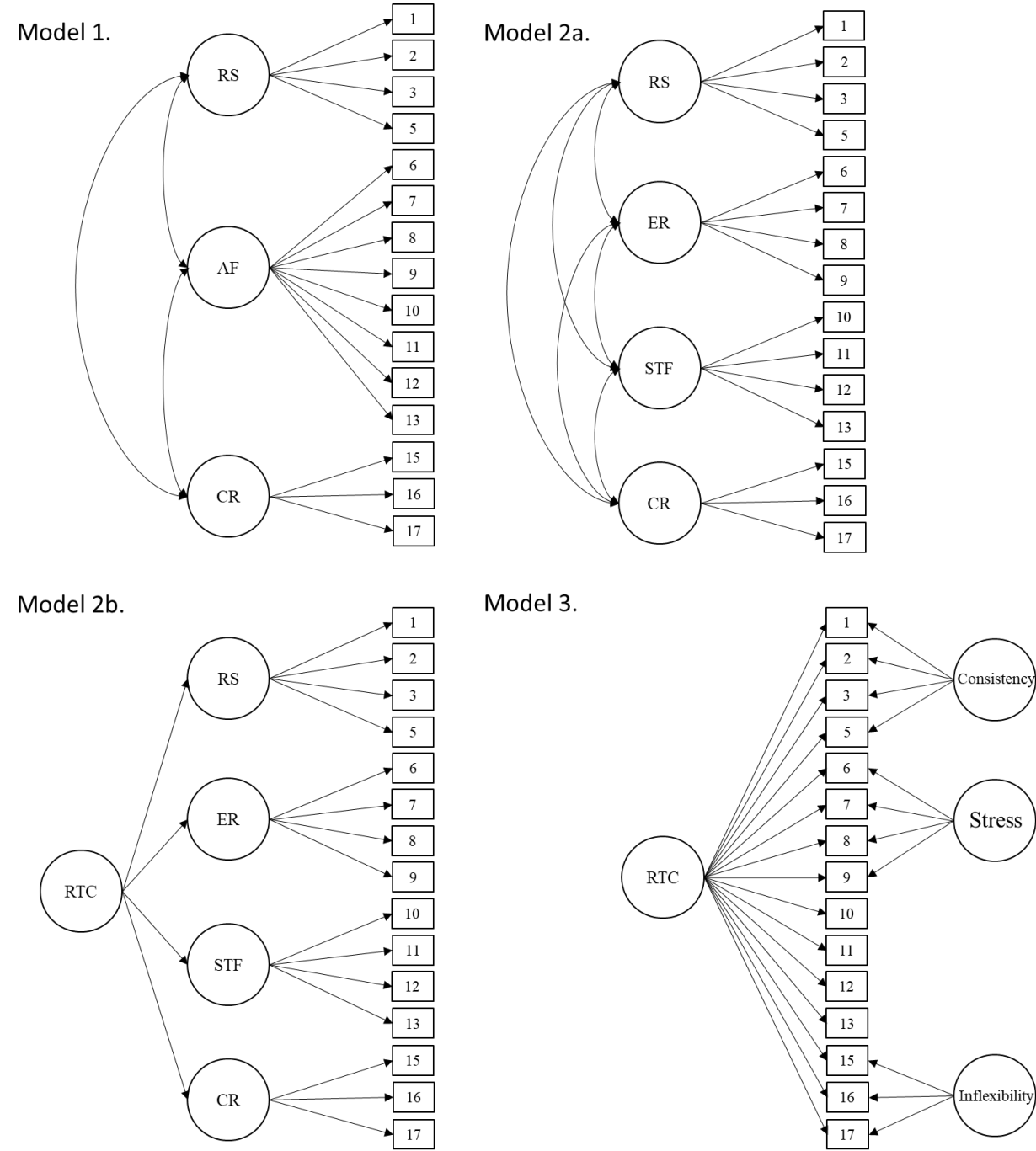


Figure 1. Models tested via CFA. Model 1 – A correlated three-factor model with Routine Seeking (RS), Affective Factor (AF) and Cognitive Rigidity (CR) latent factors. Model 2a – A correlated four-factor model with RS, Emotional Response (ER), Short-term Focus (STF) and CF latent factors. Model 2b – A four-factor model with second-order Resistance to Change (RTC) factor. Model 3 – An incomplete bifactor model with RTC general factor and three specific factors. Rectangles with numbers 1-17 represent items.

Table 1.

Polychoric inter-item correlations and item statistics for the Portuguese RTC scale.

Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
2	.23	1.00															
3	.24	.33	1.00														
4	.10	-.17	-.02	1.00													
5	.13	.34	.29	.00	1.00												
6	.06	.18	.11	-.07	.30	1.00											
7	.06	.24	.16	.06	.17	.53	1.00										
8	.04	.12	-.01	.15	.12	.37	.55	1.00									
9	.12	.22	.12	.06	.26	.19	.24	.38	1.00								
10	.27	.34	.33	.07	.38	.35	.44	.41	.33	1.00							
11	.17	.17	.20	.18	.16	.31	.37	.31	.38	.46	1.00						
12	.24	.19	.13	.14	.16	.25	.32	.31	.38	.38	.42	1.00					
13	.17	.08	.10	.13	.11	.14	.20	.21	.30	.29	.39	.46	1.00				
14	-.11	-.05	-.04	-.09	-.10	-.17	-.13	-.07	-.18	-.19	-.16	-.09	-.30	1.00			
15	-.02	.00	.10	.11	-.01	-.06	-.01	.07	.04	.06	.08	.07	.09	.56	1.00		
16	.04	.17	-.01	.06	.14	.15	.12	.18	.10	.14	.09	.20	.10	.17	.37	1.00	
17	.12	.09	.01	.07	.11	.16	.05	.17	.14	.06	-.01	.13	.05	.10	.28	.54	1.00
M	2.81	3.53	2.47	3.68	2.86	3.65	3.56	4.37	3.87	3.33	3.40	3.52	3.57	3.41	3.65	4.27	4.28
SD	1.37	1.57	1.46	1.44	1.51	1.47	1.36	1.40	1.46	1.42	1.34	1.39	1.46	1.56	1.69	1.34	1.17
Original Items (Oreg et al., 2008)									Portuguese Translations								
1.	I generally consider changes to be a negative thing.								1.	Em geral, considero que as mudanças são uma coisa negativa.							
2.	I'll take a routine day over a day full of unexpected events any time.								2.	Prefiro um dia de rotina a um dia cheio de coisas imprevisíveis a acontecerem a qualquer hora.							
3.	I like to do the same old things rather than try new and different ones.								3.	Gosto mais de fazer as mesmas coisas de sempre do que tentar coisas novas e diferentes.							
4.	Whenever my life forms a stable routine, I look for ways to change it. (r)								4.	Sempre que a minha vida fica rotineira, penso em formas de a mudar. (r)							
5.	I'd rather be bored than surprised.								5.	Prefiro estar entediado a ser surpreendido.							

Table 1.

Polychoric inter-item correlations and item statistics for the Portuguese RTC scale.

Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
6.	If I were to be informed that there's going to be a significant change regarding the way things are done at school, I would probably feel stressed.								6.	Se fosse informado de que ia haver uma grande mudança na forma como as coisas são feitas na escolar, provavelmente ia ficar stressado(a).							
7.	When I am informed of a change of plans, I tense up a bit.								7.	Quando sou informado que há mudança de planos, fico um pouco tenso(a).							
8.	When things don't go according to plans, it stresses me out.								8.	Fico stressado quando as coisas não correm de acordo com o planeado.							
9.	If one of my professors changes the grading criteria, it would probably make me feel uncomfortable even if I thought I'd do just as well without having to do any extra work.								9.	Ia sentir-me desconfortável se um dos meus professores mudasse os critérios de avaliação, mesmo sabendo que não tinha de me esforçar ou trabalhar mais para me sair bem.							
10.	Changing plans seems like a real hassle to me.								10.	Mudar de planos é um verdadeiro "bico de obra" para mim, isto é, é algo muito difícil para mim.							
11.	Often, I feel a bit uncomfortable even about changes that may potentially improve my life.								11.	Em geral, sinto-me desconfortável com mudanças mesmo aquelas que podiam melhorar a minha vida.							
12.	When someone pressures me to change something, I tend to resist it even if I think that the change may ultimately benefit me.								12.	Quando alguém me pressiona para mudar alguma coisa, tenho tendência para resistir mesmo sabendo que uma mudança acabaria por ser benéfica para mim.							
13.	I sometimes find myself avoiding changes that I know will be good for me.								13.	Às vezes dou por mim a evitar mudanças que sei que seriam boas para mim.							
14.	I often change my mind. (r)								14.	Mudo muitas vezes de ideias. (r)							
15.	I don't change my mind easily.								15.	Não mudo facilmente de ideias.							
16.	Once I've come to a conclusion, I'm not likely to change my mind.								16.	Quando chego a uma conclusão, não costume mudar de ideias.							
17.	My views are very consistent over time.								17.	As minhas ideias/pontos de vista são bastante estáveis ao longo do tempo.							

Table 2.

Standardized (and fully standardized) factor loadings and unstandardized error terms for the Resistance to Change Scale items based on the incomplete bifactor model.

Item	λ_{GEN}	λ_{C}	λ_{S}	λ_{I}	Error variance
1	1.00 (.28)	1.00 (.23)			.87
2	1.29 (.36)	2.36 (.54)			.58
3	1.01 (.29)	2.39 (.55)			.62
5	1.39 (.39)	1.46 (.33)			.74
6	1.54 (.44)		1.00 (.36)		.68
7	1.95 (.55)		2.25 (.81)		.04
8	1.91 (.54)		1.01 (.36)		.58
9	2.04 (.58)		-0.06 (-.02)		.67
10	2.60 (.73)				.46
11	2.31 (.65)				.57
12	2.20 (.62)				.62
13	1.71 (.48)				.77
15	0.25 (.07)			1.00 (.44)	.80
16	0.85 (.24)			1.88 (.83)	.25
17	0.71 (.20)			1.42 (.63)	.57

Note. λ_{GEN} = factor loadings on the general resistance to change factor; λ_{C} = factor loadings on the Consistency specific factor; λ_{S} = factor loadings on the Stress specific factor; λ_{I} = factor loadings on the Inflexibility specific factor.

Table 3.

Correlations between resistance to change, personality, psychological reactance, and wellbeing.

	General Factor	Specific Factors		
	Resistance to Change	Consistency	Stress	Inflexibility
Psychological Reactance				
HPRS	.38***	-.28*	-.05	.11
TRS	.31***	-.12	-.11	.03
Temperament & Character				
Novelty Seeking	.15*	-.21	-.05	-.08
Harm Avoidance	.26**	.04	.22*	-.22**
Reward Dependence	-.10	-.15	.01	.03
Persistence	-.16*	.04	.10	.25**
Self-Directedness	-.29**	.04	.08	.30**
Cooperativeness	-.09	-.18	.06	.19*
Self-Transcendence	.22**	-.04	-.10	.12
Wellbeing				
Non-affective wellbeing	-.12	.32*	.00	.18**
Affective wellbeing	-.22**	.18	-.08	.24**

Note. HPRS = Hong Psychological Reactance Scale; TRS = Therapeutic Reactance Scale; *p<.05.

p<.01. *p<.001

Supplementary Table 1.

Descriptive statistics for all measures used in the study.

	M	SD	Range	Skewness	Kurtosis
Resistance to Change					
The RTC Scale*	3.55	0.70	1.60 – 5.33	-0.21	-0.16
Psychological Reactance					
HPRS	3.29	0.51	1.57 - 4.71	-0.17	0.48
TRS	36.28	5.71	18.00 – 56.00	0.29	0.61
Temperament & Character					
Novelty Seeking	2.90	0.49	1.61 – 4.22	-0.10	0.11
Harm Avoidance	2.86	0.45	1.05 – 4.37	-0.14	1.33
Reward Dependence	3.50	0.42	2.13 – 4.80	0.07	-0.04
Persistence	3.44	0.46	2.28 – 4.72	0.31	0.04
Self-Directedness	3.56	0.43	2.42 – 4.75	0.19	-0.56
Cooperativeness	3.81	0.51	1.79 – 4.89	-0.39	0.32
Self-Transcendence	3.58	0.48	1.44 – 4.56	-0.42	0.62
Wellbeing					
BMSLSS	34.98	4.84	11.00 – 42.00	-1.26	2.59
BSSSS	3.60	0.43	2.08 – 4.75	-0.08	0.25
KIDSCREEN-10	3.40	0.45	1.80 – 4.50	-0.27	-0.36
PANAS – Positive	3.66	0.77	1.33 – 5.00	-0.63	0.08
PANAS - Negative	1.81	0.68	1.00 – 4.20	1.14	0.85
Non-affective wellbeing index	14.03	1.74	5.83 – 16.84	-1.21	2.46
Affective wellbeing index	1.84	1.23	-2.67 – 4.00	-0.87	0.80

Note. HPRS = Hong Psychological Reactance Scale; TRS = Therapeutic Reactance Scale. * Descriptive statistics for the Resistance to Change scale were calculated excluding items 4 and 14.