Moreira, Paulo
Faria, Vânia
Cunha, Diana
Inman, Richard A.

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# Applying the transtheoretical model to adolescent academic performance using a person-centered approach: A latent cluster analysis.

Paulo A. S. Moreira[a,b]
Vânia Faria[b]
Diana Cunha[b]
Richard A. Inman[b]
Magda Rocha[b]

[a]Instituto de Psicologia e de Ciências da Educação, Universidade Lusíada-Norte (Porto)
[b]Centro de Investigação em Psicologia para o Desenvolvimento (CIPD) [*The Psychology for Positive Development Research Center*], Portugal

Corresponding author: Prof. Paulo Moreira, Centro de Investigação em Psicologia para o Desenvolvimento, Universidade Lusíada - Porto, Rua Dr. Lopo de Carvalho, 4369-006, Porto, Portugal, email: paulomoreira@por.ulusiada.pt

Abstract

According to the transtheoretical model (TTM), intentional behavioral change to improve academic performance at school is a process that involves a progression through five discrete stages: precontemplation, contemplation, preparation, action, and maintenance. The current person-centered study assessed the emotional and sociocognitive characteristics of adolescent students ($n = 343$) with distinct academic performance stage of change profiles. Latent class analysis revealed five emergent groups. These groups mapped well onto the different academic performance stages of change: (1) students in a precontemplation stage; (2) students transitioning from precontemplation to contemplation; (3) students in a contemplation/preparation stage; (4) students in an action/maintenance stage; and (5) students outside the change process due to strong prior academic performances. In accordance with the TTM, group differences in personality, wellbeing, emotional/behavioral problems, learning approaches, and engagement with school indicated students in the more advanced stages of change had more adaptive psychological resources.


*Keywords:* transtheoretical model; academic performance; psychobiological processes; adolescents; Latent Class Analysis (LCA).

*Abbreviations:* TTM = transtheoretical model; APSCI = Academic Performance Stages of Change Inventory

Highlights

- Understanding academic trajectories requires description of underlying processes.
- Five distinct stage-of-change groups emerged from latent class analysis (LCA).
- Groups differed in personality, learning processes, and positive functioning.
- Later stages-of-change linked to more adaptive sociocognitive/emotional processes.
- Results validate the TTM as a useful psychoeducational tool.

## 1 Introduction

The transtheoretical model (TTM; Prochaska, 1979) is a well-established integrative framework for describing intentional behavioral change (Prochaska & Di Clemente, 1982). According to the TTM, behavior change occurs as movement over time across a series of five discrete stages of change (SoCs): *Precontemplation*, *Contemplation*, *Preparation*, *Action,* and *Maintenance*. These stages capture the temporal and motivational aspects of the change process (DiClemente, 1999). According to the TTM, when attempting to modify a behavior, individuals need to use a set of overt and covert processes to progress through the stages (e.g. counterconditioning; Prochaska, DiClemente, & Norcross, 1992). Which processes are necessary depends on the individual's current SoC (Prochaska, Redding, & Evers, 2008). Moreover, progression through SoCs is accompanied by a change in attitudes, beliefs, and behaviors, from those that are less adaptive to those that are more adaptive. As such, SoCs can be conceptualized as organizations of increasingly adaptive sociocognitive and emotional processes. In accordance with these proposals, research has shown that individuals in the later SoCs have higher self-efficacy and better decisional balance than those in the earlier stages (Kennett, Worth, & Forbes, 2009; Sarkin, Johnson, Prochaska, & Prochaska, 2001).

One key debate surrounding the TTM is whether it is appropriate to consider the five stages as being qualitatively distinct, or whether they correspond to pseudo-stages superimposed on an underlying continuum of change (Kraft, Sutton, & Reynolds, 1999). Consistent with this latter pseudo-stage position, constructs and processes related to the TTM have been shown to change smoothly across groups (Grant & Franklin, 2007). Nonetheless, researchers have argued that conceptualizing stages as identifiable points along a continuum of change, each with specific psychological characteristics that are manifestations of an underlying continuum, can serve as a useful heuristic for understanding the progression of change.

### 1.1 The TTM and academic performance

The TTM is likely to be an informative framework for understanding the change process involved in improving academic performance at school. Academic performance is commonly conceptualized as a developmental trajectory that is influenced by multiple

interacting factors (Fu, Chen, Wang, & Yang, 2016; Mandelman, Barbot, & Grigorenko, 2016). Crucially, because academic performance is associated with various important long-term outcomes (Chia & Miller, 2008; Fiscella & Kitzman, 2009), a current challenge for researchers is to identify the psychological processes underlying different functioning organizations and their consequent influence on students' academic trajectories.

The constructs and sociocognitive processes associated with the TTM map well onto the development of academic performance. According to Moreira, Moreira, Cunha, and Inman (2018), improving academic performance can be conceptualized as movement across five discrete academic performance SoCs:

(1) *Precontemplation* - students do not consider their academic performances problematic and have no intention to change behavior.

(2) *Contemplation* - students acknowledge that their academic performances could/should be improved and intend to modify their behavior toward this goal.

(3) *Preparation* – students intend to improve their academic performances and are beginning to take small steps towards this goal.

(4) *Action* - students are making changes to their behavior to improve their academic performances.

(5) *Maintenance* - students are working to sustain their behavioral changes.

Consistent with the TTM, adolescent students categorized into these five SoCs using the Academic Performance Stages of Change Inventory (APSCI) differed in their academic performances and engagement with school (Moreira et al., 2018). Specifically, students in the earlier stages showed worse academic performance and lower engagement with school than those in the more advanced stages. It is noteworthy, however, that student were categorized into the stages corresponding to the APSCI subscale for which they scored the highest. Crucially, individuals can have attitudes and behaviors that characterize multiple stages meaning this study was unable to accurately identify naturally-occurring homogenous subgroup of students based on responses to the different academic performance SoC subscales.

Beyond the study of Moreira et al. (2018), there is only one other peer-reviewed work applying the TTM to an educational context (Grant & Franklin, 2007). This study categorized a sample of university students into SoCs based on their intention to improve study skills. Students classified in the later stages had higher self-efficacy and were more likely to use a deep approach to learning than those in the earlier stages.

The results of Moreira et al. (2018), and Grant and Franklin (2007) suggest that the TTM is a suitable framework for categorizing and understanding students in terms of the psychological processes and characteristics related to academic development. Moreover, they suggest that the process of improving academic performance implies movement between less adaptive and more adaptive sociocognitive processes, but also that that individuals with particular organizations of psychological processes may be more likely to occupy certain SoCs. More research is necessary to; (a) further validate the TTM as a useful framework for examining change in academic performance, and (b) to identify the psychological processes germane to academic trajectories. Such research is likely to have important implications for the teachers, school policy makers, and councilors who design/use interventions for helping all types of students move on positive academic trajectories.

## 1.2 The psychological characteristics of academic performance stages of change

Of the multiple factors relevant for understanding change in academic performance, one important class of factors captures the influence of student characteristics. In particular, research has demonstrated that individual differences in trait variables (structural variables that are largely stable over time) and state variables (processes that change across contexts) play a significant role in predicting academic performance (Mega, Ronconi, & De Beni, 2014). For the purpose of the current study, we consider a series of trait and state individual difference variables for which we theoretically anticipated students across stages to differ:

**1.2.1 Traits.** Numerous models of temperament (e.g. Rothbart, Ahadi, & Evans, 2000) and traits (e.g. the five-factor model; Costa & McCrae, 1992) exist in personality research, although the framework used in the present study was the psychobiological model of personality (Cloninger, 2004; Cloninger, Svrakic, & Przybeck, 1993). Our reasoning for adopting this

framework was: (a) models derived from linear factor analyses (including the five-factor model) do not provide a full description of personality (Veselka, Schermer, & Vernon, 2012); (b) there is a growing opinion that psychobiological approaches to personality should be adopted in the social sciences (Bates & Lewis, 2012); and (c) the psychobiological model has acquired substantial empirical validation for describing normal and abnormal variations of human personality (Grucza & Goldberg, 2007).

The psychobiological model captures the emotional (temperament) and rational (character) psychobiological processes involved in shaping human behavior (Cloninger, 2004; Cloninger et al., 1993). Temperament dimensions, which capture within-individual differences in automatic procedural learning processes, have a major influence on patterns of self-regulation, motivation, and context-related emotional states. Novelty seeking temperament, for example, which is linked to impulsivity and excitability, is theoretically implied to have a negative relationship with self-control, itself a major predictor of academic performance (Duckworth & Seligman, 2005). Persistence temperament, linked to determination and ambition, is also positively correlated with academic performance (Moreira et al., 2015).

Character dimensions describe individual differences in the organizations of higher-order sociocognitive processes that determine voluntary intentions and attitudes, and shape one's sense of self (Cloninger et al., 1993; Cloninger & Zohar, 2011). The three character dimensions (self-directedness, cooperativeness and self-transcendence) exert unique effects over the regulation of dispositional tendencies, although these effects tend to be more substantial when individuals are characterized by maturity across all three dimensions (Zohar, Zwir, Wang, Cloninger, & Anokhin, 2018). As such, individuals with high levels of all three character dimensions are considered to have a more coherent personality than those with lower levels (Cloninger 2004). Indeed, higher scores across the three character dimensions have been associated with better academic performance (Moreira, Dias, Vaz, & Vaz, 2013) and increased wellbeing (Cloninger & Zohar, 2011; Moreira et al., 2015).

Individuals with certain personality characteristics may be more likely to occupy specific academic performance SoCs. Because high novelty seeking is linked to excitability and

impulsivity, it follows that students with this personality characteristic may have difficulty persisting with the work required to improve academic performance or maintaining behavioral change. Thus, such students may be more likely to occupy the lower SoCs. Conversely, students high in persistence, who can be described as being ambitious and hardworking, and/or with more adaptive self-regulatory resources (high self-directedness) may find it easier to invest and persist in change. Thus, such students may be more likely to occupy the later SoCs.

**1.2.2 States.** Because academic development implies a progression from organizations of less adaptive psychological processes to organizations of more adaptive psychological processes, it theoretically follows that individuals in different stages will differ in state variables linked to sociocognitive/emotional processes:

*1.2.2.1 Wellbeing.* Individual differences in self-regulatory ability have been associated with higher levels of wellbeing in adults (Cloninger, 2004; Cloninger & Zohar, 2011) and in adolescents (Moreira et al., 2015). Processes such as self-efficacy have also been linked to higher levels of happiness in adolescents (Caprara, Steca, Gerbino, Paciello, & Vecchio, 2006), suggesting that the personal agency mechanisms involved in academic performance are also relevant to wellbeing. Given the theoretical and empirical relationship between wellbeing and adaptive psychosocial functioning (states of wellbeing allow positive internal organizations to express as adaptive patterns of behavior), it follows from the TTM that students in the later SoCs, by virtue of having more adaptive organizations of sociocognitive/emotional processes, may benefit from elevated wellbeing compared to those in the earlier SoCs.

*1.2.2.2 Emotional/behavioral problems.* Individual differences in sociocognitive and emotional processes are also linked to risk for experiencing emotional/behavioral problems. Attentional deficits, for example, have been considered an indicator of developmental failures in self-regulation (Althoff et al., 2012), and maladaptive emotion regulation has been linked to problems with aggression (Roberton, Daffern, & Bucks, 2012). Thus, according to the TTM, students in the earlier SoCs, by virtue of having less adaptive organizations of

sociocognitive/emotional processes, may be at increased risk for emotional and behavioral problems.

*1.2.2.3 Approach to learning.* Learning-related processes include the motives and cognitive strategies employed in self-regulated learning (Pintrich, 2000). Such processes can be understood via the student approaches to learning framework (Biggs, 2001), which distinguishes between two major types of approach: (a) the *surface approach*, characterized by extrinsic motivation for undertaking a task and the use of superficial strategies; and (b) the *deep approach*, characterized by intrinsic motivation and the use of analytical strategies. Several studies have linked deep approach and its associated adaptive sociocognitive processes to superior academic performance (Richardson, Abraham, & Bond, 2012), and the surface approach to worse academic performance (Herrmann, McCune, & Bager-Elsborg, 2017). Recent research has demonstrated that adolescents with adaptive sociocognitive resources, as implied by a coherent character profile, showed a preference for the deep approach over the surface approach (Moreira, Inman, Rosa, et al., 2019). As such, it follows that students in the later stages of developing academic performance should have higher scores for deep approach to learning than students in the earlier stages.

*1.2.2.4 Engagement with school.* According to one prevalent framework, student engagement has four multi-faceted subtypes: academic, behavioral, cognitive, and psychological (Appleton, Christenson, Kim, & Reschly, 2006). Academic and behavioral indicators of engagement are considered more observable than the more internal cognitive (e.g. self-regulated learning) and psychological (e.g. sense of belonging) indicators. Individual differences in engagement are associated with differences in sociocognitive resources. Specifically, students with a more coherent JTCI character profile reported higher engagement with school than those with a less coherent character (Moreira, Inman, Pereira, et al., 2019). Thus, according to the TTM, students in the earlier SoCs, by virtue of having less adaptive organizations of sociocognitive processes, will be less engaged in school than those in later SoCs.

**1.3 The current study**

The principle aim of the study was to advance our understanding of the psychological processes underlying the academic performance SoCs. Given this objective, the study adopted a person-centered approach. Person-centered methods provide rich detail on how homogenous subgroups of individuals differ in terms of relevant variables (Asendorpf, 2015; Howard & Hoffman, 2018), and were thus ideal for addressing our main research question: *What are the psychological characteristics of students located in the different SoCs?* Variable-centered approaches would be less appropriate because they can provide little information about the stage-specific organizations of psychological processes, or the stage-specific dynamics of this organization (Asendorpf, 2015).

The study builds on past research in two ways. First, the current study used a robust person-centered method (latent cluster analysis; LCA) to classify individuals into distinct subgroups corresponding to the academic performance SoCs. The two existing studies on this topic (Grant & Franklin, 2007; Moreira et al., 2018) are limited by their reliance on simple classification algorithms that do not allow for classification error. Second, the study assessed the characteristics of the emergent subgroups in terms of several variables that have not yet been assessed in relation to academic performance SoCs. These variables were theoretically expected to differ across groups. Specifically, it was hypothesized that students in the more advanced SoCs would have psychological characteristics indicative of more adaptive organizations of sociocognitive/emotional processes, namely: (1) more coherent character; (2) more positive functioning (increased wellbeing and fewer problems); and (3) more adaptive learning processes (increased deep approach and student engagement).

## 2 Method

### 2.1 Participants

The sample comprised 343 students (57.4% female) aged between 14 and 17 years old ($M = 16.02$, $SD = 0.84$). These students were from one secondary school (10th - 12th grades) in the north of Portugal: 10th grade (40.5%), 11th grade (30.9%), and 12th grade (28.6%). Most students were Portuguese (92%).

Ethical approval was granted by the ethics board at the *[name deleted for anonymity]*.
We distributed consent forms to all students in the participating school. Only students with
parental consent could participate. To reduce the influence of fatigue effects, each participant
completed the battery of questionnaires across three supervised group sessions.

**2.2 Materials**

The study used a person-centered methodology and had a cross-sectional design.
Participants completed several validated self-report measures. Zero-order correlations between
study variables are available in Supplementary Table 1.

**2.2.1 Academic performance stages of change.** The APSCI (Moreira et al., 2018;
original version in Portuguese) is a validated self-report measure of five SoCs. The five-factor
structure of this scale was validated using confirmatory factor analysis (Moreira et al., 2018).
The scale's 14 items are scored from 1 (*strongly disagree*) to 5 (*strongly agree*). In the study
sample, reliability coefficients for the five subscales were: Precontemplation ($\omega = .81$),
Contemplation ($\alpha = .67$[1]), Preparation ($\omega = .85$), Action ($\omega = .77$), and Maintenance ($\omega = .63$).
The reliability for the full instrument was ($\omega = .86$).

**2.2.2 Academic performance.** Exam grades in Portuguese and Mathematics from the
previous academic year were obtained from school records. Because the APSCI was designed to
assess the progression of change related to overall academic performance, we calculated a
composite grade score.

**2.2.3 Personality.** The 127-item Portuguese Junior Temperament and Character
Inventory (JTCI; Moreira, Oliveira, et al., 2012) measures the temperament and character
dimensions described by the psychobiological model of personality (Cloninger, 2004). All items
are scored from 1 (*completely false*) to 5 (*completely true*). Reliability for the JTCI dimension
subscales ranged from self-transcendence ($\omega = .70$) to cooperativeness ($\omega = .89$).

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[1] Omega total cannot be computed for scales with two items, and we therefore present Cronbach's alpha.

**2.2.4 Wellbeing.** We used four instruments to assess affective and non-affective wellbeing. This approach has been used in multiple prior studies (Cloninger & Zohar, 2011; Moreira et al., 2015).

A Portuguese translation of the Brief Multidimensional Students' Life Satisfaction Scale (BMSLSS; Seligson, Huebner, & Valois, 2003) was used to measure student satisfaction with life in six domains: family, friends, school experience, self, environment, and life in general. Scores for the 6 items range from 0 (*terrible*) to 6 (*fantastic*). Scale reliability in the study sample was ($\omega = .81$).

Satisfaction with social support was measured using a brief version of the Satisfaction with Social Support Scale (SSSS; Gaspar, Ribeiro, Matos, Leal, & Ferreira, 2009; original in Portuguese). This instrument comprises 12 items scored from 1 (*totally agree*) to 5 (*totally disagree*). Scale reliability in the study sample was ($\omega = .87$).

Mental-health and wellbeing was measured using the Portuguese KIDSCREEN-10 (Matos, Gaspar, & Simões, 2012). The ten items of this instrument, scored from 1 (*not at all*) to 5 (*extremely*), measure the affective, cognitive, and psychosocial aspects of mental health. Scale reliability in the study sample was ($\omega = .85$).

Affective wellbeing was measured using a Portuguese translation of the Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988). This scale includes 12 positive and 15 negative adjectives for describing emotions, which participants indicate the extent to which they feel from 1 (*very slightly or not at all*) to 5 (*extremely*). For the study sample, the reliability of the positive and negative subscales were ($\omega > .92$).

The composite non-affective wellbeing index was the mean average score across BMSLSS, SSSS and KIDSCREEN-10. We calculated the composite affective wellbeing index by subtracting the mean score of the negative affect PANAS subscale from the positive affect PANAS subscale. Positive scores indicate a positive emotional experience. Negative scores indicate a negative emotional experience.

**2.2.5 Emotional/behavioral problems.** We used a Portuguese translation of the 112-item Youth Self Report (YSR; Achenbach, 1991) to measure the presence of eight syndromes: anxious/depressed, somatic complaints, withdrawn/depressed, aggressive behavior, delinquent behavior, social problems, thought problems, and attention problems. All items are rated on a three-point scale from 0 (*not true*) to 2 (*frequently true*). In the study sample, ω across syndromes ranged from .84 to .94. Prior studies have shown the YSR has cross-cultural invariance (Ivanova et al., 2007).

**2.2.6 Approaches to learning.** We used a version of the Learning Processes Inventory that was adapted for secondary school students and validated in a Portuguese sample (LPI-s; Moreira, Dias, Pettrachi, Vaz, & Duarte, 2012). The LPI-s has 33 items, scored from 1 (*never or rarely*) to 5 (*always or almost always*). These items load on two higher-order factors reflecting deep and surface approaches. The reliability of the deep and surface approach subscales in the study sample were (ω > .87).

**2.2.7 Student engagement**. We used a version of the Student Engagement Instrument (SEI; Appleton et al., 2006) that has been validated in Portuguese samples (Moreira & Dias, 2018) to measure the cognitive and psychological dimensions of student engagement. SEI items are scored from 1 (*totally disagree*) to 4 (*totally agree*). Reliability for the two subscales was (ω > .88).

**2.3 Data Analysis**

All analyses were conducted using R (R Core Team, 2019).

**2.3.1 Missing Data**. The percentage of missing data at the item-level was low for most measures: APSCI (< 1.2%), SEI (< 2.6%), LPI-s (< 1.2%), KIDSCREEN (< 1.2%), SSSS (< 2.0%), BMSLSS (< 1.0%), and PANAS (< 2.0%). For the JTCI, the percentage of item-level missing data was higher (< 12.8%), but this was because a number of students did not respond to any items. The percentage of item-level missing data was also higher for the YSR (< 14.0%) for the same reason. Students who did not complete the JTCI and/or YSR were not different

from the others in terms of gender (Cramer's V = .029, *p* = .595), or age (U = 5835.00, *p* = .113), but did belong to a specific group of classes (Cramer's V = .389, *p* < .001). We therefore concluded that the missing data mechanism across measures was either MCAR or MAR. Item-level missing data was dealt with using multiple imputation, specifically multivariate imputation using chained equations (*mice* package; Buuren & Groothuis-Oudshoorn, 2011). Scale scores for all measures were calculated using the full data sets with imputed values.

**2.3.2 Latent Class Analysis (LCA).** LCA was used to divide the sample into subgroups defined by shared APSCI profiles. Latent class models were estimated using students' raw scores for all 14 APSCI items. To determine the appropriate number of latent classes, a series of models with an increasing number of latent classes was tested. The fit of models with between one and six classes were compared using the adjusted Bayesian Information Criterion (aBIC; Yang, 2006). A large importance was also given to the conceptual interpretation of the model. Students were assigned to classes based on the highest probability of membership, and these classes were considered as groups.

A series of ANCOVAs tested group differences for the study variables after controlling for group differences in gender. ANCOVAs were followed by post-hoc comparisons using the Tukey correction.

**3 Results**

**3.1 LCA**

Values for aBIC favored the five-class solution (Table 1). Figure 1 presents the z scores of each APSCI subscale for these five classes. Class 1 represented precontemplation, Class 2 represented a transition between precontemplation and contemplation, and Class 3 represented contemplation/preparation. Class 4 represented action having progressed beyond contemplation and preparation. Finally, class 5 represented a pseudo action group in which students were outside the change process, but reported moderate action.

TABLE 1 ABOUT HERE

FIGURE 1 ABOUT HERE

(1) **Reluctant group ($n = 44$).** These students had a precontemplation score that was elevated by more than one standard deviation (z = 1.31). Scores were below average for all other APSCI subscales, and particularly low for action (z = -1.50).

(2) **Immotive group ($n = 76$).** These students had high values for precontemplation (z = .67) and contemplation, preparation, action, and maintenance scores at the mean.

(3) **Decision-making group ($n = 96$).** These students were characterized by preparation that was approximately one standard deviation above the mean (z = 1.04), as well as high contemplation (z = .59). This group was also characterized by modest elevations in action and maintenance, and lower than average precontemplation.

(4) **Participation group ($n = 85$).** These students had a similar profile to the decision-making profile with the exception that they did not have elevated preparation scores, instead of having scores close to the mean (z = -.11).

(5) **Satisfied group ($n = 42$).** These students had average scores for action (z = -.07), implying that they were somewhat engaged in improving academic performance. However, this was accompanied by low contemplation (z = -.87), preparation (z = -1.63), maintenance (z = -.71), and precontemplation (z = -.29).

These groups did not differ in age, $F(4, 319) = 1.26$, $p = .287$, but did differ in gender composition, $\chi^2(4) = 26.73$, $p < .001$. The reluctant (68.2% male) and satisfied (52.3% male) groups comprised more males than females. The decision-making (62.5% female), participation (75.3% female), and immotive groups (51.3% female) comprised more females than males.

**3.2 Group Differences across Variables**

Table 2 presents z-scores for the study variable across groups and ANCOVA statistics.

TABLE 2 ABOUT HERE

**3.2.1 Academic performance.** The groups differed significantly in their mean prior academic performances ($p = .005$, $\omega^2 = .033$). Notably, the satisfied group had the highest prior

academic performance (z = .49), while the decision-making group had the lowest prior

academic performance (z = -.19).

**3.2.2 Temperament.** There were observable differences in temperament profiles across

the five groups. The main effect of group was significant for novelty seeking ($p$ = .016, $\omega^2$ =

.023) and persistence ($p$ < .001, $\omega^2$ = .049). The reluctant group had a profiles defined by higher

novelty seeking, and lower harm avoidance and persistence. The profile of the decision-making

group included the combination of elevated novelty seeking and higher harm avoidance. The

participation group had a temperament profile characterized by lower novelty seeking, and

higher harm avoidance, reward dependence, and persistence. Similarly, the satisfied group had

lower novelty seeking and higher persistence, although it was differentiated by its low score for

harm avoidance.

**3.2.3 Character.** Differences in character were observed across groups, with a

significant effect for self-directedness ($p$ < .001, $\omega^2$ = .060), and cooperativeness ($p$ = .007, $\omega^2$ =

.027). Students in the reluctant group had lower than average scores for all three dimensions (a

"depressive profile"; profile names from Cloninger, 2004). Students in the immotive group had

average self-directedness and transcendence, but lower cooperativeness. The decision-making

group had lower self-directedness, but higher cooperativeness and self-transcendence. The

participation group had higher self-directedness and cooperativeness, and lower self-

transcendence. Finally, students in the satisfied group had higher self-directedness and close to

average cooperativeness and self-transcendence.

**3.2.4 Wellbeing.** The groups varied rather little in terms of wellbeing, with a significant

main effect of group only identified for non-affective wellbeing ($p$ = .046, $\omega^2$ = .017). For this

indicator, the satisfied group reported the highest score (z = .27) and the decision-making group

reported the lowest score (z = -.20).

**3.2.5 Emotional/behavioral problems.** Significant group differences were observed for

somatic complaints ($p$ = .023, $\omega^2$ = .021), attention problems ($p$ = .007, $\omega^2$ = .028), aggressive

behavior ($p$ = .037, $\omega^2$ = .018), and positive qualities ($p$ = .002, $\omega^2$ = .037). The decision-making

group reported the highest levels of somatic complaints (z = .26), as well as anxiety/depression (z = .22) and thought problems (z = .13). The immotive group reported the highest levels of attention problems (z = .43), aggressive behavior (z = .30), and fewest self-reported positive qualities (z = -.47).

**3.2.6 Approaches to learning**. Significant group differences were observed for deep ($p$ < .001, $\omega^2$ = .044), and surface approach ($p$ < .001, $\omega^2$ = .059). There was a trend of lower deep approach (z = -.62) and surface approach (z = -.54) in the reluctant group indicating less motivation (extrinsic and intrinsic) and less use of learning strategies (analytical and surface) for academic tasks. The decision-making group had moderately elevated scores for both deep and surface approach (z = .14 and .12 respectively) indicating the increased use of both, but with no clear preference. Finally, the satisfied group had high scores for deep approach (z = .29) and a lower, albeit still elevated, score for surface approach (z = .20).

**3.2.7 Student engagement**. Significant group differences were observed for cognitive ($p$ < .001, $\omega^2$ = .068), and psychological engagement ($p$ < .001, $\omega^2$ = .045). The reluctant group was the least engaged in school. In contrast, the participation and satisfied groups had higher scores for both cognitive (z = .19 and .14) and psychological engagement (z = .16 and .17). Notably, the decision-making and satisfied group had increased cognitive engagement (z = .16) but did not have the same elevation in psychological engagement as the participation group (z = -.04).

## 4    Discussion

The major finding of the present study was that five distinct profiles emerged when students were grouped based on their responses to a measure of academic performance SoCs. These groups broadly captured groups of students progressing through the different SoCs described by the TTM. A fundamental prediction of the TTM is that the process of improving academic performance implies movement between less adaptive and more adaptive sociocognitive/emotional processes. Moreover, individuals with particular organizations of processes may be more likely to occupy certain SoCs. These predictions were supported by the

present study, thus further validating the TTM as a viable framework for conceptualizing change in student academic performance. In accordance with the person-centered approach, the following discussion will consider the psychological characteristics of each of the five emergent profiles.

## 4.1 The Reluctant Group

Students in the reluctant group were characterized by a temperament profile of lower harm avoidance, lower reward dependence, lower persistence, and higher novelty seeking. Individuals with this profile thus tend to fit the description "confident and optimistic with no worry in advance of difficulties" (Cloninger, 1987, p. 577), implying that some students may be more likely to occupy the precontemplation SoC because they have a temperamental disposition to take a carefree approach to their academic performances.

According to the TTM, early SoCs correspond to the least adaptive organizations of sociocognitive/emotional processes. Organizations of sociocognitive processes, which serve as individuals' psychological resources for functioning, are captured by the JTCI character dimensions. In line with the TTM, students in the reluctant group had low scores for all three character dimensions, particularly cooperativeness, implying a tendency to see the world has being hostile. All personality disorders have been linked to low cooperativeness (Cloninger et al., 1993), which aligns with our finding that this group had high levels of attention issues and antisocial behaviors (notably delinquent and aggressive behaviors), tended to be more unhappy, were less likely to use a deep approach to learning, and were less engaged in school. These latter findings replicated past studies that have linked early SoCs to less adaptive learning processes (Grant & Franklin, 2007).

## 4.2 The Immotive Group

Students in the immotive group did not present the same elevated novelty seeking as the reluctant group, and were more reward dependent, more persistent, and less harm avoidant. These students also had low scores for character, although not to the same extent as those in the reluctant group. A further distinction between was that students in the immotive group were

more engaged in school, consistent with increased persistence, and made use of (to a roughly normative level) more learning strategies. Moreover, this group was defined by increased wellbeing (consistent with lower harm avoidance), and fewer attention/aggression issues (consistent with lower novelty seeking) than the reluctant group.

## 4.3 The Decision-Making Group

The pattern of temperament dimensions for this group included elevated novelty seeking and elevated harm avoidance. This particular combination of traits has been associated with a temperamental "push/pull" effect, where individuals are attracted to novel situations but simultaneously afraid and shy, leading to distress and lower wellbeing, and considered an indicator of disordered self-regulation (Althoff et al., 2012). This combination of high novelty seeking and harm avoidance is also linked to a personality typology characterized by overestimating the need for alarm, low self-confidence, and tendency to be pessimistic (Cloninger, 1987). Thus, these findings imply that some students may be occupy this SoC because they have a tendency to react negatively to poor prior performance, or the school context in general. Consistent with this analysis, this group reported the highest levels of anxiety/depression, somatic complaints, and thought problems, the highest levels of negative affect, and lowest levels of non-affective wellbeing.

While this group had a temperament profile that indicated high negativity, its character profile was consistent with the proposal that individuals in intermediary SoCs are characterized by moderately adaptive patterns of psychological processes. Our finding was that students in this group had low self-directedness, indicating less ability to adapt and regulate behavior according to personal goals (low self-directedness has also been linked to lower self-esteem; Cloninger et al., 1993), but elevated cooperativeness and self-transcendence. The profile of state variables for the decision-making group was consistent with a pattern of moderately adaptive set of psychological resources. For example, compared to students in the immotive group, those in the decision-making group made more use of the deep approach to learning and had higher levels of cognitive engagement (consistent with moderately elevated persistence temperament

and moderately coherent character profile). In accordance with prior research linking engagement, study strategies, and SoCs (Grant & Franklin, 2007; Moreira et al., 2018), our findings indirectly imply that students transitioning between precontemplation and action have more adaptive patterns of sociocognitive process than those in precontemplation.

**4.4 The Participation Group**

This group was the most advanced along the change continuum and broadly representative of the action/maintenance. The temperament profile of this group was in direct contrast to that of the immotive group. Specifically, these students tended to have lower novelty seeking, and higher reward dependence and persistence. This combination of traits has been linked to higher adaptive and social functioning (Rettew, Althoff, Dumenci, Ayer, & Hudziak, 2008). Research has shown that individuals with this combination of temperament dimensions also tend to have better mental health (Cloninger & Zohar, 2011). Students in the participation group had higher scores for self-directedness than the immotive and decision-making groups, as well as high cooperativeness, implying that they had superior self-regulatory abilities: such individuals are typically responsible, resourceful, goal-oriented, and empathic.

Consistent with this character profile, students in this group showed a pattern of individual differences that imply adaptive organizations of sociocognitive processes. Firstly, these students had elevated cognitive engagement, similar to the decision-making group, as well as elevated psychological engagement. This finding implies that students' sense of belonging at school is a relevant characteristic for making and sustaining changes to academic performance. A further finding was that students in the participation group had higher wellbeing than the immotive and decision-making groups, and the lowest levels of emotional and behavioral issues. Problems with attention have been considered as an indicator of developmental failures of self-regulation (Althoff et al., 2012), which strengthens the emerging pattern within the results that action/maintenance represent organizations of adaptive higher-order socio-cognitive processes, as well as more adaptive emotionality.

**4.5 The Satisfied Group**

A small group of students did not think their performances were problematic, did not think about seeking help, and were not sustaining any behavioral changes. One explanation for this profile is that these students had strong prior academic performances, and were therefore not involved in change simply because it was unnecessary. Their moderate scores for action may thus reflect automatic behavior in accordance with teacher and family expectations. In accordance with the idea that academic success is linked adaptive sociocognitive processes, students in this group reported the highest self-directedness, highest persistence, fewest attention problems, and a slight preference for a deep approach to learning tasks.

**4.6 Study implications and future research**

The study builds on a small body of research (Grant & Franklin, 2007; Moreira et al., 2018) that suggests the TTM is relevant for understanding academic trajectories, particularly the process of purposeful behavioral change related to improving academic performance. This study indicates that the TTM framework can be a useful psychoeducational tool for; (a) identifying subgroups of students with distinct psychological/behavioral characteristics, including those at risk of moving on negative academic trajectories, (b) informing stage-specific interventions for promoting positive academic trajectories, and positive functioning more generally, and (c) monitoring the effectiveness of such interventions in students over time via an assessment of stage progression.

From these results, we have been able to infer how groups of students in different academic performance SoCs tend to differ for a range of state and trait variables, although naturally our conclusions are inherently limited to the models and frameworks chosen; e.g. the psychobiological model of personality (Cloninger, 2004). Nevertheless, the observed findings are useful for directing future research because from them is possible to generate new testable hypotheses. For example, as a means to expanding the characterization of different types of students, researchers may be interested in examining how students from different academic performance SoCs vary in terms of the "big-five" personality dimensions (Costa & McCrae, 1992). Given that research has indicated that the combination of higher persistence and low

novelty seeking shares some overlap with conscientiousness (de Fruyt, van De Wiele, & van Heeringen, 2000) one testable prediction that follows from our study is that students high in conscientiousness may be more likely to occupy the later stages of change.

**4.7 Study limitations**

It is important to note a number of methodological limitations. First, the study was reliant on student self-report. Having a common data source for all variables can lead to a number of method biases including those arising from raters' desires to be consistent, implicit theories, acquiescence, and social desirability (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). A further limitation was that the sample comprised students from just one secondary school. This calls into question whether our conclusions are generalizable to students of different ages or students from other secondary schools. Although this concern is somewhat allayed by similar patterns of results in university students from a different culture (Grant & Franklin, 2007), the study findings require replication in broader samples of students. Change in academic performance, captured by progression across SoCs, is a longitudinal process. The cross-sectional design used in the present study, therefore, can be considered a limitation to fully understanding this process. Future studies should examine within-student changes in relevant variables as a function of progression across academic performance SoCs over time. Finally, it is important to note that subjects were allocated to latent classes probabilistically, resulting in classification error, meaning that the outcomes of the ANCOVAs are likely to suffer from some bias. Future studies using LCA to extract APSCI profiles should adopt more sophisticated techniques (e.g. latent class modeling with covariates; Vermunt, 2010) to examine how individuals located in different SoCs differ.

**4.8 Conclusions**

The current study builds on an emerging body of work applying the TTM to the process of academic performance. This study is the first to use mixture modelling (LCA) to identify groups of students in distinct academic performance SoCs. Our findings indicate that the TTM is a suitable framework for categorizing and understanding students in terms of the

psychological processes and characteristics related to academic development. Specifically, differences in temperament, character coherence, wellbeing, emotional/behavioral problems, learning approaches, and engagement across stages supported the hypothesis that students in more advanced SoCs are characterized by organizations of more adaptive psychological processes. These findings are important because they support the use of the TTM as a psychoeducational tool for understanding students and informing interventions for promoting positive trajectories and positive development more broadly.

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Table 1.

*Model fit and selection criteria.*

| Model | Log-likelihood | Residual *df* | aBIC | Likelihood-ratio (G$^2$) | Entropy |
|---|---|---|---|---|---|
| Model 1 | -5800.23 | 287 | 11749.72 | 7604.09 | - |
| Model 2 | -5507.62 | 230 | 11316.43 | 7018.87 | .826 |
| Model 3 | -5347.06 | 173 | 11147.25 | 6697.75 | .838 |
| Model 4 | -5224.84 | 116 | 1154.74 | 6453.31 | .883 |
| **Model 5** | **-5121.64** | **59** | **11000.27** | **6246.91** | **.872** |
| Model 6 | -5063.52 | 2 | 11035.97 | 6130.67 | .884 |

*Note.* Boldface indicates selected model. aBIC = sample-size adjusted BIC.

Table 2.

*Mean Z-scores across the groups of students and summary of ANOVA Type III statistics (only main effect of group presented) with Tukey post hoc comparisons.*

| | Group | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Class 1 | Class 2 | Class 3 | Class 4 | Class 5 | | | | |
| | Reluctant (*n* = 44) | Immotive (*n* = 76) | Decision-making (*n* = 96) | Participation (*n* = 85) | Satisfied (*n* = 42) | ANOVA | | | |
| Variable | *M* | *M* | *M* | *M* | *M* | F-value | *p* | $\omega^2$ | Tukey[a] |
| Prior academic performance | -0.15 | -0.01 | -0.19 | 0.06 | 0.49 | 3.83 | .005 | **.033** | 5 > 1, 3 |
| **TCI Personality** | | | | | | | | | |
| *Temperament* | | | | | | | | | |
| Novelty seeking | 0.24 | -0.02 | 0.21 | -0.22 | -0.25 | 3.09 | .016 | **.023** | 3 > 5 |
| Harm avoidance | -0.07 | -0.22 | 0.15 | 0.21 | -0.31 | 2.36 | .053 | **.015** | |
| Reward dependence | -0.44 | 0.00 | 0.04 | 0.16 | 0.04 | 1.40 | .233 | .004 | |
| Persistence | -0.64 | -0.18 | 0.02 | 0.26 | 0.41 | 7.36 | <.001 | **.066** | 3, 4, 5 > 1 5 > 2 |
| *Character* | | | | | | | | | |
| Self-directedness | -0.25 | -0.01 | -0.23 | 0.10 | 0.61 | 6.52 | <.001 | **.060** | 5 > 1, 2, 3, 4 |
| Cooperativeness | -0.54 | -0.18 | 0.14 | 0.24 | 0.07 | 3.57 | .007 | **.027** | 3, 4 > 1 |
| Self-transcendence | -0.16 | -0.01 | 0.10 | -0.05 | 0.05 | 0.57 | .682 | -.005 | |
| **Wellbeing** | | | | | | | | | |
| Quality of Life KIDSCREEN | -0.07 | 0.05 | -0.18 | 0.07 | 0.27 | 1.78 | .132 | .009 | |
| Satisfaction with social support | -0.06 | 0.07 | -0.15 | 0.01 | 0.27 | 1.46 | .213 | .005 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Life Satisfaction | -0.20 | 0.22 | -0.17 | 0.03 | 0.15 | 2.40 | .050 | **.016** | |
| Positive Affect | -0.22 | 0.10 | -0.02 | 0.01 | 0.07 | 1.17 | .326 | .002 | |
| Negative Affect | 0.15 | -0.15 | 0.20 | -0.11 | -0.12 | 2.00 | .094 | **.012** | |
| Composite non-affective wellbeing | -0.14 | 0.15 | -0.20 | 0.04 | 0.27 | 2.45 | .046 | **.017** | |
| Composite affective wellbeing | -0.23 | 0.15 | -0.13 | 0.08 | 0.11 | 1.74 | .141 | .009 | |
| **Problems** | | | | | | | | | |
| Anxious/depressed | 0.02 | -0.20 | 0.22 | -0.03 | -0.10 | 1.93 | .105 | **.011** | |
| Withdrawn | 0.18 | -0.18 | 0.05 | -0.01 | 0.04 | 1.02 | .399 | .000 | |
| Somatic Complaints | 0.00 | -0.20 | 0.26 | -0.12 | 0.02 | 2.87 | .023 | **.021** | 3 > 2, 4 |
| Social Problems | 0.19 | -0.05 | 0.11 | -0.18 | -0.01 | 1.13 | .341 | .002 | |
| Thought Problems | 0.06 | -0.06 | 0.13 | -0.16 | 0.07 | 0.89 | .472 | -.001 | |
| Attention Problems | 0.43 | -0.13 | 0.20 | -0.14 | -0.39 | 5.32 | <.001 | **.048** | 5 < 1, 3 |
| Delinquent Behaviour | 0.28 | -0.02 | 0.08 | -0.23 | 0.01 | 1.38 | .239 | .004 | |
| Aggressive Behaviour | 0.30 | -0.12 | 0.15 | -0.23 | 0.02 | 2.59 | .037 | **.018** | |
| Positive Qualities | -0.47 | -0.12 | 0.11 | 0.12 | 0.22 | 4.32 | .002 | **.037** | 1 < 3, 4, 5 |
| **Approaches to learning** | | | | | | | | | |
| Deep Approach | -0.62 | -0.05 | 0.14 | 0.07 | 0.29 | 5.02 | <.001 | **.044** | 1 < 2, 3, 4, 5 |
| Surface Approach | -0.54 | 0.06 | 0.12 | -0.01 | 0.20 | 6.63 | <.001 | **.059** | 1 < 2, 3, 4, 5 |
| Preference ratio | -0.02 | -0.02 | -0.02 | 0.03 | 0.04 | 0.51 | .728 | -.005 | |
| **Student engagement** | | | | | | | | | |
| Cognitive | -0.76 | -0.06 | 0.16 | 0.19 | 0.14 | 7.39 | <.001 | **.068** | 1 < 2, 3, 4, 5 |
| Psychological | -0.58 | 0.11 | -0.04 | 0.16 | 0.17 | 5.03 | <.001 | **.045** | 1 < 2, 3, 4, 5 |

*Note.* $\omega^2$ values in bold face are those indicating a small effect size ($\omega^2$ = .01 - .06). [a]Reported numbers correspond to class numbers.
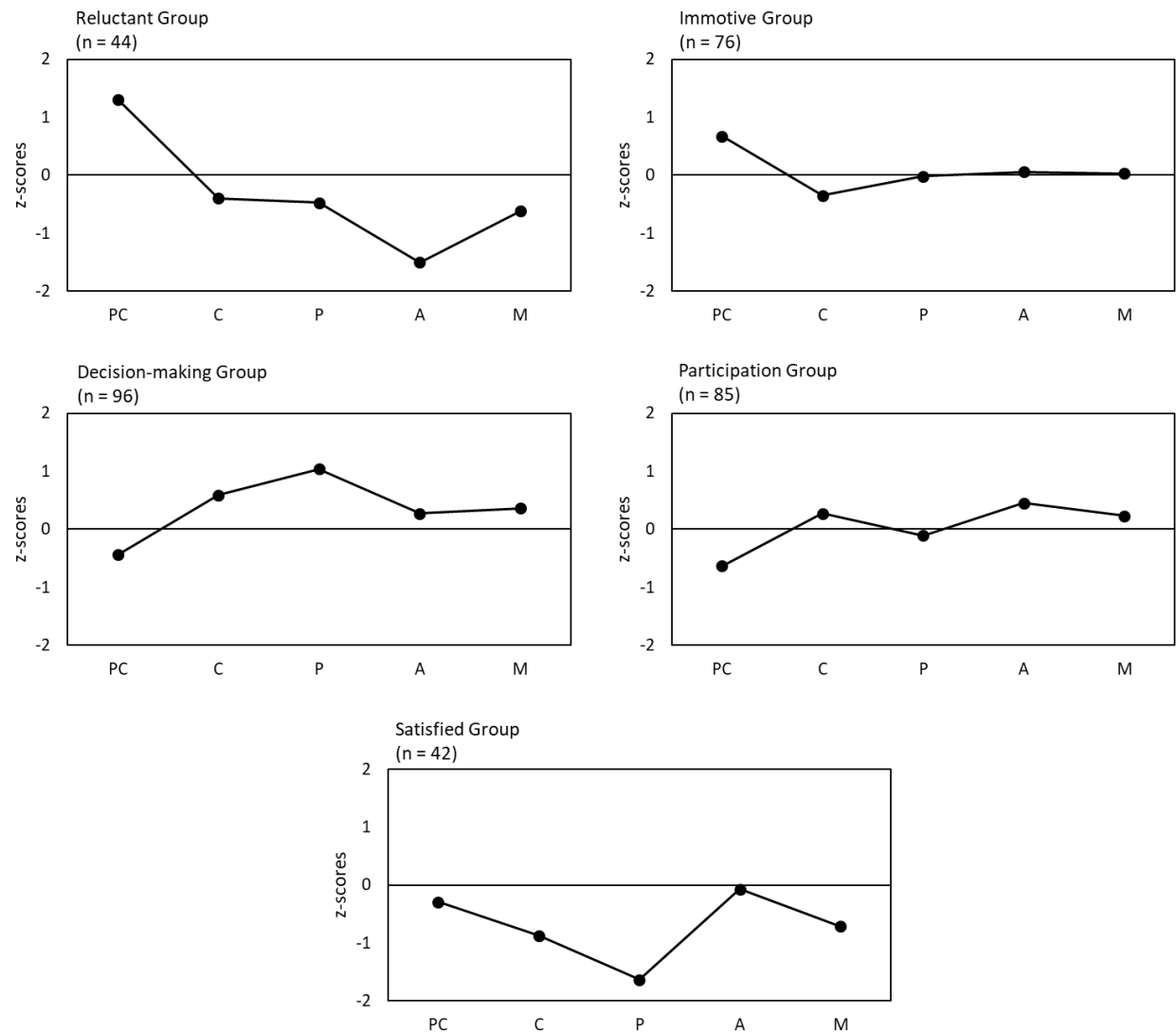
*Figure 1.* APSCI subscale z-scores for the five stage-of-change student classes. PC = Precontemplation subscale; C = Contemplation subscale; P = Preparation subscale; A = Action subscale; M = Maintenance subscale.

Supplementary Table 1.

*Zero-order correlations between study variables.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Academic Performance | | | | | | | | | | | | | | | | | | | |
| 2 Precontemplation | -.07 | | | | | | | | | | | | | | | | | | |
| 3 Contemplation | **-.27** | **-.24** | | | | | | | | | | | | | | | | | |
| 4 Preparation | -.18 | -.13 | **.43** | | | | | | | | | | | | | | | | |
| 5 Action | .03 | **-.42** | **.21** | **.22** | | | | | | | | | | | | | | | |
| 6 Maintenance | -.07 | -.17 | **.28** | **.34** | **.31** | | | | | | | | | | | | | | |
| 7 Deep Approach | **.32** | **-.26** | -.05 | .01 | **.36** | .07 | | | | | | | | | | | | | |
| 8 Surface Approach | .03 | -.14 | .10 | .09 | .07 | .07 | .19 | | | | | | | | | | | | |
| 9 Preference Ratio | **.25** | -.05 | -.15 | -.08 | .19 | .00 | **.60** | **-.62** | | | | | | | | | | | |
| 10 Cognitive Eng. | .15 | **-.32** | .05 | .08 | **.32** | .14 | **.39** | **.30** | .05 | | | | | | | | | | |
| 11 Psychological Eng. | .15 | **-.20** | -.01 | .00 | **.26** | .04 | **.37** | .19 | .14 | **.57** | | | | | | | | | |
| 12 Novelty seeking | -.10 | .13 | .19 | .11 | **-.21** | .04 | -.19 | .14 | **-.25** | -.19 | -.16 | | | | | | | | |
| 13 Harm avoidance | .06 | -.13 | .06 | .12 | .12 | **.20** | .07 | -.07 | .09 | -.01 | -.17 | -.09 | | | | | | | |
| 14 Reward dependence | .09 | -.18 | .01 | .08 | .17 | .06 | .08 | .05 | .00 | **.27** | **.23** | **-.26** | .04 | | | | | | |
| 15 Persistence | **.24** | **-.33** | -.07 | .00 | **.37** | -.04 | **.48** | .02 | **.32** | **.31** | **.20** | **-.48** | .01 | **.30** | | | | | |
| 16 Self directedness | .17 | -.12 | -.16 | **-.21** | .08 | -.17 | .15 | -.08 | .19 | **.23** | **.25** | **-.41** | **-.44** | **.32** | **.50** | | | | |
| 17 Cooperativeness | .00 | **-.23** | .12 | .14 | **.26** | .08 | .11 | -.10 | .17 | .19 | .18 | **-.45** | .00 | **.48** | **.45** | **.45** | | | |
| 18 Self transcendence | -.14 | -.06 | **.22** | .12 | .12 | .17 | .07 | .01 | .05 | .13 | .00 | -.02 | .09 | .04 | .03 | -.02 | .23 | | |
| 19 Anxious/depressed | .03 | -.09 | .12 | .11 | .02 | .12 | .09 | .14 | -.02 | -.02 | -.20 | .18 | **.44** | -.07 | -.06 | **-.35** | .00 | **.21** | |
| 20 Withdrawn/depressed | -.02 | .00 | .02 | -.04 | -.08 | .06 | .14 | .07 | .05 | -.03 | -.17 | .13 | **.37** | **-.32** | -.15 | **-.38** | **-.20** | .10 | **.56** |
| 21 Somatic complaints | .04 | -.03 | .08 | .08 | -.05 | .13 | .13 | .16 | -.01 | .02 | -.11 | .18 | **.35** | -.07 | -.06 | **-.30** | -.10 | .11 | **.64** |
| 22 Social probs. | -.03 | .05 | .05 | .04 | -.13 | .04 | .05 | .19 | -.10 | -.06 | -.19 | **.26** | **.21** | **-.20** | **-.21** | **-.40** | **-.26** | .13 | **.62** |
| 23 Thought probs. | .00 | .03 | .07 | .02 | -.12 | .09 | .10 | .18 | -.04 | .01 | -.08 | **.33** | .18 | **-.23** | **-.24** | **-.34** | **-.20** | .15 | **.57** |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24 Attention probs. | **-.22** | .08 | **.22** | .13 | **-.22** | .09 | **-.23** | .06 | **-.20** | -.18 | **-.21** | **.46** | .03 | **-.22** | **-.51** | **-.43** | -.18 | .19 | **.44** |
| 25 Delinquency | -.15 | .14 | .08 | .03 | -.19 | -.01 | -.05 | **.21** | **-.20** | -.08 | -.02 | **.37** | -.06 | **-.23** | **-.24** | **-.26** | **-.30** | .06 | **.36** |
| 26 Aggressive behaviours | -.08 | .09 | .10 | -.01 | -.17 | .09 | -.01 | **.22** | -.17 | -.06 | -.17 | **.45** | .07 | **-.24** | **-.28** | **-.34** | **-.32** | .17 | **.55** |
| 27 Positive qualities | .00 | -.14 | .14 | .05 | .11 | .07 | .08 | .05 | .02 | .10 | .08 | -.07 | **-.22** | **.25** | **.20** | **.33** | **.37** | .10 | -.01 |
| 28 Life Satisfaction | .06 | -.09 | -.12 | -.06 | .10 | -.11 | .13 | .11 | .03 | **.22** | **.47** | -.10 | **-.33** | **.20** | .14 | **.28** | .05 | -.16 | **-.30** |
| 29 Satisfaction with social support | -.08 | -.06 | -.04 | -.07 | .02 | -.06 | -.03 | .02 | -.04 | **.20** | **.35** | -.09 | **-.28** | .13 | .14 | **.29** | .11 | -.02 | **-.27** |
| 20 Quality of Life | -.03 | -.05 | -.12 | -.12 | .04 | -.14 | .11 | .11 | -.02 | **.22** | **.37** | -.13 | **-.34** | .06 | .14 | **.27** | .07 | -.14 | **-.28** |
| 21 Non-affective wellbeing | -.01 | -.08 | -.11 | -.10 | .06 | -.12 | .09 | .10 | -.01 | **.26** | **.48** | -.13 | **-.38** | .16 | .17 | **.34** | .09 | -.13 | **-.35** |
| 22 Positive emotions | -.05 | -.11 | -.04 | .00 | .10 | .02 | .11 | .12 | -.01 | **.23** | **.36** | -.03 | **-.31** | .11 | .12 | .17 | .10 | .00 | **-.20** |
| 23 Negative emotions | .08 | .06 | .07 | .12 | -.08 | .11 | -.03 | .06 | -.09 | -.06 | **-.26** | **.24** | **.26** | -.09 | -.18 | **-.27** | -.09 | .15 | **.39** |
| 24 Affective wellbeing | -.07 | -.10 | -.06 | -.07 | .11 | -.06 | .08 | .03 | .04 | .18 | **.38** | -.16 | **-.34** | .12 | .18 | **.27** | .12 | -.09 | **-.36** |

Note. Values in bold face have effect size of $r \geq |.20|$.

Supplementary Table 1 Cont.

| | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 Withdrawn/depressed | | | | | | | | | | | | | | | |
| 21 Somatic complaints | **.53** | | | | | | | | | | | | | | |
| 22 Social probs. | **.63** | **.54** | | | | | | | | | | | | | |
| 23 Thought probs. | **.56** | **.57** | **.63** | | | | | | | | | | | | |
| 24 Attention probs. | **.39** | **.38** | **.56** | **.55** | | | | | | | | | | | |
| 25 Delinquency | **.42** | **.44** | **.60** | **.59** | **.51** | | | | | | | | | | |
| 26 Aggressive behaviours | **.50** | **.52** | **.69** | **.69** | **.63** | **.74** | | | | | | | | | |
| 27 Positive qualities | -.13 | -.05 | -.16 | -.03 | -.07 | -.09 | -.04 | | | | | | | | |
| 28 Life Satisfaction | **-.30** | -.15 | **-.25** | **-.22** | **-.25** | -.01 | **-.20** | .05 | | | | | | | |
| 29 Satisfaction with social support | **-.35** | **-.24** | **-.25** | **-.24** | -.17 | -.01 | -.19 | .09 | **.48** | | | | | | |
| 20 Quality of Life | **-.29** | **-.24** | **-.22** | -.17 | -.15 | .00 | -.14 | .06 | **.60** | **.54** | | | | | |
| 21 Non-affective wellbeing | **-.38** | **-.25** | **-.29** | **-.25** | **-.23** | -.01 | **-.21** | .08 | **.85** | **.81** | **.84** | | | | |
| 22 Positive emotions | **-.26** | -.19 | -.16 | -.09 | -.05 | .06 | -.03 | .11 | **.57** | **.45** | **.68** | **.67** | | | |
| 23 Negative emotions | **.34** | **.29** | **.38** | **.35** | **.29** | .16 | **.35** | -.06 | **-.44** | **-.46** | **-.54** | **-.57** | **-.36** | | |
| 24 Affective wellbeing | **-.36** | **-.29** | **-.33** | **-.26** | **-.21** | -.06 | **-.23** | .10 | **.61** | **.55** | **.74** | **.75** | **.83** | **-.82** | |

Note. Values in bold face have effect size of $r > |.20|$.