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**Young Adolescent Psychological Need Profiles: Associations with Classroom Achievement
and Well-Being**

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PUPIL PSYCHOLOGICAL NEED PROFILES

Abstract

Drawing on self-determination theory, a person-centred methodology was adopted to identify distinct pupil profiles based on their psychological need satisfaction. A sample of 586 pupils (387 male, 199 female; mean age = 12.6, range 11-15 years old) from three secondary schools reported their psychological need satisfaction, and well and ill-being, with teachers rating pupil achievement. Hierarchical cluster analysis revealed five distinct profiles. Four profiles indicated synergy existed between the three needs, showing similar in-group levels of satisfaction across the needs but in varying amounts. Univariate and multivariate analyses, controlling for school and taught subject, revealed the satisfied group displayed the highest classroom performance ($F_{4, 540} = 7.03, p < .001, \eta_p^2 = .05$), well-being ($F_{8, 1136} = 45.63, p < .001$, Wilk's $\Lambda = 0.57, \eta_p^2 = .24$) and lowest ill-being ($F_{8, 1134} = 23.39, p < .001$; Wilk's $\Lambda = 0.74, \eta_p^2 = .14$), whereas the dissatisfied group displayed the most averse outcomes. The findings illustrate that the three psychological needs may operate interdependently and should be considered in combination rather than in isolation. The research offers practical insights into why pupils may function differently in classrooms and could inform targeted initiatives towards pupils with psychological need satisfaction deficits.

PUPIL PSYCHOLOGICAL NEED PROFILES

Introduction

Young adolescent pupils' functioning and performance at school typically derives from a combination of simultaneous, rather than isolated, personal experiences (e.g. Fall & Roberts, 2012; Wang & Holcombe, 2010). These experiences are often not directly observable, and thus it can be a challenging task for teachers to identify specific reasons why certain groups of pupils may be thriving or struggling in the classroom. For example, some pupils may feel competent at their classwork but unsupported or pressured by others in the classroom; whereas other pupils may develop close bonds with others but feel incapable of completing classwork. The academic and emotional outcomes associated with these contrasting psychological experiences may be distinctly different and warrant specific teaching support strategies. Adopting a holistic view of pupils' collective classroom experiences may offer educators a deeper understanding of why certain pupils may thrive more than others and help inform targeted ways to nurture positive classroom experiences for different pupil groups. Using self-determination theory (SDT; Ryan & Deci, 2017) as a theoretical foundation for the present research, a profiling analytical approach is sought to investigate commonalities and differences in pupils' simultaneous psychological classroom experiences, and to explore how these may impact their academic achievement and psychological health.

Self-Determination Theory in Education

SDT is a motivational theory of human behaviour and has received extensive consideration for its application within schools (e.g. Guay, Ratelle, Roy, & Litalien, 2010). Specifically SDT conceptualises how individuals perceive themselves within a social context through the satisfaction of the basic psychological needs of autonomy, competence, and relatedness, which are posited to be fundamental for optimal psychological growth and flourishing (Deci & Ryan, 2011; 2017). Autonomy is characterised as the experience of

PUPIL PSYCHOLOGICAL NEED PROFILES

volition and psychological freedom so that behaviour is perceived to emanate from oneself (deCharms, 1968). Competence reflects the feeling of being effective in achieving one's desired pursuits and goals (White, 1959). Relatedness refers to the need to form close, interpersonal relationships and feel connected with significant others (Baumeister & Leary, 1995). Positive associations have been well-established between the satisfaction of pupils' psychological needs and indicators of academic, emotional, and social development in cross sectional (e.g. Marshik, Ashton, & Algina, 2017; Saeki & Quirk, 2015; Taylor & Lonsdale, 2010), semester long (e.g. Tian, Chen, & Huebner, 2014; Véronneau, Koestner, & Abela, 2005) and multiple year studies (e.g. Ratelle & Duchesne, 2014). These academic and socio-cognitive benefits have also been demonstrated across different taught school subjects (Erturan-İlker, Quested, Appleton, & Duda, 2018). On the contrary, a frustration of these psychological needs has been associated with pupil feelings of ill-being, classroom disengagement and lower academic attainment (e.g. Chen et al, 2015; Earl, Taylor, Meijen, & Passfield, 2017; Jang, Kim, & Reeve, 2016). Consequently, young adolescents' psychological need satisfaction seems a valuable resource for educators to consider and foster in their teaching practice (Niemic & Ryan, 2009).

Despite the acclaim for psychological need satisfaction being well-founded within young adolescent education, the emergence of this evidence has predominately been derived from variable-centred research. That is, these approaches assume that the three psychological needs function distinctly rather than interactively and simultaneously with one another (Bergman & Magnusson, 1997). For example, when assessed separately, the satisfaction of each need was found to have differential relations with outcomes such as academic attainment, engagement, well-being, and social adjustment (e.g. Duchesne, Ratelle, & Feng, 2017; Jang, Reeve, Ryan, & Kim, 2009). Furthermore, averaging the three needs together into composite variable has been positively correlated with better school grades, engagement,

PUPIL PSYCHOLOGICAL NEED PROFILES

and quality motivation (e.g. Badri, Amani-Saribaglou, Ahrari, Jahadi, & Mahmoudi, 2014; Ntoumanis, 2005; Saeki & Quirk, 2015). Although each psychological need may have distinct correlates, such variable-centred approaches fail to account for the practical interplay between the three needs when pupils actually experience them in the classroom (Ryan & Deci, 2017). It is unlikely that pupils will experience satisfaction of one need in complete isolation from another. Examining satisfaction of the three needs collectively may unearth new knowledge about how the three needs function in unison and how teachers can better support pupils' satisfaction of all three needs in an applied classroom.

Much debate has arisen regarding the connectivity between the three psychological needs. Implicit motivation theorists portray the three needs as distinct from one another as the experience and benefit of each need will be dependent on a person valuing the need in a specific context (e.g., Hofer & Busch, 2011; Hofer, Busch & Kiessling, 2008). Conversely, cultural relativist perspectives espouse a view of autonomy and relatedness as conflicting, rather than being experienced in harmony (e.g., Iyengar & DeVoe, 2003; Markus & Kitayama, 1991)¹. SDT theorists, however, infer the three needs may operate interdependently as the satisfaction of one psychological need will potentially facilitate the satisfaction of the other two (Ryan & Deci, 2017). Indeed, strong and positive correlations have been consistently demonstrated between the three pairs of psychological needs (e.g., Tian et al., 2014), and the benefits of psychological need satisfaction have been evidenced irrespective of an individual's culture or desired value for a specific psychological need

¹ It should be noted that these cultural relativist standpoints define autonomy as reflecting individualism and independence from others as opposed to the experience of personal agency and volition posited by SDT (Ryan & Powelson, 1991). As such, cultural relativist and SDT perspectives may be tapping into conceptually different notions when referring to autonomy. In accord with SDT propositions, the experience of autonomy and relatedness are posited to be mutually complementary and ill effects will occur when they are turned against each other, in instances such as conditional regard (see relationships motivation theory; Ryan & Deci, 2017).

PUPIL PSYCHOLOGICAL NEED PROFILES

(Chen et al., 2015; Erturan-İlker et al., 2018). Previous findings have also illustrated that the equal and balanced satisfaction of all three needs may have greater positive connotations for university students' well-being compared to having greater amounts of satisfaction in specific needs (Sheldon & Niemiec, 2006). Even though these studies boost SDT's proposition that the three needs may operate in unison, they did not explicitly assess the interplay between the three needs. Thus, it is still unclear how the satisfaction of each need may interact with the satisfaction of the other two.

There are two distinct benefits of adopting a person-centred approach to examine pupils as individuals, rather than in relation to isolated psychological need variables. Firstly, such an analysis would be well-suited to advance SDT's theoretical framework as it would allow the proposed synergy, or lack of, between the three needs to be empirically scrutinised (Ryan & Deci, 2017). These complex interactions would be hard to trace using a variable-centred approach. Exploring the dynamics between the psychological needs may highlight the extent it is possible for pupils to thrive in the classroom through the satisfaction of one need alone or if the needs operate in a reciprocal manner. It would seem unlikely that pupils will experience a sense of volition towards classwork (i.e. autonomy satisfaction) if they, at the same time, feel they are unable to complete the classwork (i.e. lack of competence satisfaction). Likewise, pupils may struggle to develop close connections with others in class (i.e. relatedness satisfaction) if they feel self-endorsed behaviour is repressed (i.e. lack of autonomy satisfaction). This knowledge would facilitate the second strength of a person-centred approach as it may offer valuable applied knowledge that could benefit educators in their classroom teaching. Specifically, this approach will allow sub-groups of pupils to be identified that show diverse patterns in psychological need satisfaction, as well as enabling how these groups function academically and psychologically in classrooms to be explored (Bergman, & Andersson, 2010; Scholte, van Lieshout, & van Aken, 2001). From an ideal

PUPIL PSYCHOLOGICAL NEED PROFILES

perspective, pupils' academic and emotional development should not come at the expense of one another. Understanding how the satisfaction, or potential frustration, of each psychological need may influence the experience of the other two needs may equip teachers with new knowledge in how to maximise pupils' psychological need satisfaction. This may have particular relevance within school classrooms given the influence that the learning context can have on the satisfaction of all three needs simultaneously (e.g. Cheon, Reeve, Moon, 2012; Curran & Standage, 2017).

The use of person-centred research has grown within education as a valuable method, with pupils being previously profiled based on learning styles (Liu, Wang, Kee, Koh, Lim, & Chua, 2014), perceptions of fitting in and standing out at school (Gray, 2017), and distinctions of motivational regulations (e.g. SDT or achievement goals; Ratelle, Guay, Vallerand, Larose, & Senécal, 2007; Vansteenkiste, Sierens, Soenens, Luyckx, & Lens, 2009). These findings show that self-determined pupil groups demonstrate more favourable academic and well-being outcomes. Clustering pupils based on their perceptions of the learning context has illustrated that pupil groups high in autonomy and relatedness support reported more enjoyment in class (Jaakkola, Wang, Soini, & Liukkonen, 2015), whereas pupils high in perceptions of autonomy and competence support displayed more effective time management and concentration at school (Vansteenkiste et al., 2012). Two further studies have profiled pupils based on inter-individual differences in the source of their psychological need satisfaction (Raufelder, Regner, Drury, & Eid, 2015), or relatedness satisfaction (León & Liew, 2017). These studies indicated that when pupil groups relied on psychological need support from their peers and teachers concurrently, rather than solely peers or teachers, they reported higher behavioural and emotional engagement. Yet despite the central role that the three psychological needs are hypothesised to play in pupils' scholastic and psychological functioning, no study to date has examined profiles of

PUPIL PSYCHOLOGICAL NEED PROFILES

adolescent pupils based on their subjective experience of all three needs (Niemic & Ryan, 2009).

The Present Research

As a consequence of the aforementioned evidence, the present work employs a cluster-analytical approach to identify distinct pupil psychological need satisfaction profiles. Developing a greater understanding of the degree of synergy that may exist between the psychological needs may provide further understanding of how the three needs function in unison (Ryan & Deci, 2017). This may be particularly important during young adolescence when the experience of psychological need satisfaction has been posited to be integral for the development of pupils' emotional and psychosocial capacities (Hansen & Jessop, 2017). Complete synergy will be demonstrated if sub-groups of pupils simply report high, medium, and low satisfaction of all the three needs. Specifically, we hypothesise that the highest satisfaction for each psychological need will occur in one specific group of pupils whereas the lowest satisfaction of each need will be reported within a different group. Subsequently we expect a third group will emerge that displays moderate levels of satisfaction across the three psychological needs. In contrast, less synergy will be observed if the profiles are more complex with pupils reporting different levels of satisfaction across each psychological need. No evidence exists to inform hypotheses relating to what these groups might be characterised by but emergence of such groups may lead to new theoretical and practical discussion.

The second aim of the study was to investigate if the pupils in the identified profiles differed in teacher ratings of classroom achievement, as well as the self-reported outcomes of well-being (vitality and positive affect) and ill-being (academic stress and negative affect). In line with SDT propositions (Ryan & Niemic, 2009), a pupil group displaying the highest satisfaction levels across the three needs is expected to demonstrate the most adaptive levels of teacher perceived achievement and self-reported well-being, as well as the lowest levels of

PUPIL PSYCHOLOGICAL NEED PROFILES

ill-being. Conversely, a pupil group reporting the least satisfaction across the three needs will be expected to demonstrate the highest ill-being, and lowest levels in the favourable outcomes. A group showing moderate levels of need satisfaction is hypothesised to show moderate levels in the three outcome variables. It is reasoned that any groups that are relatively high in the satisfaction of one psychological need may be able to compensate for deficits in other psychological needs and may display moderate, but not optimal, levels of classroom achievement and well-being.

Method

Participants

The study sample consisted of 586 pupils (387 male, 199 female; mean age = 12.61 years, $SD = 0.88$ years, age range = 11 – 15 years old) from three secondary schools (two co-educational, and one boys school) in the United Kingdom (UK). Each school was selective in their admission of pupils. Information on individual pupils' ethnicity and special educational needs (SEN) was not available. The three schools ranged between 16% - 21% of their total pupils that were considered from ethnic minority backgrounds which is below the UK national average (Drake, 2015). Fifteen teachers completed the ratings for the pupils' performance in their class.

Procedure

Full ethical approval was obtained from the principal researcher's university ethics committee. Once head teachers had permitted the research in their school, teachers were recruited purposively based on them being the regular teacher of a Year 7, 8 or 9 class ($N=24$ classrooms). Data collection was conducted in the final term of the academic year to ensure teachers had taught the pupils in that class for at least one academic year. Teachers provided written consent to participate and opt-out forms were provided to all pupils' parents to indicate if they did not wish for their child to participate. Three parents chose for their child

PUPIL PSYCHOLOGICAL NEED PROFILES

not to participate in the study. Pupils confirmed their willingness to participate in writing. Questionnaires were administered at the start of a school lesson by the principal researcher. Pupils with SEN status, or where English was an additional language, could have a teaching assistant on-hand to help with comprehension and clarification of any wording. All pupils were instructed that they did not have to complete the questionnaire if they did not wish to and that all items referred to the specific lesson in which the questionnaire was administered. The pupil questionnaire took approximately ten minutes to complete. The main classroom teacher remained a passive observer in the classroom and pupils were asked to direct any questions regarding the study to the principal researcher to ensure confidentiality. The taught subject varied between classes with 38% of pupils completing the questionnaire in physical education, 33% in creative Learning, 21% in citizenship lessons, and 8% in geography. In traditional UK secondary school systems, teachers train in a specialist subject and typically only teach pupils in that subject. The teacher-rated pupil achievement questionnaire was provided to teachers at the end of the school lesson and was completed in regards to the pupils within the specific class. These were returned to the principal researcher within a week of being administered.

Measures

Autonomy Satisfaction

Autonomy satisfaction was measured using six items (e.g. “I have a say regarding what skills I want to learn”) derived from previous research with young adolescents (Standage, Duda, & Ntoumanis, 2005). The stem used was, “When in this class . . .”, and responses were rated on a 7 point scale, ranging from 1 (not at all true) to 7 (very true). These six items have previously demonstrated acceptable internal consistency ($\alpha = .80$; Standage et al., 2005) which was replicated in the present study ($\alpha = .71$).

Competence Satisfaction

PUPIL PSYCHOLOGICAL NEED PROFILES

Competence satisfaction was measured using five items (e.g. “I think I am pretty good at activities in this class”) from the Perceived Competence subscale of the Intrinsic Motivation Inventory (McCauley, Duncan, & Tammen, 1989). Items were adapted to the broader classroom context, rather than a specific task. For example, “I am satisfied with my performance at this task” was modified to “I am satisfied with my performance in this class”. These five items have previously been used to assess young adolescent pupils’ competence satisfaction when adapted to a school subject and classroom context (e.g. Standage, Duda, & Ntoumanis, 2003; Taylor, Ntoumanis, Standage, & Spray, 2010). In both instances, internal consistency for the 5 items was shown to demonstrate good reliability ($\alpha = .85 - .87$). Responses were rated on a 7 point scale, ranging from 1 (not at all true) to 7 (very true) and scores demonstrated good internal consistency in the present work ($\alpha = .86$).

Relatedness Satisfaction

Relatedness satisfaction was measured using the five item Acceptance subscale of the Need for Relatedness Scale (Richer & Vallerand, 1998). The stem “When in this class I feel . . .” was followed by the items (e.g. “listened to”, “understood”, “supported,”). Responses were rated on a 7 point scale, ranging from 1 (not at all true) to 7 (very true). In accord with previous work ($\alpha = .85-.94$; Richer & Vallerand, 1998), these items demonstrated good internal consistency in the present study ($\alpha = .90$).

Teacher-Rated Achievement

Guided by previous measures of pupil achievement (Pianta & Stuhlman, 2004; Rabiner, Murray, Schmid, & Malone, 2004), two items were designed for the purpose of this study: “Compared to the average student, this student performs well in this class” (item 1) and “This student achieves a high academic level in this class” (item 2). Teachers rated each pupil in their specific class on both items. We used teacher perceptions of pupils’ achievement in class due to the unavailability of actual school grades. Although less objective

PUPIL PSYCHOLOGICAL NEED PROFILES

than school grades, teacher perceived pupil achievement has been shown to be fairly accurate in predicting actual pupil performance (Sudkamp, Kaiser, & Moller, 2012; Zhu & Urhahne, 2015). Both items were designed to reflect teachers' general perceptions of pupils' overall attainment in class, and were checked by teachers not participating in the study for clarity and comprehension. Each item was rated on a 6 point scale ranging from 1 (never) to 6 (always) and scored by averaging both items to create a composite achievement variable. Scores demonstrated acceptable internal consistency ($\alpha = .83$) and factor loadings for an achievement factor (item 1 = .86; item 2 = .83).

Subjective Vitality

Pupils' feelings of aliveness in the class and energy available to the self were measured using a five item version of the Subjective Vitality Scale (Ryan & Frederick, 1997), previously used by Bartholomew, Ntoumanis, Ryan, Bosch, and Thøgersen-Ntoumani (2011). Items were rated on a 7 point scale, ranging from 1 (strongly disagree) to 7 (strongly agree). Example items include "I have energy and spirit" and "I nearly always feel alert and awake". Scores from the items demonstrated good factorial structure and internal consistency in both previous ($\alpha = .92$; Ryan & Frederick, 1997) and the present work ($\alpha = .79$).

Academic Stress

To measure pupils' feelings of stress in class we used the shortened four item Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983) and adapted the stem to "When in this class...". Example items included "Do you feel that things are going your way" and "How often do you feel difficulties are piling up so high that you cannot overcome them". Items were rated on a 5 point scale, ranging from 1 (never) to 5 (very often). This four item scale previously demonstrated acceptable internal consistency ($\alpha = .86$) and scale validity (Cohen et al., 1983). In the present study, initial internal consistency for these items was found to be below conventional levels of acceptability ($\alpha = .58$). Evaluation of removing each

PUPIL PSYCHOLOGICAL NEED PROFILES

item and a supplementary confirmatory factor analysis revealed one problematic item (“In this class, do you feel that you are unable to control the important things”), which was removed and improved internal consistency ($\alpha = .64$).

Positive and Negative Affect

Pupils’ general positive and negative feelings in class were measured using the 10 item short form of the Positive and Negative Affect Schedule (PANAS; Thompson, 2007). Both positive affect (e.g. ‘alert’ and ‘inspired’) and negative affect (e.g. ‘upset’ and ‘ashamed’) had five items. The questionnaire stem used was “Thinking about yourself and how you normally feel in this class, to what extent do you generally feel”, and pupils rated how often they experienced each feeling on a 5 point scale, ranging from 1 (never) to 5 (often). The short version of the PANAS has demonstrated good factorial validity and internal consistency in previous work (positive affect: $\alpha = .74$; negative affect: $\alpha = .80$; Thompson, 2007), as well as the present work (positive affect: $\alpha = .76$; negative affect: $\alpha = .71$).

Statistical Approach

Preliminary analysis involved calculation of descriptive statistics and bivariate correlations (see Table 1). Prior to group clustering, univariate (z-score values ± 3.29 , $p < 0.001$; Tabachnick & Fidell, 2001) and multivariate (high Mahalanobis values) outliers were removed. As there was not an *a priori* hypothesised number of clusters, a combination of both hierarchical and non-hierarchical cluster analysis was conducted (Gore, 2000), using SPSS statistical software (version 22.0). Based upon pupils’ scores for autonomy, competence, and relatedness satisfaction, Ward’s method was used to conduct hierarchical cluster analysis. The optimal number of clusters was determined when the squared Euclidian distances were not substantially distinguishable (Hair, Anderson, Tatham, & Black, 1998). Subsequently, iterative non-hierarchical k-means clustering assigned pupils to a relevant

PUPIL PSYCHOLOGICAL NEED PROFILES

cluster, using the determined number of clusters from the first step as a non-random clustering solution (Gore, 2000). Given the over-representation of males in our sample, as well as variation in age, individual school, co-educational or male only schooling, and classroom subject, we conducted chi-square difference tests to examine the distribution of these variables across the identified pupil clusters. Statistically significant chi-square differences resulted in the respective variable being controlled for in all subsequent analyses. Univariate analysis of covariance (ANCOVA) and post-hoc comparisons were conducted to explore group differences in teacher-rated pupil achievement. Multivariate analyses of covariance (MANCOVA) tests were used to explore the differences across the pupil groups in the composite well-being and ill-being outcomes. Vitality and positive affect were entered as outcome variables in a 'well-being' MANCOVA, whereas academic stress and negative affect were entered in an 'ill-being' MANCOVA. Significant multivariate effects were followed up with discriminant function analysis, rather than univariate ANOVA, to allow for the relationships between the dependent variables to be considered (Field, 2013).

Results

Descriptive Statistics

Means, standard deviations, and bivariate correlations for all measurement scales are presented in Table 1.

INSERT TABLE 1 HERE

Identification of Pupil Psychological Need Satisfaction Profiles

Prior to conducting cluster analysis, 6 univariate and 5 multivariate outliers were removed. Inspection of the Euclidian distances (shown in Table 2) determined five distinguishable pupil groups, explaining 53.7% of variance in autonomy satisfaction, 62.0% of variance in competence satisfaction, and 70.7% of variance in relatedness satisfaction. A three-cluster solution was found to reduce the explained variance for each need (autonomy =

PUPIL PSYCHOLOGICAL NEED PROFILES

37.8%; competence = 53.4%; relatedness = 59.1%), as did a four-cluster solution with the exception of competence (autonomy = 49.1%; competence = 63.0%; relatedness = 60.0%). A six-solution appeared less parsimonious than the five cluster solution and did not show substantial improvement in explained variance across the three needs (autonomy = 53.9%; competence = 67.9%; relatedness = 73.5%).

INSERT TABLE 2 HERE

Table 3 depicts group comparisons across the five cluster solution based on mean scores for each psychological need grouping variable (see Figure 1 for graphical representation). This five cluster solution consisted of a *satisfied* group ($n = 86$, 15%), comprising of pupils reporting the highest levels of satisfaction in each of the psychological needs. A *competent* group ($n = 131$, 23%) characterised by pupils high in competence satisfaction, but with relatively low autonomy satisfaction and moderate relatedness satisfaction. A *moderate* group ($n = 149$, 26%) comprised of pupils with moderate levels of satisfaction in each psychological need above or approximate to the mid-point of the scale. A *low* group ($n = 96$, 16%) emerged reporting relatively low levels of satisfaction across all three needs which were below or approximate to the mid-point of the scale. Finally, a *dissatisfied* group ($n = 115$, 20%) was characterised by pupils that reported the lowest levels of satisfaction for each need.

Across the five pupil groups, chi-squared difference tests revealed there were no significant differences in the gender distribution, $\chi^2(4, n = 575) = 7.83, p = .10$, or age distribution, $\chi^2(16, n = 575) = 22.83, p = .12$. In contrast, significant effects across the five clusters were found by individual school, $\chi^2(8, n = 577) = 17.54, p = .03$; by type of school (i.e. co-educational versus male only), $\chi^2(4, n = 577) = 11.57, p = .02$; and by class subject, $\chi^2(12, n = 577) = 26.31, p = .01$. Only 10% of students from the exclusively male school were categorised in the dissatisfied group compared to 22% from the co-educational

PUPIL PSYCHOLOGICAL NEED PROFILES

institutes. Thirty-five percent of Geography pupils were grouped in the dissatisfied group compared to 24% of Creative pupils, 18% of P.E. pupils, and 10% of Citizenship pupils. Sixteen percent of pupils in Creative lessons were categorized as competent pupils (16%) compared to the other groups (23-29%), whereas only 14% of Geography pupils were represented in the moderate group compared to the others (25-29%). On the basis of these findings, all subsequent analyses controlled for different schools, school type and class subject.

INSERT TABLE 3 & FIGURE 1 HERE

Group Differences in Achievement, Well-being, and Ill-being

Mean scores, univariate F -values with no covariates, effect sizes and specific group differences for all outcome variables are presented in Table 3. Results for all ANCOVA and MANCOVA are described below, with Table 4 showing the multivariate group centroids obtained from the discriminant analysis for the well-being and ill-being outcomes.

Teacher-Rated Achievement.

ANCOVA identified there was a significant difference in teacher-rated pupil achievement across the five psychological need profiles, $F(4, 540) = 7.03, p < .001$; partial $\eta^2 = .05$. Tukey's post hoc tests, shown in Table 3, revealed the dissatisfied group were lower in teacher-rated achievement compared to the satisfied, competent and moderate group but not the low group (see Figure 2). No other statistical differences were found between the groups.

Well –Being.

MANCOVA revealed a significant difference across the five psychological need profiles, $F(8, 1136) = 45.63, p < .001$; Wilk's $\Lambda = 0.57$, partial $\eta^2 = .24$. Follow up discriminant analysis revealed two discriminant functions, however the second function did not significantly differentiate the pupil clusters, $\Lambda = 0.99, \chi^2 = 5.78, p = .12$. The first

PUPIL PSYCHOLOGICAL NEED PROFILES

function explained 98.6% of the variance, canonical $R^2 = .64$, with vitality ($r = .92$) and positive affect ($r = .84$) strongly loading. Group centroids showed that the first function discriminated between all five groups. Specifically, the satisfied group tended to report higher levels of well-being, followed by the moderate group, then the competent and low groups respectively, and the dissatisfied group reporting the lowest levels of well-being.

Ill –Being.

MANCOVA revealed a significant difference across the five psychological need profiles, $F(8, 1134) = 23.39, p < .001$; Wilk's $\Lambda = 0.74$, partial $\eta^2 = .14$. Discriminant analysis revealed two discriminant functions, however the second function did not significantly differentiate the pupil clusters, $\Lambda = 0.99, \chi^2 = 0.34, p = .95$. The first explained 99.8% of the variance, canonical $R^2 = .52$, with academic stress ($r = .96$) loading more predominately than negative affect ($r = .59$). This first function discriminated between all five groups. Specifically, the satisfied group tended to report the lower levels of ill-being, followed by the moderate, competent, and low groups respectively. The dissatisfied group reported the highest levels of ill-being.

INSERT FIGURE 2 & TABLE 4 HERE

Discussion

The purpose of this study was to use a person-centred approach to determine different pupil profiles based upon their satisfaction of the psychological needs for autonomy, competence, and relatedness. The cluster-analytic results revealed five distinct psychological need profiles. Extending previous evidence on psychological need dynamics (Sheldon & Niemiec, 2006), a considerable degree of synergy was observed in satisfaction of the three psychological needs across the groups with only one group displaying a lack of synergy. Conceptually, the findings emphasise the importance of focusing on the individual pupils and the interplay between the three needs. Deficits in pupils' satisfaction of one need may have a

PUPIL PSYCHOLOGICAL NEED PROFILES

detrimental impact on the experience of the others (Ryan & Deci, 2017). The present findings also reinforce the notion that optimal academic achievement and well-being occur when the three needs are satisfied in unison and balance. From a practical perspective, the current study offers insights into why different pupil groups may thrive or struggle in classrooms. In conjunction with more broad need supportive interventions (e.g. De Naeghel, Van Keer, Vansteenkiste, Haerens & Aelterman, 2016), there may be scope to develop targeted initiatives towards individual pupil groups that have specific deficits in psychological need satisfaction.

The Composition of Pupil Profiles

As hypothesised, a degree of synergy between the three psychological needs was evidenced within four of the five clusters (i.e. the satisfied, moderate, low, and dissatisfied groups). These four groups reported consistent in-group levels of satisfaction across the three needs, albeit it with varying amounts. Such in-group consistency is rarely demonstrated in young adolescent profiles when using more disparate types of grouping criteria, such as categories of motivation as opposed to psychological needs (e.g. Jaakkola et al., 2015; Ratelle et al., 2007; Wang & Biddle, 2001). The present clusters accentuate the interactive nature of the three psychological needs as proposed within SDT (Ryan & Deci, 2017). That is, the highest levels of satisfaction for each psychological need may occur with the complementary fulfilment of the other two needs (e.g. the satisfied group).

In contrast, a degree of incongruence was evident in the competent group which may suggest pupils are able to experience distinct high levels of competence satisfaction in classrooms even with relatively low satisfaction of autonomy and relatedness. One potential explanation for this incongruence may be that these pupils have a high implicit desire for achievement, not assessed in the current study, which may be affiliated with greater experiences of competence satisfaction and mastery in classrooms (Hofer, Busch &

PUPIL PSYCHOLOGICAL NEED PROFILES

Kiessling, 2008). It may be that pupils with achievement-orientated preferences have a particular desire to enhance and demonstrate their performance in accord with social standards (McClelland, Koestner, & Weinberger, 1989). Indeed, school classrooms typically represent achievement-focused contexts in which the need for competence may be particularly salient for pupils in this “competent” group. It may be worthwhile to investigate how pupils’ implicit tendencies may impact their psychological need satisfaction profile, in addition to their conscious experience within the classroom context. For instance, it would be interesting to see if pupils with an implicit orientation for affiliation report profiles higher in autonomy or relatedness satisfaction (see Hofer & Busch, 2011).

Nevertheless, the current findings suggest it is unlikely for optimal competence satisfaction to be experienced in the absence of autonomy and relatedness satisfaction. Contrary to portrayals of autonomy and relatedness as conflicting (Iyengar & DeVoe, 2003), high interrelation between the two needs was observed across the psychological need profiles. Although pupils may be able to experience some degree of competence satisfaction independently in the classroom, it seems unlikely pupils will experience relatedness satisfaction if they are prevented from volitional behaviour. Reciprocally, it may be difficult for pupils to autonomously engage in class if they feel unsupported or secluded by teachers and other pupils (Ryan & Deci, 2017). This interplay between the three needs would not have been uncovered with a variable-centred approach and highlights the importance for teachers, and researchers, to consider the three psychological needs in combination rather than in isolation (Sheldon & Niemiec, 2006).

Group Differences in Classroom Achievement, Well-Being and Ill-Being

Extending previous variable-centred evidence regarding pupils’ need satisfaction and frustration (Erturan- Ilker et al., 2018; Jang, Kim, & Reeve, 2016), the present person-oriented findings demonstrate that pupils reporting a satisfied psychological need profile will

PUPIL PSYCHOLOGICAL NEED PROFILES

function better psychologically and academically in classrooms compared to their dissatisfied counterparts (Niemic & Ryan, 2009; Sheldon & Niemic, 2006). These associations were found when controlling for differences in school and classroom subject. In regards to academic achievement, pupils reporting a dissatisfied psychological need profile may be at particular risk of poor academic performance compared to pupils with higher levels of satisfaction across the three needs or in a specific psychological need. Previous findings have linked the satisfaction of each need with corresponding behaviours that may facilitate higher academic achievement, such as increased helping-seeking (Marchand & Skinner, 2007) and higher school engagement (Raufelder, Regner, Drury, & Eid, 2015).

Nonetheless, these group differences in pupil achievement were small in effect size. To avoid reliance on pupil self-report measures, our assessment of achievement was teacher-rated and, therefore, not vulnerable to inflated effect sizes associated with common method variance (Lindell & Whitney, 2001). Furthermore, teachers' perceptions of student achievement are still subjective and may translate into how they interact with pupils, which in turn may influence how pupils report psychological need satisfaction in the classroom (Diseth, Danielsen & Samdal, 2012; also see work on teacher expectations and self-fulfilling prophecies, McKown, Gregory, & Weinstein, 2010). Future research may extend the present findings by considering the addition of objective school recorded attainment grades to provide a more comprehensive examination of the relationship between pupils' psychological need profiles and classroom achievement. School achievement is also dynamic and can be influenced by a number of factors, in addition to psychological need satisfaction, which could be incorporated into future studies examining variation in pupil achievement, such as academic support from parents or teachers (e.g., Levpušček, Zupančič, & Sočan, 2012), prior numeracy or literacy skills (Duncan et al., 2007) or behavioural engagement (e.g., school attendance; Li & Lerner, 2011).

PUPIL PSYCHOLOGICAL NEED PROFILES

In regard to well-being, the satisfied psychological need group was associated with the highest levels of well-being, and lowest levels of ill-being. Interestingly, even when not highly satisfied, a more balanced psychological need profile (i.e. the moderate group) was associated with higher well-being and lower ill-being compared to an imbalanced need profile (i.e. competent group), despite the competent group reporting higher competence satisfaction (for similar findings see Sheldon & Niemiec, 2006). Both autonomy and relatedness have been associated with young adolescent pupils' quality of life, well-being and social adjustment (Duchesne et al., 2017; Gillison, Standage, & Skevington, 2008; Van Ryzin, Gravely, & Roseth, 2009). Competence satisfaction has also been shown fundamental for current and future well-being (Véronneau et al., 2005), and it is unlikely that groups of pupils will display optimal well-being in class if they lack belief in their ability to be successful (Legault, Green-Demers, & Pelletier, 2006). The present findings highlight the importance for teachers to be aware of pupils experiencing a lack (i.e. dissatisfied group) or sub-optimal (i.e. low group) satisfaction across all three needs, as these pupils represent the highest risk of ill-being which, in turn, may result in classroom disengagement or poor pupil behaviour (Earl et al., 2017; Jang et al., 2016).

Implications of Findings

The present study is among the first to use a person-centred methodology to cluster pupils based on their satisfaction of all three psychological needs. Theoretically the findings add to SDT's claim of interdependence between the three needs (Ryan & Deci, 2017). Although each psychological need represents an independent construct, the present work alludes to the synergy that may exist between the three pairs of psychological needs and how they function in combination. This potential synergy between the needs may stem from social contextual influences, particularly in regards to autonomy supportive versus controlling school contexts, which can facilitate or disrupt fulfilment of all three needs (Cheon & Reeve,

PUPIL PSYCHOLOGICAL NEED PROFILES

2015; Reeve, 2009; 2015). We also acknowledge that this synergy may be, in part, accountable to the three needs being less distinguishable through the use of self-report measurements. Future research may assess if similar patterns emerge across pupil profiles when using alternative measures, such as interview responses, to assess psychological need satisfaction.

From an applied perspective, the findings can be used to help teachers become more aware of specific groups of pupils that experience psychological need deficits in class. It seems important that classroom contexts do not nurture one need at the expense of another. Autonomy represented the least satisfied need within each respective profile. Teachers may benefit from interventions to help them apply autonomy supportive teaching strategies more effectively (e.g., Cheon & Reeve, 2013; Reeve, Jang, Carrell, Jeon, & Barch, 2004), especially given that the compulsory nature of classroom activities may be easily interpreted as coercive by many pupils (Reeve, 2009). Autonomy supportive teaching strategies welcome pupil opinion, offer patience rather than pressure towards learning, allow meaningful choice and emphasise the relevance of activities (Jang, Reeve, & Halusic, 2016; Reeve, 2006; 2015). The support of pupil autonomy is also an essential component in simultaneously fostering their competence and relatedness satisfaction (Hospel & Galand, 2016; Jang, Reeve, & Deci, 2010; Ryan & Powelson, 1991).

Akin with previous work (Erturan-İlker et al., 2018), the present study indicates that diverse school subjects may offer different opportunities for pupils to experience psychological need satisfaction. For instance, a higher proportion of pupils in classroom based subjects (i.e. Geography and Creative) were categorised in the dissatisfied group compared to pupils from less classroom based subjects (i.e. P.E. or Citizenship). It may be that subjects not exclusively taught in traditional classroom contexts provide pupils with more freedom and opportunities to work with others. These subjects may also involve less

PUPIL PSYCHOLOGICAL NEED PROFILES

academic assessment compared to more exclusive classroom subjects that typically involve more stringent classroom rules and evaluations. Thus, it may be particularly important that targeted need supportive teaching strategies are implemented in classroom based subjects.

Directions for Future Research and Practical Application

The current findings provide valuable insights that advance the application of SDT with young adolescent pupils. It is notable that many pupils were categorised differently in their psychological need profile. Psychological need satisfaction is a subjective and intrapsychic experience (i.e. see functional significance; Deci & Ryan, 2000) and thus the development of targeted teacher interventions, despite being essential, may only partly address deficits in pupils' psychological needs. Even if teachers provide need supportive behaviours, pupils may not always perceive this to be the case (e.g., Aelterman, Vansteenkiste, Van den Berghe, De Meyer, & Haerens, 2014). Additional interventions that target the pupils themselves, and their relative awareness of their psychological needs, may also be valuable in nurturing pupils' psychological need satisfaction (see Ryan, Curren, & Deci, 2013).

Secondly, the present findings are representative of pupil experienced psychological need satisfaction, and teacher rated achievement, within a specific classroom context. We acknowledge that these reports may differ within an alternative classroom or taught subject. Examining how pupils' psychological need profiles may be consistent across multiple school classrooms may provide educators with greater insights into how pupils may function personally and academically at school more generally. We also recognise that school classrooms are not the only contexts that may influence pupils' psychological needs (Milyavskaya & Koestner, 2011). Future person-centred SDT studies could investigate if pupils clustered within specific sub-groups predominately come from similar family or socio-economic backgrounds, as well as investigate how inter-individual differences, such as their

PUPIL PSYCHOLOGICAL NEED PROFILES

motivational dispositions (e.g. Hagger & Chatzisarantis, 2011), influence a pupil's psychological need profile. Such investigations may help detect specific pupil types that represent a higher risk for maladaptive psychological need profiles at school. Furthermore, overt psychological need frustration has been shown to be distinct from a lack of need satisfaction and associated with more maladaptive emotional and academic outcomes (e.g. Jang et al., 2016; Haerens, Aelterman, Vansteenkiste, Soenens & Van Petegem, 2015). The inclusion of psychological need frustration in future profiling studies may help identify specific pupil groups experiencing higher classroom ill-being and poorer academic performance (Vansteenkiste & Ryan, 2013).

Conclusions

The present study adopted a person-centred approach, identifying five distinct pupil profiles based upon the satisfaction of their psychological needs of autonomy, competence, and relatedness. The findings provide empirical support for SDT's proposal of synergy between the three psychological needs, with the optimal satisfaction of each need existing when the two other needs are simultaneously satisfied (Ryan & Deci, 2017). Pupils reported optimal achievement and emotional well-being in classrooms when all three needs were satisfied congruently as opposed to simply feeling competent towards school work. This knowledge may have both scientific and practical implications, highlighting the dynamic interplay between the three psychological needs and the importance of examining pupils as individuals rather than in relation to isolated variables. The current pupil-oriented methodology may also help teachers be aware of specific psychological need deficits that pupils may experience and the importance of targeted need supportive teaching in classrooms.

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PUPIL PSYCHOLOGICAL NEED PROFILES

Table 1
Descriptive Statistics and Bivariate Correlations Among Study Variables

Variable	Range	Mean	SD	1	2	3	4	5	6	7	8
1. Autonomy	1-7	3.36	1.00	-							
2. Competence	1-7	4.69	1.30	.33**	-						
3. Relatedness	1-7	4.49	1.32	.50**	.50**	-					
4. Vitality	1-7	4.39	1.26	.51**	.52**	.54**	-				
5. Academic Stress ⁺	1-5	2.64	0.81	-.31**	-.47**	-.45**	-.37**	-			
6. Positive Affect	1-5	3.41	0.78	.50**	.52**	.59**	.73**	-.43**	-		
7. Negative Affect	1-5	1.86	0.65	-.14**	-.35**	-.35**	-.25**	.45**	-.19**	-	
8. Achievement	1-6	4.30	0.81	.06	.26**	.16**	.18**	-.16**	.21**	-.17**	-

Note: * $p < .05$. ** $p < .01$. ⁺ Factor analysis revealed one problematic item for this factor which was removed to increase internal consistency.

Table 2

Euclidian Distances From Hierarchical Cluster Analysis

Number of Clusters	Fusion coefficient
1	2560.89
2	1569.93
3	1225.26
4	1068.93
5	932.91
6	845.53
7	771.45

PUPIL PSYCHOLOGICAL NEED PROFILES

Table 3

Group Differences in Mean Scores for all Grouping Variables and Outcome Variables with SD's, F values and effects sizes.

	1. Satisfied		2. Competent		3. Moderate		4. Low		5. Dissatisfied		F	η_p^2
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
Grouping Variables												
Autonomy	4.38 ^{2,3,4,5}	0.83	2.76 ^{1,3,4,5}	0.60	3.94 ^{1,2,4,5}	0.67	3.59 ^{1,2,3,5}	0.57	2.35 ^{1,2,3,4}	0.74	170.972**	.55
Competence	6.12 ^{2,3,4,5}	0.61	5.51 ^{1,3,4,5}	0.70	4.90 ^{1,2,4,5}	0.84	3.58 ^{1,2,3}	0.88	3.31 ^{1,2,3}	0.93	228.173**	.62
Relatedness	6.23 ^{2,3,4,5}	0.54	4.15 ^{1,3,5}	0.76	5.33 ^{1,2,4,5}	0.73	4.03 ^{1,3,5}	0.47	2.85 ^{1,2,3,4}	0.91	340.763**	.71
Outcome Variables												
Vitality	5.56 ^{2,3,4,5}	1.02	4.33 ^{1,3,5}	1.08	4.81 ^{1,2,4,5}	1.09	4.15 ^{1,3,5}	0.93	3.24 ^{1,2,3,4}	0.99	71.349**	.34
Positive Affect	4.06 ^{2,3,4,5}	0.57	3.43 ^{1,3,5}	0.62	3.72 ^{1,2,4,5}	0.54	3.26 ^{1,3,5}	0.63	2.60 ^{1,2,3,4}	0.70	85.241**	.38
Academic Stress	2.14 ^{2,4,5}	0.81	2.52 ^{1,4,5}	0.68	2.34 ^{4,5}	0.61	2.90 ^{1,2,3,5}	0.72	3.33 ^{1,2,3,4}	0.74	45.374**	.24
Negative Affect	1.58 ^{4,5}	0.57	1.79 ⁵	0.59	1.71 ^{4,5}	0.54	1.97 ^{1,3,5}	0.65	2.24 ^{1,2,3,4}	0.72	16.527**	.11
Achievement	4.51 ⁵	0.97	4.45 ⁵	0.87	4.37 ⁵	0.87	4.24	0.83	3.92 ^{1,2,3}	0.84	7.202**	.05

Note. Numerical superscripts indicate statistically significant differences ($p < .05$) between the respective groups for each given variable, based on Tukey's honestly significant difference test. * $p < .05$. ** $p < .001$.

PUPIL PSYCHOLOGICAL NEED PROFILES

Table 4
Group Centroid Values for the Well-Being and Ill-Being Composites

Pupil Profiles	Function	
	1	2
Well-Being		
Satisfied	1.23	0.18
Competent	-0.01	-0.10
Moderate	0.53	-0.07
Low	-0.26	-0.02
Dissatisfied	-1.38	0.90
Ill-Being		
Satisfied	-0.75	-0.01
Competent	-0.18	-0.00
Moderate	-0.44	0.02
Low	0.37	-0.05
Dissatisfied	1.03	0.02