



Multiple autonomy support attunement connections with perceived competence in learning and school grades among rural adolescents

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Accepted: 26 February 2021

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Abstract

In this study, we examine the associations of Multiple Autonomy Support Attunement (MASA) (corresponding to configurations of (in)consistent perceived multiple autonomy support regarding parents, teachers, and mentors) with perceived competence in learning and native language and math grades, among rural adolescents. A total of 448 ninth graders ($M = 14.71$; $SD = .90$; 58.03% girls) from The Azores Islands, a Portuguese mostly rural and isolated area participated in this study. Using Latent Class Analysis (LCA), a three-class solution for MASA presented the best fit and was more interpretable. Multivariate Analysis of Variance showed that unattuned MASA, due to low teacher support, was the most recurrent MASA configuration. While less recurrent, high MASA was associated with improvements in all educational outcomes. The effect of high MASA on improving educational outcomes among these youths was above and beyond, and more systematic, than factors that typically play a central role in rural educational trajectories, such as SES and gender. Our study shows the need to further articulate rural students' social ecology features with the usual explanations for rural education failure.

Keywords Multiple autonomy support · Gender · SES · Perceived competence in learning · School achievement

Introduction

Autonomy support incorporates a set of interpersonal attitudes and behaviors that promote the identification and promotion of another's need to choose, self-regulate and motivate (Reeve, 2009; Ryan & Deci, 2009). These attitudes and behaviors include providing freedom of choice, offering informative feedback to facilitate decision-making, considering others' feelings and opinions, and providing opportunities for personal initiative (Ryan & Deci, 2009). Alongside, Multiple Autonomy Support Attunement (MASA) corresponds to the degree of autonomy support consistency or coordination across youths' most significant relationships coming from different social contexts (Simões et al., 2018a, b).

In the present research, we intend to examine the links of MASA with perceived competence in learning and native language and math grades, among rural adolescents. Our aim

tackles the lack of knowledge about how patterns of multiple autonomy support may intervene in the process of shaping adolescents' educational outcomes. With the exception of a seminal study by Guay, Ratelle, Larose, Vallerand, and Vitaro (2013), conducted with adolescents from various origins, this research question has not attracted scholarly attention. This shortcoming is remarkable, considering the substantial changes in social ties during adolescence. In this developmental period, adolescents show greater openness to non-familial adults' informative feedback or acknowledgement of feelings and opinions, including teachers (Froiland, Davison, & Worrell, 2016) or mentors (Schwartz, Rhodes, Chan, & Herrera, 2011) while parents become less pivotal in the socialization process (Cotterell, 2007). The literature has, however, approached these socialization changes by isolating the potential effect of autonomy support provided by each source on educational-related outcomes, instead of examining how these outcomes can be associated with multiple-source autonomy support.

We also intend to test if the associations between MASA and the selected educational outcomes are moderated by Socioeconomic Status (SES) and gender among rural students. Our second aim is justified by three contextually-relevant arguments. First, international reports (e.g. Organization for Economic Cooperation and Development, 2019) echo rural

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students' underachievement, due to general limitations of rural educational systems, such as greater teacher mobility (Reagan et al., 2019) or a narrower educational offer (Theodori & Theodori, 2015). Aside, personal and contextual factors underlying educational outcomes in rural areas are still under-researched (Bæck, 2016).

Second, autonomy support literature has seldom focused on how adolescents' educational performance in rural areas are upheld and shaped by a single support source (e.g. Hardre & Reeve, 2003). This approach is inexistent in the case of multiple-source autonomy support. Such a gap is noteworthy, as rurality is an evolving conceptualization conveying place, social and cultural conditions, as well as a structure of opportunities for work, education and leisure organized by local and supra-local entities and policies (Bæck, 2016). By following our second aim, we address how three dimensions of the rural social milieu such as multiply autonomy support, SES and gender (as a social constructed category), can be associated with or interact to affect the educational outcomes of rural adolescents. We do this, bearing in mind that the interplay of these factors is informed by a limited structure of local opportunities.

Finally, in rural communities, autonomy support offered by family or community adults is often enacted based on local and traditional values. Their support more easily involves the minimization of education as a social elevator compared to what happens in cities (Papadakis & Kyvelou, 2017). In turn, teacher support is more aligned with the general education system values, channeled through *curricula*, bringing attached contemporary values, which reflect an urban lifestyle or ethos (Bæck, 2016; Theodori & Theodori, 2015). For rural adolescents, bridging between different adults' autonomy support may result in a loyalty conflict, increasing the chances of perceiving a mismatch between the supportive efforts of adults from distinct life contexts. Moreover, being more or less successful at school is also a test of their loyalty regarding their family and their community values, because students with higher attainment will more easily leave for cities, in search of better opportunities (Farrugia, 2016).

Multiple Autonomy Support Attunement: An Alternative Approach to Adolescents' Social Ecology

Adolescents' positive development outcomes, including educational-related ones, can be shaped by the autonomy support delivered across multiple contexts and relationships of one's social ecology (Varga & Zaff, 2017). The importance of personal social ecology for adolescents' social, behavioral or educational development has consistently been brought forward by the systemic model (Alarcão, 2000; Keller, 2005) or the bioecological model (Bronfenbrenner & Morris, 2006).

The efforts to uncover adolescent outcomes sustained by multiple autonomy support providers are scarce (e.g. Rueger, Malecki, & Demaray, 2010). The few existing studies focusing on multiple-source support and adolescents' academic-related outcomes have adopted one of two prevailing measurement approaches: *the unique effects' approach* and *the interactive effects' approach*. In the *unique effects' approach*, a given source of support offers a unique contribution to an outcome of interest that the support from other adults cannot explain. In the case of the *interactive effects' approach*, two analytical paths can be taken. First, a given source of support (e.g. a teacher), can make a compensatory contribution to youth development outcomes. In this case, the support provided by other sources, from a mentor for instance, interacts with teacher support in predicting youth adjustment. In turn, the hierarchical conditional model proposes that the support provided by one source may also interact with support from other relationships, but in a different way: the positive effect of a given support may operate only if another support source is rewarding (Larose et al., 2018).

Just a few reports have tested the impact of different support sources on academic outcomes, following a unique effects' perspective. For instance, Rueger et al. (2010) have found that only parental support is consistently associated with positive attitudes towards school at different points in adolescence, compared to teachers, best friends, classmates and school support. More recently, Larose et al. (2018) have tested interactive effects between multiple support sources in predicting academic outcomes. Their findings show that mentor support predicts improvements in academic adjustment, but only when maternal support is also adequate. However, in the provided examples, autonomy support is included in measures of general social support. More importantly, these approaches do not explore how patterns of multiple autonomy support may come to affect youth outcomes, including educational ones.

More recently, some works have started to discuss the importance of examining the connections of enacted and perceived multiple-source support (whether in the form of autonomy support or other) and youth development outcomes. For instance, Varga and Zaff (2017) have developed a model of positive youth development from a supportive youth system perspective. According to these authors, support behaviors are enacted and perceived across multiple support contexts such as family, school, neighborhood, or others. Within each of these contexts, also labeled as cores, relationships have different degrees of importance for an adolescent. These most important relationships stemming from each core are labeled as anchors. Due to their relevance, intensity and/or frequency of contact, these relationships might have greater importance in explaining certain adolescent outcomes. Alongside this, a seminal work by Guay et al. (2013) has advanced measurement approaches on how to assess multiple

autonomy support involving, at least, two different cores: family and school.

The model of positive youth development from a supportive youth system perspective (Varga & Zaff, 2017) and Guay et al. (2013) study have made substantial contributions to an ecological approach to social support effects when provided by multiple sources. However, neither of these research efforts have focused on the effects of perceived or enacted coherence between meaningful supportive relationships or anchors cutting across multiple cores (family, school, and community). Multiple social support attunement application to different social support dimensions, such as autonomy support, has been proposed as an alternative measurement approach to fill in this gap (Simões et al., 2018a, b).

MASA builds on the primitive meaning of the verb to attune. To attune corresponds to bring into musical accord; in general, it refers to harmonize or adapt to a matter, action or idea (New Oxford Dictionary of English, 2012). Attunement has a communal sense as well, which has slowly been streamed into psychological sciences, for the past decades, to describe relational interactions. In this vein, Erskine (1998) synthesizes attunement as the ability of “going beyond empathy to enable a two-person experience of unbroken feeling connectedness, by providing a reciprocal effect and/or resonating a response” (p. 236). Grounded on this, attunement has come to describe interpersonal contact unity and coherence in dyadic relationships, such as psychotherapy (Erskine, 1998) or youth mentoring (Pryce, 2012). Attunement communion meaning can be further expanded in the youth multiple social support area of research, going beyond dyadic relationships. MASA upholds this perspective, as it can be described in terms of the degree of autonomy support consistency or coordination across youths’ anchors coming from different social cores, with the potential to affect a given youth outcome (Simões et al., 2018a, b).

MASA as a conceptualization of coherence is a twofold notion because it addresses both processes, as well as its results. As a process, MASA refers to how the enacted coordination between multiple anchors from different social cores occurs, based on lesser or greater intentionality of anchors to attune their autonomy support efforts. In MASA enactment, anchors will reflect their own core properties (values, beliefs, interactive patterns) (Alarcão, 2000; Keller, 2005). Depending on the mobilization of these properties, MASA enactment may be classified according to three different stages aligned in a continuum. Performance is a stage in which anchors show severe adherence to the core properties, minimizing chances for MASA coordination, especially when their supportive roles depart from very distinct sets of values. Improvisation is a stage whereby multiple anchors overlap their efforts, sometimes shifting away from the strict reproduction of their core’s values and interactive patterns while testing new strategies for support enactment. This attempt may result in

unintentional coordination, as anchors involved in youths’ multiple social support can, sometimes, not be entirely aware of each other’s supportive efforts. This unintentional coordination may be partial (when only the efforts of some of the regarded anchors display overlap) or total (when the efforts of all the regarded anchors overlap). Finally, rehearsal is a stage corresponding to intentional efforts in order to develop shared and coordinated positions between various youths’ anchors where common experimental courses of action take place. In the process of experimenting, ways of joint collaboration are proposed, tested, and evaluated just as in a musical rehearsal (Simões, Calheiros, & Alarcão, 2021).

The analysis of MASA results is focused on how patterns of social support, organized in terms of the degree of perceived autonomy support consistency between multiple anchors from distinct social cores, based on each anchor’s support scores, will affect an outcome. Youths’ intrapersonal patterns concerning MASA anchors may take one of at least three forms: low-attuned multiple autonomy support involves low levels of perceived support from all anchors; unattuned multiple autonomy support occurs when the level of perceived support is unbalanced across different anchors, with multiple combinations being possible; and high-attuned multiple autonomy support occurs when all anchors offer perceived high levels of autonomy support (Simões et al., 2018a, b). These patterns may then be studied as sources of youth development variation in different areas, including in education performance.

Until now, the existent research has focused only on MASA results. Reports show that high-attuned multiple autonomy support has consistently been found to be the optimal condition to improve adolescents outcomes. This has been the case with social development indicators, with high-attuned multiple autonomy support being associated with lower anti-social behavior, higher prosocial behavior and stronger self-regulation, after controlling for age effects (Simões et al., 2018a, b). Moreover, high-attuned multiple social support, including autonomy support dimensions, is also associated with vulnerable adolescent’s improved levels of quality-of-life, after controlling for age and gender effects (Mendonça & Simões, 2019). Interestingly, unattuned autonomy support due to low teacher support is the pattern delivering the worst social development outcomes (Simões et al., 2018a, b), which further substantiates the importance of testing MASA associations with educational outcomes.

Autonomy Support and Perceived Competence in Learning

Perceived competence in learning refers to personal perceptions of competence across learning fields. It is considered the motivational component of self-regulated learning, which also includes metacognition and strategic planning (Boekaerts & Corno, 2005).

Perceived competence shows significant overlap with other notions that also assess competence perceptions, such as self-efficacy beliefs and outcome expectations. Perceived competence refers to a general self-perception of competence across different fields or tasks, while self-efficacy beliefs are subjective perspectives about personal competence in a specific domain (Pajares & Miller, 1994). Moreover, whilst the measurement of perceived competence in learning may involve self-other comparisons (for instance, between a student and his/her peers), self-efficacy does not convey the assessment of social comparisons (Schunk & Pajares, 2005). In turn, perceived competence and self-efficacy beliefs are both distinct from outcome expectations. Competence beliefs, whether more general or specific, can help individuals to speculate about all possible outcomes associated with different courses of action (Schunk & Pajares, 2005). Conversely, outcome expectations are judgments limited to the most likely or realistic consequences of a certain behavior (Beal & Crockett, 2010).

The connections between one-source autonomy support and perceived competence in learning, as well as their connections with further educational outcomes, are far from being univocal. Seminal works have found that perceived teacher autonomy support increments students' perceived competence in learning, including among rural students (e.g. Hardre & Reeve, 2003). In addition, parental autonomy support was found to interact with perceived competence in learning to predict engagement in physical education, among elementary school students (Shen et al., 2018). Moreover, both teacher and parent support were found to yield more positive motivational outcomes that, in part, overlap perceived competence in learning, among adolescents. However, while teacher support was associated with two autonomous forms of motivation (introjected and identified motivation), stronger parental autonomy support only delivered an increment in introjected motivation (Chirkov & Ryan, 2001). In parallel, parental support has been associated with perceived competence support among university students, as fully mediating the relationship between support and career decision-making (Pesch, Larson, & Surapaneni, 2016). This result contrasts with the lack of connections between teacher autonomy support and perceived competence in learning among other groups of tertiary education students (Wang, Qiao, & Chui, 2018).

The intricate pathways through which one-source autonomy support is associated with perceived competence in learning are justified by the different sources providing support or the motivational fluctuations across educational trajectories, such as a progressive decrease of academic motivation from childhood to adolescence (Schunk & Pajares, 2005), leading to different theoretical approaches in the field of educational studies (Guay, Boggiano, & Vallerand, 2001). According to the Cognitive Evaluation Theory (Deci & Ryan, 1985), perceived competence in learning mediates between autonomy

support and changes in intrinsic motivation. The Diathesis-Stress Model (Boggiano, 1998) focuses on how autonomy support affects perceived competence in learning, through intrinsic motivation. Another possible approach is to test how different levels of perceived competence in learning moderate the effects of autonomy support on intrinsic motivation (Guay et al., 2001). Still, it is important to wave that the only study testing direct associations between configurations of MASA and perceived competence in learning indicated that high MASA involving mother, father and teacher, as well as unattuned MASA, due to low father autonomy support, was linked to stronger perceived competence in learning (Guay et al., 2013).

Autonomy Support and School Grades in Native Language and Math

Various reports have examined how one-source autonomy support affects academic results in subjects such as native language or math. Parental autonomy support, for instance, namely maternal support, including elements of autonomy support, such as the consideration of others' feelings, helps to explain the improvement of math interest among Finnish first graders; although it does not have a similar impact on reading (Aunola, Viljaranta, Lehtinen, & Nurmi, 2013). Conversely, parental autonomy support at age 5 predicts third graders' improvement in reading, but has no impact on math results (Joussemet, Koestner, Lokes, & Landry, 2005). Among middle schoolers, parental autonomy support has a detrimental effect on math marks (Grolnick, Kurowski, Dunlap, & Hevey, 2000). Greater teacher autonomy support has also been found to lead to greater engagement in language learning, specifically of a foreign language (Oga-Baldwin, Nakata, Parker, & Ryan, 2017). No significant direct paths have been found, however, between teacher autonomy support and greater math engagement among high school students (Hagger, Sultan, Hardcastle, & Chatzisarantis, 2015). More rarely, mentoring support, including autonomy supportive behaviors, has been associated with improvements in GPA, but also in specific subjects, such as native language and math, among lower and upper middle school students of rural areas (Simões & Alarcão, 2014).

The contradictory findings regarding the effects of one-source autonomy supportive relationships on school marks are due to gender, age, school grade, prior school performance, autonomy support source (Vasquez, Patall, Fong, Corrigan, & Pine, 2016), or motivational factors. Among these motivational elements are performance expectation (Aunola et al., 2013), mastery beliefs (Diseth & Samdal, 2014), or intrinsic motivation for learning (Froiland et al., 2016). This trend is more salient for math grades and is evident for elementary school (Aunola et al., 2013) and high

school students (Diseth & Samdal, 2014; Froiland et al., 2016).

It is important to remark that in the case of multiple-source autonomy support, moderately high MASA involving father, mother and teacher translates into significantly higher grades in native language, compared to unattended MASA, due to low teacher support and low MASA (Guay et al., 2013).

Autonomy Support, Socioeconomic Status, Gender and Educational Outcomes in Rural Areas

The connections between different autonomy support sources in rural areas can be shaped by other social factors, one of them being Socioeconomic Status (SES). Overall, a higher SES is a relevant predictor of more positive educational trajectories (Hattie, 2018). Economic hardship is stronger in rural areas (Sullivan, Perry, & McConney, 2013). Those accumulating risks due to rural origin and low SES are in greater danger of being less supported in their autonomy and of falling behind at school. This risk is more relevant if greater income disparities exist within rural communities. In such a case, students coming from privileged social groups can use their resources to buffer disadvantages related to their rural origin or benefit from greater parental participation at school (Bæck, 2016).

Gender may also have a role in shaping multiple-source autonomy support and its educational correlates, in rural areas. In general, female students report a more positive perception of their learning skills (Zisimopoulos & Galanaki, 2009). Girls also outperform boys in different school subjects (Voyer & Voyer, 2014), such as native language courses (Steinmayr & Spinath, 2008), including in writing and reading skills (Pajares & Valiante, 2001). Girls' greater achievement is reported in math as well, although existing research also reports that boys outstrip girls in math and science (e.g. Else-Quest, Hyde, & Linn, 2010). Second order meta-analytical findings have shown that while gender is not a top predictor of school achievement (Hattie, 2018), girls do outstrip boys in both language courses and math and that the gender gap in favor of girls is greater in language subjects (Voyer & Voyer, 2014).

Similarly to those in urban areas, rural girls are more academic-minded and nurture greater educational and professional expectations compared to boys (Farrugia, 2016; Leibert, 2016). Differences between rural boys and girls are less systematic during the primary school years, with some studies showing girls performing better than boys in specific skills, such as reading and writing (Ferla, Valcke, & Schuyten, 2010) and other research pieces showing no gender differences (Di Gropello & Marshall, 2011). The disparities in school achievement favoring rural girls become more evident in adolescence (Sharp, Seaman, Tucker, Van Gundy, & Rebellon, 2019).

Rural girls' performance is an outstanding outcome, given that both leisure and work market structures uphold gender stereotype conventions in the countryside (Sadler, Akister, & Burch, 2015). According to these structural features, girls' free time socialization and future professional expectations are often limited to indoor or domestic and care giving duties within the family (Sadler et al., 2015). The ultimate result of this cultural context is the intensification of rurality masculinization, while women escape to the cities to study and work (Leibert, 2016; Sharp et al., 2019).

Present Study

Our research is aimed at: (a) examining the links between MASA, perceived competence in learning and grades in native language and math, among rural adolescents; and (b) testing if these associations are moderated by SES and gender.

We implemented a set of broad selection criteria, to enable diverse participation in the study. We aimed at involving 9th graders from public schools, aged 14 to 18 years old. We focused on 9th graders as these students are about to go through a transition from upper middle school to secondary school, a fact that might challenge autonomy support coherence across different social cores. Private schooling is rare and very selective in the region where the study took place, meaning that students attending public schools would better reflect socioeconomic disparities in the region. Alongside, school failure is a structural educational problem in the same region, meaning that a third of the 9th graders have been retained before, thus justifying a wider age range. The only restrictive inclusion factor was if the potential participants had a mentor for more than 12 months so that the autonomy support provided by an anchor relationship based on the community could be assessed.

To describe MASA, we selected the most important adults from three cores: (a) family (whether father or mother, depending on who was more involved in managing their behavior, from the adolescents' perspective); (b) school (the teacher who also played the role of class director); and (c) the community (a mentor, defined as someone aged 18 or older, with whom the participant interacted on a weekly basis, for more than 12 months). The educational outcomes were selected in order to assess both participants' motivation and performance at school. Moreover, the two selected grades are central for students to move on to secondary education, in the Portuguese education system. A student underperforming in both Portuguese language and math is automatically retained.

Finally, to test our hypotheses among rural adolescents, we conducted this study in The Azores Islands, an archipelago in the middle of the Atlantic Ocean, a two hour flight from Lisbon. This is an isolated and mostly rural region.

We tested four hypothesis. First, we expected that more students would acknowledge unattended configurations of

MASA compared to those reporting low or high MASA patterns. To test this hypothesis, we followed a person-centered approach, namely Latent Class Analysis (LCA), allowing a given sample of groups of participants with identical sources of autonomy support to be identified. Second, we also expected that high MASA would deliver better results across all the selected outcome variables, compared to other MASA configurations. Third, we also hypothesized that low-income students depicting high MASA would show identical results in the outcome variables, compared to students depicting a high MASA, as well as high SES. Moreover, we anticipated boys reporting high MASA would show identical educational outcomes compared to girls who also depicted high MASA. We assessed these three hypotheses using Multivariate Analysis of Variance (MANOVA).

Method

Participants

Five-hundred and twenty seven ninth graders from 10 public schools were asked to participate in our study. Four-hundred and forty eight students aged 14 to 16 years old ($M = 14.71$; $SD = .90$; 58.03% girls) were included, because they admitted to have a mentor (89.75%). Most of them were living with both parents (70.80%) and their siblings (71.40%), and came from a household with an average SES (61.80%), with similar proportions of participants with a low (19.20%) and high socioeconomic status (19.00%). A majority of the participants had never been retained at school (76.30%).

Site

Our study was implemented in The Azores Islands, a Portuguese archipelago composed of nine islands. The region faces a series of demographic, economic and educational challenges fitting what some authors label as a shrinking region (Bæck, 2016). The Azores Islands are losing population (less 2.20%, since 2011). This reduction is more evident among younger population (aged 0 to 24 years old) (Instituto Nacional de Estatística, 2019).

In terms of labor force, the tertiary sector involves most of the working population (74.00%), ahead of the secondary (15.30%) and the primary occupational sector (10.70%) (Governo Regional dos Açores, 2018). Youth unemployment is a structural challenge in the region. According to the latest figures, the regional rate of youths Not in Employment, nor in Education and Training (NEET) is 15.20%, while the national rate is 8.70% (Instituto Nacional de Estatística, 2019).

Regarding education indicators, in The Azores Islands the rate of upper middle school conclusion is the sixth lowest in the country among 25 regions (92.00%), slightly below the national

average (92.98%). Alongside, the rate of high school conclusion has improved in the archipelago (77.70%) and was situated above the national average (74.00%) in 2017 (Conselho Nacional da Educação, 2018). Yet, the rate of early school leaving is the highest in the country, across regions. These results are usually ascribed to the population lower living standards, compared to the rest of the country, leading to worse parental expectations about their children's educational attainment and lower parental involvement at school (Governo Regional dos Açores, 2018).

Measures

Multiple Autonomy Support Attunement

We evaluated MASA using an adapted version of the autonomy subscale of the Portuguese version (Sousa, Pais Ribeiro, Palmeira, Teixeira, & Silva, 2012) of the Basic Needs Satisfaction in General Scale (BNSGS) (La Guardia, Ryan, Couchman, & Deci, 2000). The subscale includes five items (e.g.: My father/mother (or teacher or mentor) acknowledges my feelings). Scores range from 1 (Never) to 5 (Always). We reworded the items to allow the participants to assess autonomy support within each of the relationships. Still, the items content was the same for parents (mother or father), teacher and mentor. Lower rates in this scale indicate perceptions of relationship control; higher rates depict perceptions of autonomy supportive relationships. Acceptable to good reliability scores have been found for the instrument with Portuguese early adolescents as a measure for parental ($\alpha = .75$), teacher ($\alpha = .80$), and mentor autonomy support ($\alpha = .78$) (Simões et al., 2018a, b). In the present study, reliability scores were high for parental autonomy support ($\alpha = .86$) and very high for teacher ($\alpha = .90$) and mentor autonomy support ($\alpha = .93$).

Perceived Competence in Learning

Perceived competence in learning was assessed using the Portuguese version (blind for review) of the Perceived Competence in Learning Scale (PCLS) (Williams et al., 1998). This scale assesses subjective competence associated to learning in general (e.g., I am capable of learning in most of the subjects I attend). The PCLS encompasses four items that are rated using a 5-point scale ranging from 1 (Never) to 5 (Always). Total scores may range from 5 to 20 points. Higher scores indicate more positive perceived competence in learning. Prior studies have delivered adequate internal consistency values for this scale ($\alpha = .85$) (Simões & Alarcão, 2011). In our study, the PCLS also denoted to be a reliable measure ($\alpha = .89$).

Portuguese and Math Grades

Portuguese and math grades for the trimester when the study took place were supplied by teachers, according to the Portuguese

middle school grading system (1 = poor; 2 = insufficient; 3 = average; 4 = good; 5 = very good).

Demographic Variables

We depicted the participants in terms of gender (0 = male; 1 = female), age (ranging from 14 to 18 years old), living with both parents (0 = no; 1 = yes) and school grade retention (0 = yes; 1 = no).

We described SES using a composite measure of parents' professional status and educational level. To do so, we first classified the mother and father's professional status into four categories, based on the International Standard Classification of Occupations-08 (International Labour Office, 2012): (a) unemployed or unoccupied; (b) non-specialized workers (farmers, fisherman and elementary occupations), (c) intermediate workers (clerical support workers, service and sales workers, and plant and machine operators), and (d) specialized workers (managers, professionals, and technicians and associate professionals).

We also classified the mother and the father's educational levels according the Portuguese educational certification system as follows: 0 = middle school (9th grade) or lower; 1 = completed high school; and 2 = completed university. Finally, we gathered parents' occupational status and school level into a SES whole measure divided in three levels: (1 = at least one of the parents was unemployed/non-specialized worker and/or did not complete middle school; 2 = at least one of the parents was an intermediate worker and/or completed high school; and 3 = at least one of the parents was a specialized worker and/or completed university).

Procedures

Our study was approved by the Ethics Committee of the University Institute of Lisbon and by The Azores Department of Education. Every school in seven municipalities of the two most populated islands of the region were asked to participate. After we obtained parental informed consent, we conducted a collective administration of the research protocol by class, in the classroom. Our data collection involved describing the research goals, requesting the participants for their agreement to collaborate, and reading the instructions for each section of the protocol. The participants had 60 min to complete the survey.

Data Analyses

We performed descriptive and correlational analyses. Afterwards, we employed LCA to classify the participants on the basis of the degree of MASA. LCA is a clustering mixture model for independent categorical variables (Celeux & Govaert, 2016). We used Latent Gold (version 5.1), a software prepared to conduct LCA, with a number of advantages over similar software: (a) modeling may include ordinal, continuous, and/or

nominal variables; (b) local independence assumption between variables is not demanded to perform LCA; and (c) exploring patterns of group membership may comprise all covariates at the same time. Therefore, by using Latent Gold we classified and predicted class membership grouping, avoiding prediction and measurement model re-estimation (Vermunt, 2010).

To conduct LCA we implemented a four-step approach (Vermunt, 2010). First, we built up an LCA model based on autonomy support measures for each of the selected support relationships. Second, we compared fit indices, namely the Bayesian information criteria (BIC), the sample-size-adjusted BIC and entropy statistics. Lower BIC and sample-size-adjusted BIC, as well as higher entropy values (closer to 1) indicated better fit. Our fit analyses also regarded posterior distribution of MASA membership to prevent subgroups with fewer than 30 participants (Wurpts & Geiser, 2014). Third, we validated the differences between MASA groups through Tukey post-hoc mean comparison tests between social support measures for all regarded sources. Finally, we estimated percentiles 25, 50, and 75 for each source of support, based on the participants' original ratings for parent, teacher and mentor, to facilitate class membership interpretation. Ratings >25th percentile indicated low autonomy support; ratings between 26th percentile and 49th percentile ratings indicated average low autonomy support; ratings between 50th percentile and 74th percentile ratings indicated average high autonomy support; ratings >75th percentile showed high autonomy support.

Once we determined the best fitting solution for MASA groups, we compared the groups regarding their distribution across all demographic variables, using Chi-Square tests. Lastly, we conducted a MANOVA to compare MASA groups on all outcome measures, setting MASA, SES and gender as fixed-factors. The model allowed for testing the interactions between MASA and gender and between MASA and SES. The bias-corrected bootstrapped estimates procedure for post-hoc mean comparisons between MASA groups using Games-Howell test was implemented; 1000 bootstrapped samples were requested referring to the 95% Confidence Intervals (CI). The same procedure was implemented for SES groups. Where needed, we also conducted effect sizes tests, using partial eta-squared statistics, and power tests analyses. Effect sizes were classified as small ($\eta_p^2 = .01$), medium ($\eta_p^2 = .06$) and large ($\eta_p^2 = .16$) (Cohen, 1988). Acceptable power was set above .80. Chi-square tests and MANOVA were conducted using SPSS 25.0.

Results

Descriptive Analysis

Percentiles were calculated to depict autonomy support means distribution, with the following results: (a) parental autonomy support (25th percentile = 16.00; 50th percentile = 19.00; 75th

percentile = 23.00); (b) teacher (25th percentile = 15.00; 50th percentile = 17.00; 75th percentile = 21.00); and (c) mentor (25th percentile = 16.00; 50th percentile = 20.00; 75th percentile = 24.00).

Correlational Analysis

Table 1 summarizes zero-order correlations for the study variables. Being a girl ($p < .01$) and displaying a higher SES ($p < .01$), is associated with better Portuguese language grades. Being younger ($p < .01$) and not having a school grade retention ($p < .01$) is also associated with stronger perceived competence in learning and better Portuguese language grades. In general, autonomy support factors are not associated with gender or SES, with the exception of a small association between higher SES and stronger parent autonomy support ($p < .05$). Autonomy support delivered by the different sources depicts medium positive correlations between each other ($p < .01$). Autonomy support factors also denote average positive correlations with perceived competence in learning ($p < .05$) and small positive correlations with Portuguese language.

Latent Class Analysis

According to Table 2, a three-classes model showed the best fit to the data, with a BIC of 2541.06, a sample-size-adjusted BIC of 4025.49, and an entropy score of .73. Although entropy was higher (.76) for a four-classes solution, a three-classes solution was retained, because it was the most interpretable one. Also, the four-classes solution included a class with very few observations ($n < 30$).

Tables 3 and 4 present the main descriptive statistics for each class. Class 1, low attuned MASA ($n = 134$; 29.91%) was characterized by youth reports of average

low autonomy support (between 26th and percentile 49th) from parent ($M = 16.13$; $SD = 3.47$) and low autonomy support from teacher ($M = 13.75$; $SD = 3.71$) and mentor ($M = 14.88$; $SD = 2.13$). Class 2, unattuned autonomy support/low teacher support was the largest group ($n = 219$; 48.88%) and was characterized by youth reports of medium low support from teacher (between 25th and 49th percentile) ($M = 16.88$; $SD = 3.83$), and average high support (between 50th and 74th percentile) from parent ($M = 19.26$; $SD = 3.74$), and mentor ($M = 21.03$; $SD = 2.60$). Class 3, high MASA ($n = 95$; 19.47%) was characterized by student reports of high support (> 75 th percentile) from parent ($M = 23.14$; $SD = 1.95$), teacher ($M = 23.02$; $SD = 1.84$), and mentor ($M = 24.02$; $SD = 1.68$).

High MASA presented a higher estimate of perceived competence in learning ($M = 16.46$; $SD = 2.81$), Portuguese grade ($M = 3.69$; $SD = .85$) and Math grade ($M = 3.55$; $SD = 1.07$), compared to other configurations of MASA (see Table 4). Differences between all the support variables were significant across the three classes ($p < .001$), according to Tukey post-hoc tests. In addition, MASA groups were equivalent regarding its proportional distribution by gender, $\chi^2(2, 446) = 1.09$, $p = .58$, age, $\chi^2(3, 445) = 8.94$, $p = .063$, living with both parents, $\chi^2(2, 446) = .40$, $p = .82$, SES, $\chi^2(3, 445) = 4.46$, $p = .348$, and school retention, $\chi^2(2, 446) = 4.46$, $p = .348$ (Table 5).

Multivariate Analysis of Variance

Using Wilks' criterion, the multivariate test for MASA group differences was statistically significant, $F(3, 445) = 14.024$, $p < .001$, $\eta_p^2 = .09$, Power = 1.00. According to the analysis, MASA groups presented significantly different results on perceived competence in learning, $F(2, 446) = 42.135$, $p < .001$, $\eta_p^2 = .16$, Power = 1.00, Portuguese language grade, $F(2,$

Table 1 Zero-order correlations between study variables

Variables	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Gender	–										
2. Age	–.10*	–									
3. Living with both parents	.02	–.11*	–								
4. SES	–.10*	–.23**	.09	–							
5. School grade retention	.10	–.71**	.15**	.30**	–						
6. Parent autonomy support	–.07	–.07	.06	.10*	.05	–					
7. Teacher autonomy support	.04	–.05	.01	.04	.04	.42**	–				
8. Mentor autonomy support	.08	–.14**	–.02	.01	.07	.46**	.52**	–			
9. Perceived competence in learning	–.03	–.16**	–.01	.10*	.17**	.33**	.35**	.30**	–		
10. Portuguese grade	.21**	–.25**	.01	.18**	.32**	.12*	.20**	.19**	.34**	–	
11. Math grade	.07	.01	.06	.01	.01	.01	.01	.01	.01	.01	–

* $p < .05$ ** $p < .01$

Table 2 Fit indices for one-, two-, three- and four-latent class solutions for latent class analysis

Fit indices	Two classes	Three classes	Four classes
BIC	2611.62	2541.06	2532.70
Sample-size adjusted BIC	4321.01	4025.49	4192.18
Entropy	.74	.73	.76

446) = 8.268, $p < .001$, $\eta_p^2 = .04$, Power = .984, and math grade, $F(2, 446) = 14.476$, $p < .001$, $\eta_p^2 = .06$, Power = .999. Post-hoc mean comparisons summarized in Table 6 further show that, in general, students reporting high MASA also denoted more positive results than students in the remaining MASA groups ($p < .001$). In addition, students in unattuned autonomy support, due to low teacher autonomy support group, also depicted significantly better outcomes in perceived competence in learning ($p < .001$) and math grade ($p < .05$) than those included in low MASA.

The multivariate test for SES group differences was also statistically significant, $F(3, 445) = 5.449$, $p < .001$, $\eta_p^2 = .04$, Power = .997. Still, between-subjects comparisons show that the differences across educational outcomes were only significant for the Portuguese grade, $F(2, 446) = 8.268$, $p < .001$, $\eta_p^2 = .04$, Power = .961, and the math grade, $F(2, 446) = 14.476$, $p < .001$, $\eta_p^2 = .06$, Power = .999. The inspection of mean comparison post-hoc tests summarized in Table 7 shows that, in general, students in a high SES condition significantly outperformed students from average and low SES condition in terms of grades ($p < .001$). Students coming from an average SES condition only outperformed low SES students in Math grades ($p < .05$).

Multivariate testing for gender group differences was statistically significant as well, $F(3, 445) = 5.636$, $p < .001$, $\eta_p^2 = .04$, Power = .945. However, in this case, between-groups differences were only evident regarding the Portuguese grade, $F(1, 447) = 14.806$, $p < .001$, $\eta_p^2 = .03$, Power = .970, indicating that girls had significantly better results than boys in this parameter.

Finally, the interactions between MASA and SES, as well as between MASA and gender were not significant across any of the outcome variables.

Table 3 Means (and standardized errors) for autonomy support variables for the three-clusters latent class analysis solution

Support sources	^a . ($n=134$)	^b . ($n=219$)	^c . ($n=95$)	Clusters differences $F(3, 233)$
Parent	16.13 (3.47)	19.26 (3.74)	23.14 (1.95)	121.57***
Teacher	13.75 (3.71)	16.88 (3.83)	23.02 (1.84)	201.11***
Mentor	14.88 (2.13)	21.03 (2.60)	24.02 (1.68)	499.39***

^a Low MASA; ^b Unattuned multiple autonomy support/Low teacher support; ^c High MASA
*** $p < .001$

Discussion

Our study delivered three main results. First, and as we expected, the number of students included in unattuned configurations of MASA was larger than the number of students included in low or high MASA groups. This result extends other findings connecting MASA to socialization indicators (Simões et al., 2018a, b). Moreover, it reflects developmental trends. The diversification of adolescents’ social network includes an increase of friendships with peers, but also a greater openness to the influence of adults other than parents (Cotterell, 2007). The most significant adults from different cores, also known as anchors (Varga & Zaff, 2017) depart from very distinct goals. During adolescence, parents remain important, but are often involved in setting and managing limits (Cotterell, 2007). Teachers may open up opportunities in terms of knowledge and learning, while upholding positive social development (Reeve, 2009). Mentors can buffer personal, social and learning risks, based on a less-hierarchical relationship that is more relevant for academic development among those depicting an average level of risk (Schwartz et al., 2011). Thus, consistency of autonomy support will tend to be the exception, rather than the rule. Moreover, in a rural area, consistent perceptions of autonomy support across multiple anchor relationships may be more complicated, especially when the studied configurations of multiple autonomy support include teachers. Autonomy support offered by family or community adults often clashes with that provided by teachers (Papadakis & Kyvelou, 2017). Parents and mentors autonomy support more often conveys local and traditional values, as well as an expectation that young generations will commit to perpetuate those values (Theodori & Theodori, 2015). Furthermore, teacher autonomy support is aligned with the educational system and contemporary values which reflect an urban ethos, thus pressing youths to project their future lives outside the community (Bæck, 2016; Farrugia, 2016). These disparities increase, therefore, the potential for a mismatch of multiple autonomy support perceptions, when occurring across different social cores (Varga & Zaff, 2017).

Second, although high MASA is an exception, we hypothesized that this sort of multiple autonomy support configuration would deliver better results across all the selected

Table 4 Means, standard deviations, and means difference tests for each outcome variable across MASA group

Outcome variables	^a . (<i>n</i> =134) M (<i>SD</i>)	^b . (<i>n</i> =219) M (<i>SD</i>)	^c . (<i>n</i> =95) M (<i>SD</i>)
Perceived competence in learning	12.68 (2.62)	14.50 (2.72)	16.46 (2.81)
Portuguese grade	3.12 (.71)	3.29 (.70)	3.69 (.85)
Math grade	2.90 (.85)	3.16 (.97)	3.55 (1.07)

^a. Low MASA; ^b. Unattended multiple autonomy support/Low teacher support; ^c. High MASA

outcome variables, compared to other MASA configurations. In this study, it is interesting to verify that students depicting low autonomy support from teachers, but average high autonomy support from parents and mentors, also outperformed

students in a low MASA condition. Our results in part extend one previous study (Guay et al., 2013) showing that more consistent MASA involving parents (mother and father), as well as teachers provides better school grades. However, and

Table 5 Results of chi-square groups: demographic variables by MASA groups

Demographic variables		Low attuned MASA	Low teacher autonomy support	High MASA	Pearson χ^2	
Gender	Male	Count	60	91	$\chi^2 (2,446)=1.09, p=.580$	
		Expected count	56	91		
		% within group	44.80%	41.60%		37.90%
	Female	Count	74	128		59
		Expected count	78	128		55
		% within group	55.20%	41.60%		62.10%
Age	14	Count	60	119	$\chi^2 (3,445)=8.94, p=.063$	
		Expected count	71	116		58
		% within group	44.80%	54.30%		61.10%
	15	Count	52	80		26
		Expected count	47	77		34
		% within group	38.80%	36.50%		27.40%
	16	Count	22	20		11
		Expected count	16	26		11
		% within group	16.40%	9.10%		11.60%
Living with both parents	No	Count	37	67	$\chi^2 (2,446)=.40, p=.820$	
		Expected count	39	64		131
		% within group	27.60%	30.60%		29.20%
	Yes	Count	97	152		317
		Expected count	95	155		317
		% within group	72.40%	69.40%		70.80%
SES	Low	Count	27	39	$\chi^2 (3,445)=4.46, p=.348$	
		Expected count	26	42		86
		% within group	20.10%	17.80%		19.20%
	Average	Count	83	143		277
		Expected count	83	135		277
		% within group	61.90%	65.30%		61.80%
	High	Count	24	37		85
		Expected count	18	42		85
		% within group	25.30%	16.90%		19.00%
School retention	Yes	Count	96	170	$\chi^2 (2,446)=4.46, p=.348$	
		Expected count	102	167		76
		% within group	71.60%	77.60%		80.00%
	No	Count	38	49		19
		Expected count	32	52		23
		% within group	28.40%	22.40%		20.00%

Table 6 Mean differences [and 95 Confidence Intervals] between MASA groups for perceived competence in learning, Portuguese grade and Math grade

Outcome variables	a.	b.	c.	ANOVA <i>F</i> tests	Effect size η_p^2
Perceived competence in learning	3.78 [2.91; 4.66]***	1.96 [1.16; 2.76]***	1.82 [1.11; 2.54]***	42.135***	.16
Portuguese grade	.58 [.34; .81]***	.40 [.19; .62]***	.17 [-.02; .37]	8.268***	.04
Math grade	.64 [.34; .95]***	.38 [.10; .67]***	.26 [.01; .51]*	14.476***	.06

^a High MASA X Low MASA; ^b High MASA X Unattuned multiple autonomy support/Low teacher support; ^c Unattuned multiple autonomy support/Low teacher support X Low MASA

*** $p < .001$; * $p < .05$

contrary to our findings, high MASA in this previous study is not significantly associated with better motivational outcomes, such as perceived competence in learning, when compared to unattuned MASA, due to lower father support. A couple of reasons can justify these dissimilarities. To begin with, our study involves a more extensive network of relationships, while the former focuses on two cores: family and school. Moreover, while the Guay et al. (2013) study involves a comprehensive set of participants, with both rural and urban origins, ours focuses on rural adolescents only. For adolescents living in the countryside, a principle that “more is better” seems to apply, when it comes to multiple autonomy support. Greater perceived consistency across autonomy support delivered by anchors from different cores can have a greater meaning among these adolescents, not only in terms of actual performance, but also in terms of stronger motivation for learning, that unattuned MASA configurations may fail to provide. Besides this, the need and efficacy of high MASA among rural adolescents signals lower levels of tension between the values of different autonomy support sources and cores and/or a greater capacity of teachers to incorporate local needs and views, while supporting their students (Bæck, 2016). Finally, these results are aligned with previous studies showing that high MASA among rural adolescents is the optimal condition to improve adolescents’ social development (Simões et al., 2018a, b).

Third, contrary to what we expected, high MASA did not level educational performance across the selected outcomes between low and high SES students as well as between boys and girls. In fact, students displaying high MASA presented

better outcomes across all educational indicators, while SES and gender did not establish these systematic differences across the same outcomes. Given that the groups are equivalent in terms of SES and gender distributions, these results further strengthen the conclusion that high MASA was more required for educational success, among these participants. This is an interesting result, given that the typical story told about educational trajectories in rural education is one of failure due to harder economic conditions (Sullivan et al., 2013), together with one of the struggle of girls to overcome gender stereotype conventions (Sadler et al., 2015). While the composition of rural populations as well as the structure of opportunities (Bæck, 2016; Reagan et al., 2019) are certainly decisive in improving students’ prospects of success, the quality of relationships across different social cores has been an underestimated factor that may need more discussion. We foresee the implications of this conclusion below.

Limitations and Implications

Our results raise new and challenging questions on the issue of MASA in rural learning environments. These questions embody our research limitations and implications.

Our report is a first attempt to uncover MASA connections with educational outcomes in rural areas. Still, it is a cross-sectional study. Future longitudinal research plans, focusing on comparisons between urban, suburban and rural adolescents will strengthen our knowledge on MASA configurations within- and between-sites impacts.

Table 7 Mean differences [and 95 Confidence Intervals] between SES groups for Portuguese grade and Math grade

Outcome variables	a.	b.	c.	ANOVA <i>F</i> tests	Effect size η_p^2
Portuguese grade	.44 [.18; .69]***	.40 [.20; .61]***	.04 [-.17; .24]	8.268***	.04
Math grade	.89 [.57; 1.22]***	.59 [.33; .86]***	.26 [.03; .56]*	14.476***	.05

^a High SES X Low SES; ^b High SES X Average SES; ^c Average SES X Low MASA

*** $p < .001$; * $p < .05$

The meaning of high MASA configuration needs to be clarified. In principle, its connection with more positive educational outcomes shows that all anchor relationships are inclined to support adolescents' commitment to education, meaning a higher chance of them leaving the countryside (Farrugia, 2016; Theodori & Theodori, 2015). However, adults, including teachers, may also be merging their support of adolescents' autonomy by better integrating local values. In-depth qualitative studies may be quite helpful in clarifying MASA underlying processes, namely how anchor adults are supporting rural adolescents' autonomy support.

We also used a person-centered approach. To better connect macro and micro levels of analysis, person-centered approaches need to be articulated in the future with multilevel analysis, conveying a person level, but also social and cultural levels of analysis. This will deliver a more complete picture of the MASA interplay with educational results in rural areas, accounting for cultural (e.g. values) and structural (e.g. teacher mobility) factors (Bæck, 2016; Reagan et al., 2019).

Finally, perceived competence in learning is only one of the dimensions of self-regulated learning. Future research efforts may contribute to a greater clarification of MASA relevance in overall self-regulated learning by integrating meta-cognition and strategic planning indicators in the plan of analysis (Boekaerts & Corno, 2005).

Conclusion

We believe our findings lead to two main contributions to the literature. First, our results show that a MASA approach to educational outcomes may add to competitive or interactive measurement trends. Assessing the most relevant autonomy support source for different educational indicators, above and beyond other sources influence continues to be required. Knowing in which circumstances two different anchors can compensate or potentiate each other to improve school performance has certainly been vital for informing programs and policies. However, a more integrated, ecological perspective of multiple autonomy support seems to offer new contributions that are not highlighted by prevailing evaluation approaches in the field. A MASA approach brings strong (un)intended cooperation between meaningful adults from different social cores to the fore as the most effective pattern of multiple autonomy support, a result that might be incorporated as a purposive feature of stronger educational interventions. However, while this trend has been found across several cross-sectional studies and youth development indicators, this conclusion certainly merits more complex research designs, in a near future.

Second, the effect of high MASA on improving educational outcomes among these youths is above and beyond, and more systematic, than factors usually playing a central role in rural

educational trajectories, such as SES and gender. Therefore, our findings sustain the need to go beyond the usual, fatalistic explanations for rural education failure, by further looking at rural students' social ecology potential in upholding successful academic trajectories. By doing so, rural education success may more easily be appropriated as rewarding for both youths and their communities.

Acknowledgments This work was funded by a research grant from the Foundation for Science and Technology (Grant number SFRH/BPD/99616/2014). The authors wish to thank to all students and schools involved in the research.

Data Availability The datasets generated during and analysed during the current study are available from the corresponding author on reasonable request.

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

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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

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