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The influence of attentional control and emotion regulation on the optimal experience of adolescents' daily life: A longitudinal study

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STATEMENT OF INTEGRITY

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I hereby declare having conducted this academic work with integrity. I confirm that I have not used plagiarism or any form of undue use of information or falsification of results along the process leading to its elaboration.

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The influence of attentional control and emotion regulation on the optimal experience of adolescents' daily life: A longitudinal study

ABSTRACT

Researchers have shown that optimal experience has beneficial short and long-term effects on the psychological functioning and development of adolescents. They have also identified what individual and contextual factors contribute to the promotion of this optimal psychological state. Nonetheless, there is still a lack of knowledge on how an individual's attentional processes, emotions, and the regulation of those emotions interact with daily contexts to create the conditions to foster optimal experience in adolescence. In line with this, the present dissertation aimed to examine, in a first moment, how challenge-skill, effortless attention, positive affect, negative affect, and contexts (activity and company) explain the variations in the levels of optimal experience. For this, we conducted a study with 245 Portuguese adolescents (14–19 years old, 63% female) and used the Experience Sampling Method (ESM, Csikszentmihalyi & Larson, 1987). Findings revealed that challenge–skill, effortless attention, and positive affect had a positive effect on optimal experience, while negative affect had a negative effect. Also, that effortless attention and the contexts mediated and moderated the relationships, respectively. In a second moment, this dissertation aimed to examine the influence of self-regulation abilities, namely attentional control and emotion regulation strategies (cognitive reappraisal and expressive suppression), in adolescents' daily optimal experience. We conducted a study with 110 Portuguese adolescents (14-19 years old, 72% female), in which we examined the main effects of these predictors at two levels of analysis (trait and state) and their interaction with contexts (activity and company). We used retrospective measures and the ESM at two-time points across the school year (Wave 1 and Wave 2). Results showed that attentional control and emotion regulation strategies were significant predictors of optimal experience at different levels of analysis and contexts moderated some of the relationships. In general, this dissertation shows promising findings on the role of self-regulation abilities and emotions for an optimal psychological daily functioning in adolescence and their interplay with daily activities and companies. It highlights the relevance of stimulating the capacity of attention control and the flexible use of emotional regulation strategies in interventions with adolescents that promote optimal experiences in daily life.

Keywords: adolescents, attentional control, emotion regulation strategies, experience sampling method, optimal experience.

A influência do controlo atencional e da regulação emocional na experência ótima da vida diária de adolescentes: Um estudo longitudinal

RESUMO

A experiência ótima tem efeitos benéficos a curto e a longo prazo no funcionamento psicológico e no desenvolvimento dos adolescentes. Nas últimas décadas, os investigadores identificaram os fatores individuais e contextuais que contribuem para a promoção de experiência ótima. No entanto, existe ainda uma lacuna em termos de conhecimento científico sobre a influência dos processos atencionais, das emoções e da regulação dessas emoções, em interação com os contextos diários. A presente dissertação pretendeu analisar, num primeiro momento, como a perceção de desafio-competência, a atenção sem esforço, o afeto positivo e negativo, e os contextos (atividade e companhia) explicam as variações na experiência ótima. Para tal, conduzimos um estudo com 245 adolescentes portugueses (14–19 anos, 63% sexo feminino) e utilizámos o *Experience Sampling Method* (ESM, Csikszentmihalyi & Larson, 1987). Os resultados revelaram que a perceção de desafio-competência, a atenção sem esforço e o afeto positivo tiveram um efeito positivo, enquanto que o afeto negativo teve um efeito negativo. Além disso, a atenção sem esforço e os contextos mediaram e moderaram estas relações, respetivamente. Num segundo momento, pretendemos analisar a influência das capacidades de autorregulação, nomeadamente o controlo atencional e as estratégias de regulação emocional (reavaliação cognitiva e supressão emocional), na experiência óptima da vida diária. Realizámos um estudo com 110 adolescentes portugueses (14-19 anos, 72% sexo feminino), no qual examinámos os efeitos destes preditores em dois níveis de análise (traço e estado) e a sua interação com os contextos (atividade e companhia). Para isso, usámos medidas retrospetivas e o ESM em dois momentos do ano escolar (*Wave 1* e *Wave 2*). Os resultados mostraram que o controle atencional e as estratégias de regulação foram preditores significativos em diferentes níveis de análise e que os contextos moderaram algumas dessas relações. Em geral, esta dissertação mostra resultados promissores sobre o papel da autorregulação e do afeto na experiência ótima dos adolescentes, sustentada numa perspetiva ecológica de funcionamento. Evidencia, ainda, a pertinência de se estimular o controlo atencional e o uso flexível das estratégias de regulação emocional em intervenções com adolescentes que promovam experiências ótimas na vida diária.

Palavras-chave: adolescentes, controlo atencional, estratégias de regulação emocional, experience sampling method, experiência ótima.

LIST OF ABBREVIATIONS

AC – Attentional Control

CR – Cognitive Reappraisal

ER – Emotion Regulation

ES – Expressive Suppression

ESM - Experience Sampling Method

ICC – Intraclass correlation

NA - Negative Affect

OE - Optimal Experience

PA – Positive Affect

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INTRODUCTION

Theoretical foundations: Developmental science and positive psychology

Over the past decades, the theoretical framework for the study of human development has gradually transited from developmental psychology to developmental science. This progressive transformation has led to the emergence of a broader and interdisciplinary field with the recognition and integration of the different systems involved in human development. This reflected the changes in key theoretical principles such as the integration of nature-nurture approaches, the acceptance of an ecology of human development, and the focus on the relationship between levels of analysis instead of the effects of a single level as the unit of analysis (Lerner, 2006).

Along with these conceptual changes in developmental science, a new field of research has emerged in psychology. In contrast with the more traditional perspective on mental health almost exclusively focused on the psychological problems and on psychopathology, the positive psychology movement, embedded in the humanistic approach, has recovered the focus on the positive aspects of human existence that make live worth living (Seligman & Csikszentmihalyi, 2000). This new field of positive psychology has brought a fresh lens for the study of human behavior becoming a "growing and vibrant sub-area within the broader field of psychology, committed to using the same rigorous scientific methods as other sub-areas, in the pursuit of understanding well-being, excellence, and optimal human functioning" (Donaldson, Dollwet, & Rao, 2015, p. 193). Over the years, positive psychology has developed in successive and overlapping waves of growing knowledge and complexity. From its initial and enthusiastic focus on positive phenomena (first wave), positive psychology moved into a more critical analysis period (second wave) that resulted in the adoption of a more balanced approached, in which both positive and negative dimensions of mental health and human functioning started to be considered and integrated (Lomas, Waters, Williams, Oades, Kern, 2020). More recently, a third wave seems to be emerging in which researchers have started to go beyond the individual and to consider also the contexts, groups, and systems, to employ designs other than cross-sectional, to include a more diverse array of methodologies, and to make more multicultural and interdisciplinary studies (Donaldson et al., 2015; Lomas et al., 2020).

Merging developmental science and positive psychology serves as a powerful and well-established theoretical foundation for researchers to investigate various aspects of human psychological functioning

across the entire human lifespan and, specifically, for this present dissertation, to investigate aspects of a positive and optimal functioning across the developmental period of adolescence.

Researching adolescence from a positive developmental perspective

Researching adolescence under the scope of developmental science and positive psychology means to search in an optimistic and proactive way for individual characteristics and their ecologies that, together, can promote positive human development across this sensitive age period (Lerner, 2006). Adolescence is a period of rapid growth, maturation, and learning of new knowledge, skills, and social competence to successfully transition to adult life. Although it is associated with a set of risks and vulnerabilities well established in literature, it is also a time of opportunities created by the intense changes in cognitive, affective, social, and motivational domains (Dahl, Allen, Wilbrecht, & Suleiman, 2018). Positive youth development framework (Lerner, 2005) embraces this perspective by focusing on the potentialities of adolescents rather than solely on their incapacities, envisioning young people as resources for society than as problems to be managed (Damon, 2004). Although recognizing the risks and adversities along the growth process, it emphasizes the competences and abilities of the youngsters to understand and respond to the many difficult developmental challenges and tasks they encounter, viewing them as producers of their own development (Larson & Tran, 2014). Nowadays, adolescents are challenged to respond to an unprecedented multitude of demands within an array of social and global changes. Understanding the factors that create windows of opportunity to promote positive patterns of functioning or to enhance successful developmental trajectories is a main goal in the agenda of developmental science, as it is in the study of adolescent's positive development.

Expanding the knowledge on optimal experience: The influence of self-regulation

One of the core constructs of the positive psychology movement that is closely linked to positive youth development is that of 'flow' or optimal experience. Csikszentmihalyi (1975) developed the flow theory that focuses on this optimal state of functioning, in which all the contents of consciousness are in harmony with each other and with the goals of the self, causing a sense of intense and deep involvement, enjoyment, and absorption in the task being performed. A considerable amount of research has been devoted to understand its phenomenological characteristics, antecedents and consequences, as well as its biological, cultural and psychological features (Delle Fave & Bassi, 2016). Researchers have found

that every individual can experience this optimal psychological state across different cultures and within diverse activities (Csikszentmihalyi, 1997; Delle Fave & Massimini, 2005). In particular, for adolescents, flow is an important daily subjective experience that offers several developmental opportunities of growth and flourishing (Freire, Tavares, Silva, & Teixeira, 2016). Indeed, the association of optimal experience with adolescents' positive development is well established in literature, with several studies showing short and long-term positive effects (e.g. Bassi, Steca, Monzani, Greco, & Delle Fave, 2014; Csikszentmihalyi & Larson, 1984; Rogatko, 2009). This positive impact of optimal experience on adolescents' functioning makes a more in-depth study of the factors that lead to flow relevant and necessary. Dispositional and situational factors have been identified as important factors for explaining differences in optimal experience frequency and intensity (Schmidt, Shernoff, & Csikszentmihalyi, 2007). Nonetheless, this is a complex and unfinished task and further work is needed to continue the process of acknowledging the influence of other factors, especially those psychological constructs that have proved to be protective factors for general psychological and behavioural outcomes for children and adolescents.

One group of skills that have been identified in recent research as crucial factors for facing the fundamental adaptive challenges of the adolescent period are those included under the broader concept of self-regulation (Gestsdottir & Lerner, 2008). Self-regulation is essential for surviving and managing all the demands in everyday life by allowing the regulation of attention, emotions, and behaviors (Diamond & Aspinwall, 2003). The ability of self-regulation may be particularly important for adolescents, given the number of novel interpersonal and emotional situations that they must navigate across daily life. Theoretical models and empirical findings indicate that self-regulation capacities emerge and stabilize during childhood and adolescence (Atherton, Lawson, & Robins, 2020; Raffaelli, Crockett, & Shen, 2005). Particularly, adolescents become more efficient in regulating their emotions via reappraisal as their cognitive functioning increases during development (McRae, Ochsner, & Gross, 2010). Literature has shown that self-regulation is positively associated with prosocial behaviors and academic achievement and negatively with internalizing and externalizing problems in adolescence (Eisenberg et al., 2005). For the purpose of the present dissertation, we will focus on two self-regulation abilities: attentional control and emotion regulation, which will be presented and discussed later.

Assessing optimal experience in daily life: The use of the experience sampling method

The capacity to experience flow is the result of the individual abilities that are genetically inherited or learned throughout development and the structure of the external environment (Csikszentmihalyi &

Csikszentmihalyi, 1988). In line with this, it is imperative that researchers assume an ecological perspective when studying optimal experience to understand the influence of the complex and dynamic interplay between the persons and the contexts in which they are embedded (places, activities, and companies). Although optimal experience can be assessed through the more traditional methods such as retrospective questionnaires, it can also be captured in its different momentary expressions across the different contexts of daily existence. For this, the daily life methods appear as a suitable choice for assessing the person in its natural environment since they allow the assessment of psychological features of individual experience as they occur in the real world (Mehl & Conner, 2011).

One daily life method that has been most used in optimal experience research is the experience sampling method (ESM; Csikszentmihalyi, Larson, & Prescott, 1977; Hektner, Schmidt, & Csikszentmihalyi, 2007). Experience sampling refers to the capturing of repeated sampling of momentary experiences such as events, behaviors, feelings or thoughts at the moment of, or close to, their occurrence and within the context of a person's everyday life (Riediger, 2010). For this reason, ESM is considered a real-time and an ecological assessment method. The standard protocol implied that each participant carried an electronic beeper or pager and a self-report booklet to answer a set of questions about their momentary experience whenever the device signalled them. Progressively, with the development of new technologies and the widespread use of smartphones and availability of specific software, the traditional use of pen-and-paper is being replaced by the adoption of mobile devices (Van Berkel et al., 2017; Xie et al., 2019). In the present dissertation, we still used the pen-and-paper approach since not all participants had a smartphone available at the time of the data collection and because the software available at that time offered no possibility to include open questions in self-reports.

In general, several reasons support the choice of using daily life methods in research, in particular the ESM. From a methodological standpoint, the immediacy of the measurement avoids the retrospective memory distortions and cognitive heuristics biases often present in retrospective self-reports or interview methods. Also, the fact that it takes place in the natural environment of the person enhances the ecological validity of the information assessed, enabling the generalizability of results. From a conceptual perspective, it allows the analysis of the natural intra-individual variation of human behaviour and experience, offering insights into the short-term psychological processes and fluctuations occurring at the within-person level (Wilhelm, Perrez, & Pawlik, 2011). Although the prevailing emphasis in most research is on differences between individuals at given points in time, the importance of within-person processes for understanding psychological phenomena have been acknowledged theoretically and empirically by

many researchers in the field (Riediger, 2010). Another conceptual benefit of the experience sampling method is that it makes accessible to scientific investigation the role of daily contexts. For the case of adolescents, it can give important insights about the influence of the educational, social, and personal environments on their daily optimal experiences. Finally, a note for the considerable advantage of applying ESM in conjunction with other methods such as global self-reports, especially when researchers need to assess multiple traits or the same constructs at the trait, aggregate, and state levels. By adopting a multi-method approach, researchers can benefit from the strengths of each assessment method, such as the longer time frame covered by retrospective self-reports and the ecological nature of ESM (Scollon, Kim-Prieto, & Diener, 2003).

Despite these advantages, using ESM in research comprises significant challenges that researchers must be aware when they decide to conduct daily life studies. ESM is a resource-intensive and costly assessment method as it implies the use of a set of electronic devices and equipment to be carried by each participant. Due to the demanding nature of obtaining multiple and repeated assessments from the same individuals across time (e.g. a week), it also places a much larger burden in participants then single-time questionnaires. This could interfere with the motivation and commitment of participants and, consequently, to have implications in terms of representativeness and attrition of the sample. This means that the participants who decide to volunteer in such an intensive longitudinal design could be over- or underrepresented in the sample or could drop out during the study. Another important challenge is "reactivity" that implies that the phenomena under study may change because of measurement or reporting. Asking participants to respond to the same questions repeatedly over time could increase their attention and awareness to some internal states or behaviors, which in turn may lead to changes in those behaviors (Riediger, 2010). Nonetheless, researchers can apply specific recommendations to solve some of these challenges/limitations (Scollon et al., 2003). In sum, when applied adequately, ESM represents a powerful tool to respond to new research questions and examine them in greater depth at different levels of analysis.

The use of ESM in empirical studies has brought already some evidence about normative daily patterns and fluctuations in adolescents' daily psychological functioning (Csikszentmihalyi & Larson, 1984; Schmidt et al., 2007), and specifically, in adolescents' daily optimal experiences and its interaction with everyday contexts (Bassi & Delle Fave, 2012; Choe, Kang, Seo, & Yang, 2015; Freire, Lima, & Fonte, 2009). The present dissertation intends to go beyond this and add into the equation new psychological variables that may have an important influence on the levels of adolescents' daily optimal experience.

The use of ESM will provide a fine-grained and more detailed picture about the predictor role of self-regulation abilities in adolescents' optimal experiences of daily life, and will allow to analyse them in their aggregate and sate manifestations. Combining the ESM with the use of global self-reports will provide information on the influence of these predictors at the trait level. The results of this endeavour may open new avenues for future research and inform how practitioners may improve and promote optimal experiences in adolescents' daily lives.

Aims and structure of the dissertation[1]

The primary aim of the present dissertation was to evaluate the influence of adolescents' attentional control and emotion regulation in daily optimal experience. For attaining this main goal, we divided the doctoral project into several steps along a line of continuous and progressive work.

We have first made a literature review to evaluate the state-of-the-art on the several psychological constructs under study. Specifically, we aimed to collect the evidence-based knowledge about optimal experience, attentional control, and emotion regulation in adolescence and their relationship with each other and with adolescent's positive development. As a result of this first step, we have made a theoretical paper (published in 2016) with the title "Flow experience, attentional control, and emotion regulation: Contributions for a positive development in adolescents", which we present in Chapter I. In this conceptual task, we have reviewed the major findings concerning the importance of flow or optimal experience in the lives and development of adolescents and the influence of individual and contextual factors in optimal experience. We also tried to bring into discussion the contribution of other psychological constructs that had already a preponderant role in the domain of psychological functioning, well-being, and psychopathology. We are referring to attentional control and emotion regulation, two self-regulation processes that have not been thoroughly investigated yet, regarding their impact on optimal experience, in general and especially in adolescence. In this theoretical review, we started to introduce the concept of flow or optimal experience and its relationship with adolescents' positive development. Then, we presented the constructs of attentional control and emotion regulation (specifically the use of emotion regulation strategies), the empirical evidence about their association with healthy and unhealthy psychological functioning, and their unique link (or possible link) with flow experience. We also debated about how these three constructs could be interrelated and how literature supports this assumption. We

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[1] The project of the current dissertation was approved by the Ethics Committee of the University of Minho (Appendix).

then presented some concluding thoughts on the importance of adopting an integrated approach that combines individual and contextual factors for explaining differences in optimal experience, and the methodological consequences of this choice. Regarding this matter, we highlighted the adequacy of using real-time daily life methods, such as the experience sampling method (ESM; Csikszentmihalyi et al., 1977; Hektner et al., 2007), for capturing the interaction between the person and the contexts within an ecological perspective. We proposed the use of longitudinal designs and mixed methodologies for obtaining in-depth understanding of the predictive power of attentional control and emotion regulation in optimal experience within the real world of adolescents. Finally, we have made a brief summary on the implications of researching the above-mentioned relationships for intervention with adolescents that aim to promote higher levels of optimal functioning in the everyday lives of adolescents.

Along the review process, we acknowledged that general research about flow experience in adolescence was still scarce, although initial studies in flow domain had focused mostly on adolescents (Adlai-Gail, 1994; Carli, Delle Fave, & Massimini, 1988; Hektner & Csikszentmihalyi, 1996). Therefore, we first intended to understand better and bring additional empirical evidence about what factors nowadays contribute to optimal experience in adolescence. For this, we run a first empirical study under the title "Internal and external factors underlying variations in adolescents' daily optimal experiences" (Chapter II), in which we conceived and tested a model that included some well-known predictors such as the challenge-skill relationship and some daily contexts, such as activities and companies. Nevertheless, more importantly, we included in this model other variables (effortless attention, positive affect, and negative affect) that could influence optimal experience as well, as suggested by theoretical frameworks and some empirical studies. Effortless attention is considered a heightened state of attention that is not perceived as being effortful (Bruya, 2010). Researchers initially assumed that this was a main characteristic of flow experience, but the findings of some studies suggested that effortless attention could itself influence the achievement of an optimal state of functioning (Esteban-Millat, Martínez-López, Huertas-García, Meseguer, & Rodríguez-Ardura, 2014; Harris, Vine, & Wilson, 2017). Although being conceptual different from the construct of attentional control, both phenomena are under the broader domain of attentional processes that is considered by flow theory the primordial and central cognitive resource for controlling consciousness and achieving a state of flow (Nakamura & Csikszentmihalyi, 2002). Thus, for these reasons we decided to include effortless attention in this first empirical study. We considered relevant to include also in this first study the constructs of positive and negative affect as predictors of adolescents' daily optimal experience. We intended to first test the influence of emotions in

adolescents' optimal experience, to confirm if these ones would be relevant correlates to take in account when studying later the influence of emotion regulations strategies. Besides, the findings in literature showed a weak or almost inexistent evidence of the impact of affect in adolescents' optimal experience, namely for negative affect. In sum, in our first empirical study, presented in Chapter II, we tested the predictive power of internal psychological states (challenge-skill perception, effortless attention, positive affect, and negative affect) and contextual variables (activity and company) on the optimal experience of adolescents' daily life. We run a series of multilevel models within a sample of 245 adolescents and 7,967 observations obtained through the experience sampling method (ESM; Csikszentmihalyi et al., 1977; Hektner et al., 2007). In this first study, we have corroborated the influence of some well-established individual and contextual variables (i.e., challenge-skill, activity, and company) and have brought some initial evidence about the predictive role of those less studied variables in daily optimal experience: effortless attention and positive and negative affect. Furthermore, and in an innovative way, we have shown the mediator role of effortless attention and the moderator role of contexts in these relationships.

In a third and final step, following the main goals of the dissertation and the results obtained in the first study, we conducted a second empirical study. We examined the contribution of our main predictors - attentional control and emotion regulation strategies (cognitive reappraisal and expressive suppression) - in adolescents' daily optimal experience. We included positive and negative affect as covariates in the multilevel models tested since they have shown a significant association with optimal experience in the first study. We also included demographic variables (gender, school year) and the contextual variables activity and company since we intended to examine their interaction with our main predictors in predicting daily optimal experience. Therefore, we present the second empirical study in Chapter III under the title "Predicting adolescents' optimal experience in daily life: The role of state and trait levels of attentional control and emotion regulation and the moderation of daily contexts". In this study, we employed a mixed-methodological approach in data collection, by using a combination of different assessment measures. We used the experience sampling method (ESM; Csikszentmihalyi et al., 1977; Hektner et al., 2007) to assess the constructs at a state level and global retrospective self-reports to measure the same constructs at the trait or dispositional level. Integrating in the same study stable (trait) predispositions and momentary (state) expressions increases the robustness of studies as it allows to detect between-person differences and within-person variability (Beckmann, Wood, & Minbashian, 2010). This study allowed us to disentangle the trait and state influences of attentional control and emotion regulation in adolescents' optimal experience. The use of an integrated approach that investigates traits and states simultaneously

has been employed in personality psychology to predict behavior more effectively (Sosnowska, Kuppens, De Fruyt, & Hofmans, 2020).

Also in this study, we used a daily life method (ESM) that has allowed us to gather momentary and repeated individual assessments across a short period (e.g. one week), being therefore considered an intensive longitudinal method (Bolger & Laurenceau, 2013). Along with this, we conceived a longitudinal design at a macro-level as well. We collected data in two-time points across a wider period: adolescents reported their experience with ESM and with retrospective questionnaires at the beginning of the school year (Wave 1) and at the end of the year (Wave 2). We intended to respond to the need of longitudinal studies in this psychological area and to examine specifically whether the relationships between the constructs changed across time. In this sense, we conducted several multilevel models to test whether state attentional control and emotion regulation strategies predicted optimal experience, concurrently and prospectively, while adding the interaction of contexts; and to test the existence of cross-direct and cross-level interaction effects of trait and state attentional control and emotion regulation strategies in adolescents' optimal experience. 110 adolescents participated in the study, with a corresponding total of 6466 observations. The findings add to the existent scientific knowledge a broader view of what can influence daily optimal experience in youth by bringing into scene some unexplored relevant psychological constructs. Moreover, this second empirical study highlights the importance of combining different assessment methods in daily research to test the relationships at different levels of analysis and, consequently, to have a more accurate picture of what kind of influences can co-occur in explaining the variations in adolescents' optimal experience.

Following the three chapters, the present dissertation includes a final section, in which we discuss and elaborate the main conclusions, highlighting the most innovative results that contribute for the scientific advancement in the flow research field. We also make some final considerations concerning future research and implications for practitioners. Particularly, in terms of how practitioners should target self-regulation abilities in interventions, considering their specific interaction with the type of activity and company, to promote optimal experience in this age period.

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CHAPTER I

Flow experience, attentional control, and emotion regulation: Contributions for a positive development in adolescents[2]

Abstract

Research has shown that optimal experiences lead to positive development outcomes. Adolescence is a critical period for the engagement in daily optimal experiences, namely, flow experience, since it is a period of experimentation and definition of interests. Adolescents are more willing to attend new challenges and develop new skills, finding more opportunities within contexts to develop engaged and happy lives. In this article, we review the major findings of the impact of flow experience in adolescents' lives and positive development, and the individual and contextual factors associated with this psychological state of consciousness. We specifically relate attentional control and emotion regulation concepts to flow experience. We discuss the possible link between flow and these self-regulation abilities and its potential for positive adolescent development. Finally, we make some conclusions and suggest new lines for future research concerning predictors of flow experience within a social and ecological framework.

Keywords: flow experience, attentional control, emotion regulation, adolescents, positive development.

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1. Introduction

A positive developmental approach to the study of adolescence brings the possibility to unveil processes and mechanisms of what constitute an optimal functioning in teenage years, which can eventually be applied to those who are not living satisfactory and enriching lives (Rich, 2003). This positive emphasis adds to the problem and risk perspective a new way of conceptualizing development and brings some changes in what constructs should be the target of research and intervention (Tolan, 2014).

Flow experience appears as one central construct for research about adolescents' optimal and positive development. Flow experience is defined as an optimal psychological state characterized by a profound absorption, total concentration, enjoyment and intrinsic motivation in the activity (Csikszentmihalyi, 1990). Csikszentmihalyi (1975, 1990) studied the flow concept extensively and its relationship with adolescents' well-being, psychosocial adjustment and academic achievement (Csikszentmihalyi & Larson, 1984). Literature has been trying to identify the factors that contribute to the occurrence of flow experience in adolescence. Cognitive, emotional, motivational and social variables, along with contextual factors have proven to be important for the occurrence of flow experience (Schmidt, Shernoff, & Csikszentmihalyi, 2007). However, there is still a lack of research on this area, especially regarding the role of individual self-regulation abilities.

Adolescence is a developmental period marked by major changes in the way adolescents control their thoughts, emotions, and behaviors. Thus, self-regulatory abilities are of extreme importance at this age, since they represent one of the mechanisms through which adolescents can successfully face the challenging tasks of the teenage years (Steinberg, 2005). Attentional control and emotion regulation are at the core of self-regulation abilities (Raffaelli, Crockett, & Shen, 2005). Attentional control is defined as the capacity to consciously and voluntarily regulate one's attention, focusing and switching attention when needed (Derryberry & Reed, 2002). Emotion regulation refers to the individual ability to use a set of processes to regulate emotions (Gross, 1998). Researchers have consistently associated these two constructs with the onset and maintenance of various psychological disorders in adolescence (Chaplin & Cole, 2005; Muris, Van Der Pennen, Sigmond, & Mayer, 2008; Racer & Dishion, 2012; Southam-Gerow & Kendall, 2002). However, in recent years, empirical evidence showed that attentional control and emotion regulation are also positively associated with indicators of well-being and positive functioning (Gross & John, 2003; Gumora & Arsenio, 2002; Kuhnle, Hofer, & Kilian, 2012; Teixeira, Silva, Tavares, & Freire, 2015; Vasey, Harbaugh, Mikolich, Firestone, & Bijttebier, 2013).

The aim of this paper is to present the constructs of flow experience, attentional control, and emotion regulation, how they interact and how they contribute to positive and optimal development in adolescence. We organized this paper into five parts. First, we present the conceptual framework of flow experience and the impact of this experience on adolescents' lives and developmental trajectories. We also review the major findings of person-level characteristics and the internal and external dimensions of experience associated with flow experience. Then, in a second and third part respectively, we focus specifically on attentional control and emotion regulation, presenting the concepts and their relation to psychological disorders and positive adolescent development. We review the literature concerning the relation of each one to flow experience. In a fourth part, we discuss the possible link between all these three concepts with the flow theory as background and within a positive developmental approach. Finally, we make some conclusions and point toward new directions for research on adolescence and optimal development.

2. Flow Experience

In the last decades, more researchers had become interested in studying the positive (rather than negatives) aspects of adolescent functioning and how these relate to positive youth trajectories and developmental outcomes (Rich, 2003). Embracing the idea that adolescents are producers of their development (Larson & Tran, 2014; Lerner, 1982; Seiffge-Krenke, Kiuru, & Nurmi, 2010), it becomes relevant to know how adolescents positively address the wide range of developmental challenges they face in their daily lives.

The study of the quality of subjective experience during teenage years has grown as an important issue to deepen the knowledge about adolescent daily functioning from an ecological perspective (Csikszentmihalyi, Larson, & Prescott, 1977; Schmidt et al., 2007). Investigating subjective experience had brought interesting possibilities for learning more about interactions among adolescents and their contexts in their daily lives (Bassi & Delle Fave, 2004; Csikszentmihalyi & Larson, 1984). It also has informed about opportunities and constraints for reaching an optimal functioning (Swann, Keegan, Piggott, & Crust, 2012), particularly, for adolescents attaining optimal psychological states when involved in daily activities (Choe, Kang, Seo, & Yang, 2015).

The concept of flow experience was introduced by Csikszentmihalyi (1975) to represent those moments of optimal psychological functioning where everything in the person seems to 'flow' in a natural and synchronized way. People who experience a state of flow report a loss of self-consciousness and a

total focus on the activity, feeling that inner sensations, rules, goals, challenges, and feedback are interacting smoothly and orderly. When in a flow state, individuals function at their fullest capacity in an effortless and enjoyable manner (Csikszentmihalyi, 1990). Flow theory postulates that flow experience has six dimensions: a) an intense and focused concentration; b) a merging of action and awareness; c) a sense of being in control; d) a loss of self-consciousness; e) a sense of distortion of time and f) intrinsic motivation while engaged in the activity. For entering into a flow state, three pre-conditions must be met: a balance between perceived high challenges and high skills, clear goals for the activity and immediate feedback (Nakamura & Csikszentmihalyi, 2002). Research has shown that individuals can experience flow in all kind of activities and contexts (Csikszentmihalyi, 1997) and that people from different cultures describe the experience of flow in a similar way (Delle Fave & Massimini, 2005; Massimini, Csikszentmihalyi, & Delle Fave, 1988).

The conceptual flow model, which researchers have refined over the years (Csikszentmihalyi, 1975; Delle Fave & Massimini, 2005; Massimini & Carli, 1988), considers that to reach a flow state and to have an enjoyable experience, challenges and skills must match at a higher level than the individual average. Flow is a dynamic state: a shift in this challenge-skill balance modifies subjective experience and gives rise to other subjective states. The initial Four Channel Model (Csikszentmihalyi, 1975), operationalizes four different subjective experiences: flow (high challenges, high skills), anxiety (high challenges, low skills), relaxation (low challenges, high skills) and apathy (low challenges, low skills). Regarding the quality of experience, flow corresponds to an optimal experience whereas apathy is the worst daily experience individuals can have (Csikszentmihalyi & Csikszentmihalyi, 1988). An Italian research team refined the initial model and developed the Experience Fluctuation Model, an eight-channel and more complex model (Massimini & Carli, 1988). It adds four transitional channels to the initial Four Channel Model: activation, control, boredom, and preoccupation, which represent subtle changes concerning the quality of subjective daily experience. Although some authors have criticized this type of flow conceptualization (Løvoll & Vittersø, 2014), the four or eight-channel model have been extensively used in flow research.

Following Csikszentmihalyi's initial theoretical and empirical work, other researchers continued to study flow experience in a diverse array of settings like sport, school, work and leisure (e.g. Csikszentmihalyi & Csikszentmihalyi, 1988; Csikszentmihalyi & LeFevre, 1989; Jackson, Kimiecik, Ford, & Marsh, 1998). In particular, research in sport psychology has largely contributed to the study of flow concept in athletes (e.g. Jackson, 1992, 1995, 1996; Jackson et al., 1998) and to the development of self-report instruments to assess flow experience (Jackson & Eklund, 2002; Jackson & Marsh, 1996;

Marsh & Jackson, 1999). Considering a componential approach, which integrates the nine dimensions of flow experience, sports researchers developed the Dispositional Flow Scale-2 (DFS-2; Jackson & Eklund, 2002) and the Flow State Scale-2 (FSS-2; Jackson & Eklund, 2002; Jackson & Marsh, 1996). These instruments measure, respectively, the dispositional tendency to experience flow in general (broad trait) or in specific activities (domain-specific trait) and the intensity of flow experience within a particular event recently experienced (state). They have been used extensively in areas other than sport (e.g. Fullagar & Kelloway, 2009; Rogatko, 2009; Wang, Liu, & Khoo, 2009).

Other researchers have used alternative approaches to measuring flow experience (see review by Moneta, 2012). Based on the descriptions of flow obtained in interviews with artists and people with different occupations, Csikszentmihalyi developed the Flow Questionnaire (FQ; Csikszentmihalyi & Csikszentmihalyi, 1988) to measure the prevalence of flow in general and in specific contexts. The FQ presents definitions of flow and asks respondents if they have had similar experiences and in which situations or activities. Then they have to rate their subjective experience when they are engaged in those activities. Another approach used a more complex measurement method to capture flow in daily experience. The Experience Sampling Method (ESM; Csikszentmihalyi et al., 1977) is a real-time measure that was developed to assess the internal dimension (perceptions of challenges and skills and cognitive, emotional and motivational components) and the external dimensions (location, company, activity) of momentary experience. Respondents carry an electronic device along one week. This equipment signals them (randomly or pre-programmed) to respond to a brief questionnaire about the experience they were having at that moment. This methodology allows researchers to have samples of respondents' daily momentary experience, therefore, measuring flow and the quality of experience associated with it. Researchers can then analyze data at a person-level or a beep-level which gives them an amount of additional and valuable information about the interplay between the person and his/her contexts.

The reported measures allow researchers to assess flow experience based on different conceptual approaches. Despite the advancements in flow measurement, future research should continue to improve the different measurement methods for obtaining a more clearly and integrated view of the construct of flow (Moneta, 2012).

2.1 Flow Experience in adolescence

Adolescents present a high variability in experiential states along the day (Larson, Csikszentmihalyi & Graef, 1980). Their quality of experience is highly dependent on context, which results in higher, quicker and less predictable mood changes, in comparison to adults. Those adolescents who respond to the variations of the environment with a higher control to accomplish their goals become more confident and competent and have more possibilities to enter in a flow state (Csikszentmihalyi & Larson, 1984). Flow is an optimal state since most of the dimensions (cognitive, affective and motivational) of subjective experience when in a flow state are on a positive level (Csikszentmihalyi & Csikszentmihalyi, 1988). Flow experience shows some variations among adolescents and across different activities (Bassi & Delle Fave, 2012; Freire, Lima, & Fonte, 2009). However, the major variation in flow is due to differences in subjective experience within the same adolescent along the week than between adolescents (Schmidt et al., 2007).

The person-level characteristics associated with flow in adolescents are gender (with girls experiencing more flow than boys), high self-esteem, high self-efficacy and high optimism about the future (Schmidt et al., 2007). However, different results were found by Stavropoulos, Alexandraki, and Motti-Stefanidi (2013) concerning gender. They showed that boys were more likely to experience flow than girls, but the study reported only to internet activities. Leibovich, Maglio, and Giménez (2013) found that the experience of flow decreases with the increase of age (from 12 to 17 years). Openness to experience and extraversion are two personality factors that were found to predict the occurrence of flow experience (Bassi, Steca, Monzani, Greco, & Delle Fave, 2014; Leibovich et al., 2013).

Concerning the external dimensions of subjective experience (activities, location, and company) in daily life, adolescents experience more flow in active or structured leisure activities than in school activities (Bassi & Delle Fave, 2004; Mesurado, 2009; Schmidt et al., 2007). When in the school context, they report more flow in social interactions with peers and extracurricular activities related to leisure, such as sport and arts, when compared to curricular ones (Freire et al., 2009; Shernoff, Csikszentmihalyi, Schneider, & Shernoff, 2003). When flow emerge in classroom curricular activities, it occurs predominantly in subjects like mathematics, history and sciences (Csikszentmihalyi & Larson, 1984), or in activities such as class discussions, individual work (laboratory, exercises) and test/quiz resolution (Shernoff, Knauth, & Makris, 2000). This kind of activities has specific characteristics like clear goals and rules, immediate feedback, development of abilities or skills, which make them more flow-inducive (Csikszentmihalyi, 1997; Mesurado, 2009). They are also more structured, challenging and allow adolescents to be more in control and to be more active (Shernoff et al., 2003).

Although being an important part of the subjective experience that explains flow state, these external dimensions are not its unique predictor. Internal dimensions of the subjective experience such as the autonomy (wanting to do the experience), the balance of high challenges and high skills, the importance of the activity, the perception of success at the activity and focused attention explained 45% of the variation in flow in adolescents' daily life (Schmidt et al., 2007). Huang, Chiu, Sung, and Farn (2011) also found that focused attention was a critical determinant of the immersion dimension of flow, but, specifically, in web-based and text-based interaction environments. In a recent qualitative study of Choe et al. (2015), adolescents (16 to 18 years) identified the sense of control as the psychological condition that facilitates students' flow in learning. Other researchers showed that the basic psychological needs of competence, autonomy, and relatedness in adolescents predicted dispositional and state flow in sports (Coterón, Sampedro, Franco, Pérez-Tejero, & Refoyo, 2013; Moreno, Gimeno, & Gonzále-Cutre, 2010) and in internet use (Zhao, Lu, Wang, & Huang, 2011). A set of internal psychological dimensions seem to have an important contribution to flow, but more research is needed to replicate and to extend these results, providing an integrated view of their specific role in adolescents' flow experience.

In sum, person-level characteristics, external and internal dimensions of subjective experience have a direct contribution to flow experience. However, the interplay between them should not be disregarded as well as possible moderator or mediator roles. For example, research showed that person-level characteristics revealed a mediation role between contextual dimensions and flow experience (Leibovich et al., 2013). Moreover, as we mentioned previously, the contribution of gender seems to differ accordingly to context. Stavropoulos et al. (2013) found that if assessing flow in a domain-specific activity (internet), boys have more flow (not girls), which put in evidence the important role of context in the relationship between person-level characteristics and flow experience. Another example is what concerns intrinsic motivation and its relation to flow. Theoretical background and empirical evidence show that flow experience is an intrinsically motivated state characterized by higher levels of autonomy (Csikszentmihalyi, 1975; Deci & Ryan, 2000; Schmidt et al., 2007). However, empirical evidence does not show linear results concerning this issue. Flow experience is not always associated with high levels of intrinsic motivation and autonomy. Bassi and Delle Fave (2012) showed that optimal experience in schoolwork is associated with low self-determination (less autonomous regulation) in a sample of adolescents. Delle Fave and Massimini (2005) found that motivational and affective variables varied across different activities, while the cognitive variables remain stable. Situational/contextual features can explain these apparently contradictory results. Autonomy does not seem to be an essential component of flow

experience in some contexts. Overall, the evidence provided by these studies support the interactionist and ecological perspective about the nature of flow experience, considering both person and contextual features (others, places, activities) when explaining this subjective state (Freire, 2006, 2011; Schmidt et al., 2007).

2.2 Flow experience and adolescents' positive development

Positive development can be defined as the individual growth concerning positive psychological, behavioral and social outcomes, considered from a strengths-based perspective, which emphasizes individual potentialities and view adolescents as resources (Damon, 2004; Lerner, Almerigi, Theokas, & Lerner, 2005). It can also be defined within an integrated perspective of well-being and happiness, which joins the subjective (hedonic) and psychological (eudaimonic) conceptualizations (Delle Fave, Brdar, Freire, Vella-Brodrick, & Wissing, 2011; Keyes, Shmotkin, & Ryff, 2002).

Regarding positive development within a strength-based approach, the enjoyment associated with flow drives the adolescent to repeat the activity in which emerged the flow experience, entering into a process of progressive complexification of skills and strengths. For sustaining the flow state, the activity must provide challenges with increased difficulty. To respond to those challenges, the adolescent must develop a set of activity-related skills if he/she wants to maintain an optimal state of experience. This process shapes individual trajectories as it implies an individual psychological selection in which interests and goals are defined (Massimini & Delle Fave, 2000; Nakamura & Csikszentmihalyi, 2002). It is through this mechanism that adolescent interacts with the environment to create opportunities for a positive development of inner strengths and the self (Freire, 2006).

Regarding a broader positive development perspective, linked to well-being, flow experience is associated with a series of positive outcomes regarding children and adolescents' functioning (Bassi & Delle Fave, 2004; Csikszentmihalyi & Larson, 1984). Adolescents who experience more flow have higher satisfaction with life (Asakawa, 2010; Bassi et al., 2014), higher psychological well-being and self-esteem (Bassi et al., 2014; Nakamura & Csikszentmihalyi, 2002; Steele & Fullagar, 2009), higher sociability and joy (Hektner, Asakawa, Knauth, & Henshaw, 2000), increased positive affect (Rogatko, 2009), increased happiness (Csikszentmihalyi & Hunter, 2003) and higher engagement in learning and achievement (Mesurado, 2010; Schüler, 2007; Shernoff et al., 2003; Steele & Fullagar, 2009). The impact of flow experience goes beyond the immediate increase in the quality of subjective experience while performing

the activity, having a long lasting and cumulative effect on adolescents' development (Csikszentmihalyi & Larson, 1984; Massimini & Carli, 1988). However, flow does not lead to positive development automatically. Outcomes of flow experience vary according to the structure's degree of the activity, the goals and the long-term process of meaning-making (Delle Fave, 2009; Freire, Tavares, Silva, & Teixeira, 2016).

3. Attentional control

Research has made considerable progress in highlighting the voluntary and conscious processes in controlling our actions and in modulating our temperamental reactivity. Individuals actively make efforts to regulate their thoughts, feelings, and behaviors, counteracting the automaticity inherent to human behavior (Derryberry, 2002). Voluntary self-control implies the awareness of one's self and the external world. It is through consciousness that we voluntary control our mental processes (Posner & Rothbart, 1998).

One of the earliest forms of self-control is the capacity to control attention (Rothbart, Posner, & Rosicky, 1994). Attentional control is defined as the individual capacity to focus and shift attention voluntarily, to control external and internal distractions and to reach specific goals (Derryberry & Reed, 2002). It is considered a dispositional component of self-regulation (Diehl, Semegon, & Schwarzer, 2006).

The capacity to voluntarily control one's attention relies on executive attentional mechanisms (prefrontal cortex) (Derryberry, 2002). Norman and Shallice (1986) developed a model of executive attentional control. The authors proposed that a Supervisory Attentional System (SAS) monitors and regulates the activation of appropriate schemas for action but also creates new schemas to respond to novel or conflicting situations when the automatic attentional processes can no longer respond. SAS is slower but more flexible than the automatic attentional processes as it requires conscious control (Norman & Shallice, 1986). Similarly, Posner and colleagues (Posner & Peterson, 1990; Posner & Raichle, 1994; Posner & Rothbart, 1998) developed a model in which attentional control relies on a voluntary attentional neural system (anterior attentional system) that regulates automatic responses, in opposition to an involuntary one (posterior attentional system). These systems are related to motivational processes and are triggered by the person's needs and goals (Derryberry, 2002). Therefore, it is expected the existence of individual differences in the ability to control attention.

Attentional control develops earlier in infancy and through adolescence and has an important role in regulating distress (Posner & Rothbart, 1998). The increase of activity in executive areas and of neural

connectivity in adolescence impacts cognitive and emotional development of teenagers (Casey, Jones, & Somerville, 2011; Luna, Padmanabhan, & Hearn, 2011; Steinberg, 2005). Adolescents become more able to exert cognitive control in a flexible manner (Luna et al., 2011). However, this is an ongoing process of neural maturation and interaction with context and environment. There are still immaturities in normative adolescent functioning that limit the consistent use of attentional control abilities. So, concerning adolescent's socioemotional development, adolescence can be conceptualized as a transitional life period of adjustment but also of increased vulnerability (Steinberg, 2005). The increase of executive related capacities in this age period creates opportunities for the onset of psychopathology but also represents a chance to recruit new tools for respond in a more flexible and adjust manner to new challenges, and not persevere in inefficient modes of thinking, feeling and behave.

Research shows that attentional control is linked to the development of psychopathology in childhood and adolescence. Individual differences in attentional control are related to the internalizing and externalizing problems (Derryberry & Rothbart, 1997; Eisenberg et al., 2001; Sportel, Nauta, de Hullu, de Jong, & Hartman, 2011). Lower levels of attentional control have been consistently associated with more psychological problems in children and youth, namely anxiety, aggression, depression, rumination and ADHD (Meesters, Muris, & Van Rooijen, 2007; Muris, de Jong, & Engelen, 2004; Muris, Meesters, & Rompelberg, 2007; Muris, Mayer, Lint, & Hofman, 2008; Muris, Van Der Pennen, et al., 2008; Verstraeten, Vasey, Raes, & Bijttebier, 2009). However, attentional control seems to have also a protective function toward psychopathology and adolescents' maladjustment. Attentional control moderates the effect of negative affect on the development of depressive symptoms in adolescents (Vasey et al., 2013). High levels of attentional control reduce the effect of high behavioral inhibition (reactive temperament) on the reporting of internalizing symptoms by adolescents (Sportel et al., 2011).

Fewer studies addressed the relationship between attentional control and positive outcomes in adolescence. To the best of our knowledge, only two studies have done so. Zorza, Marino, de Lemus, and Mesas (2013) found that effortful control (from which attentional control is a component) predicted academic performance and social competence of adolescents. Checa, Rodríguez-Bailón, and Rueda (2008) showed that an efficient executive attention is related to positive academic outcomes and social adjustment of adolescents.

3.1 Attentional control and flow

In his theoretical flow model, Csikszentmihalyi (1990) pointed out the important role of attention in the control of consciousness and the enjoyment of everyday life. He defends that attention is our most important tool to improve the quality of experience. Moreover, that entering into a flow state requires the adequate use of psychological skills, such as the ability to control attention. However, few studies have tried to put in evidence the role of attentional capacities for the occurrence of flow experience.

A qualitative study with 12 different samples (14 to 86 years) has found that people from different cultures describe the flow experience in similar ways regarding its onset and its continuation (Massimini et al., 1988). Concentration is pointed as the second main trigger to enter in a flow state (13% of the respondents of different cultures), being the first the performance of the activity itself (40%). Interestingly, concentration was identified more like a trigger for the onset of flow experience than a factor for its continuation. Considering only the college students' participants, concentration becomes the major factor for becoming involved in the flow experience (and not the second one, as identified by the adult participants). The authors suggest that this difference is due to the developmental stage students are in, which is devoted to intellectual activities in a great proportion of time, and consequently requires a greater amount of investment of attention and concentration, comparatively with adult life (Massimini et al., 1988). Therefore, concentration seems to be important to the occurrence of flow experience, especially for entering into a flow state and for students. However, there is a lack of research to consistently confirm this result.

Hamilton, Haier, and Buchsbaum (1984) have found specific attentional patterns associated with the intensity of flow experience in their laboratory studies. Intrinsic enjoyment (a central characteristic of flow experience) was significantly correlated with self-reported attentional control and with an observed attentional increase in cortical area. Research on online flow models and in e-learning environments showed that focused attention is a direct antecedent of flow and has a significant effect on determining students' flow level (Esteban-Millat, Martínez-López, Huertas-García, Meseguer, & Rodríguez-Ardura, 2014; Novak, Hoffman, & Yiu-Fai Yung, 2000; Shin, 2006). Abuhamdeh and Csikszentmihalyi (2012) found that attentional involvement (amount of attention devoted to moment-to-moment activity) mediates the relationship between the balance of challenges/skills and enjoyment. They suggest that attentional processes could be the central feature of flow experiences. Swann, Keegan, Piggott, and Crust (2012) highlighted the effects of mindfulness interventions in flow athletes. Self-regulation of attention, which is the main component of mindfulness training, has been related to increases in global flow and the flow

dimensions of clear goals and sense of control. Cohen, Tenenbaum, and English (2006) also demonstrated that a psychological skills training intervention (with a component of attentional control training) with two female college-level golfers helped the athletes to achieve optimal emotional states.

Although putting in evidence important results, the studies mentioned above do not conceptualize attentional processes within the same perspective and consequently, do not measure the construct equally. Some studies assess the amount of attention/concentration participants have in the moment of performing the activity, using real-time measures (e.g. Abuhamdeh & Csikszentmihalyi, 2012) and others attend to the capacity to control attention in a specific context/activity, using retrospective questionnaires (e.g. Esteban-Millat et al., 2014). This difference in the approach for measuring attention serves obviously the goals of each study. However, we should look at these results with cautious because they are referring to distinct phenomena. The majority of research about attention in flow experience focuses on the dimension of concentration which is part of the experience itself. For bringing some clarity to this issue and avoiding tautological explanations, it is fundamental to distinguish between the individual ability to control voluntarily attention, and the intense concentration felt during the ongoing flow experience. Some authors bring this issue to scientific debate arguing that effortless attention, which characterizes flow experience, is different from effortful attention (attentional control) (Dormashev, 2010; Ullén, De Manzano, Theorell, & Harmat, 2010). The former refers to a state of heightened attention where the person exerts no mental effort while the latter represents a state of high attention during the mental effort.

So, if we direct our lens to empirical studies that focused on the relationship between attentional control, conceptualized as a dispositional characteristic, and flow experience, research becomes inexistent. Nevertheless, there are some studies that point to some directions about the subject. For example, Abuhamdeh and Csikszentmihalyi (2012) showed that 20% of the variance of attention involvement in daily life (attention/concentration felt during the performance of the activity) resided at the between-level person. The authors suggested the existence of personal characteristics that influence this attentional involvement. Csikszentmihalyi (1990) had already considered earlier that how attention is used is a result of personality traits or specific patterns of functioning. The author introduced the concept of autotelic personality for describing those individuals who tend to enjoy life or do things for their own sake, having certain metaskills which allow them to enter more frequently and easily in a flow state (Csikszentmihalyi, 1997). Being or not associated with autotelic personality, we consider that these patterns of functioning could be an expression of attentional control capacity.

Unfortunately, none of these reviewed studies linked attentional capacities to flow experience during the adolescence period. The majority used college students or adult samples. Only a few studies conducted by Csikszentmihalyi and Larson (1984) showed that adolescents who voluntarily use their attentional capacities and have goals can find enjoyment in the activities. More studies with adolescents are needed to clarify the role of attentional control for the occurrence of flow experience.

4. Emotion regulation

The definition of emotion regulation is a controversial topic since it refers to a complex construct that involves the management of multiple components (e.g. cognitive, neurophysiological, behavioral, culture and contextual) (Zeman, Cassano, Perry-Parrish, & Stegall, 2006). A widely accepted definition considers emotion regulation as the ''extrinsic and intrinsic processes responsible for monitoring, evaluating, and modifying emotional reactions, especially their intensive and temporal features, to accomplish one's goals'' (Thompson, 1994, p. 27–28).

Emotion regulation is a topic of great interest in the scientific community when studying youth (Riediger & Klipker, 2014). Adolescence is a period of increased emotionality, due to the major bio-psycho-social transformations teenagers experience throughout their growing process. Associated with pubertal changes, greater negative emotionality, sensation-seeking and risk-taking arise in early adolescence (Nelson, Leibenluft, McClure, & Pine, 2005). These transformations heighten the vulnerability for emotional and behavioral dysregulation since the complete maturation of executive brain regions is still not complete in this period (Steinberg, 2005). Todd, Cunningham, Anderson, and Thompson (2012) suggest that the emotion regulation capacity becomes more sophisticated and complex with cognitive/executive development, giving rise in adolescence to more deliberate and flexible strategies.

However, all these transformations must be conceptualized within an ecological perspective as they occur in the adolescents' daily lives and are interwoven with their social contexts and culture. Teenagers spent more time with peers than within the secure context of the family. Besides, society expects adolescents to be more autonomous and work toward the achievement of selected goals (Lerner, Freund, De Stefanis, & Habermas, 2001). Responding adaptively to these daily and contextual demands can be a challenging task for teenagers. However, it also gives them the opportunity to apply their developing regulatory capacities to the complex array of emotions elicited by new and unpredictable situations (Larson, 2011). Regulating one's emotions in socially and contextually adaptive ways have been

shown to be an important resource for interpersonal and intrapersonal healthy psychological functioning (Gullone, Hughes, King, & Tonge, 2010; Southam-Gerow & Kendall, 2002).

Different theoretical frameworks exist in the literature concerning emotion regulation processes and functioning. The process model of emotion regulation (Gross, 1998) is one of the most reported and used in empirical research. It is an interesting model to account for if we want to explore the relationship between emotion regulation and flow experience because it takes into consideration the person-situation interaction, resembling the ecological approach that supports flow concept. The model is based on a process-oriented approach and defines emotion regulation as a set of different conscious and unconscious processes, by which positive and negative emotions are increased, diminished or maintained (Gross & Thompson, 2007).

Gross's model (1998) differentiates two sets of emotion regulation strategies based on the moment they are used in the emotion-generative process: antecedent-focused strategies, usually used earlier and before the emotion response have been totally generated, and response-focused strategies, employed later when an emotion is already being experienced (Gross & Thompson, 2007). Situation selection, situation modification, attentional deployment, and cognitive reappraisal are the antecedent-focused strategies operationalized by the model whereas response modulation represents the response-focused strategy (Gross & John, 2003). Situation selection and situation modification involve taking action toward the environment, shaping the individual's situation. Attentional deployment and cognitive reappraisal regulate emotions without changing the environment. Instead, they involve the transformation of internal aspects by using cognitive capacity (e.g. distracting or moving the focus of attention away from the situation; concentrating on a specific aspect of the situation; ruminating or directing repetitively attention to our feelings). In turn, response modulation influences the experiential, physiological and behavioral aspects of the emotion that have already been generated (e.g. taking drugs, doing exercise, suppressing the expression of emotions) (Gross & Thompson, 2007).

The two emotion regulation strategies that have received more empirical attention are cognitive reappraisal and expressive suppression. Cognitive reappraisal implies changing the way we think about a situation to decrease its emotional impact. Expressive suppression refers to the inhibition of the emotion-expressive behavior. This strategy does not change the emotion itself, only its expression (Gross & John, 2003). Empirical studies showed that reappraisal have, in general, healthier effects on affective, cognitive and social functioning and are associated to better well-being than suppression (Butler, Egloff, Wilhelm, Smith, Erikson, & Gross, 2003; Gross, 1998; Gross, 2014; Gross & John, 2003; John & Gross, 2004).

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Mauss, Levenson, McCarter, Wilhelm, and Gross (2005) presents response coherence between experience, behavior and physiology as a possible mechanism for explaining this differential impact of different emotion regulation strategies on psychological functioning. Besides psychological functioning, research has investigated the implications of using different emotion regulation strategies, linking them to psychological, neural, physiological and physical functioning (e.g. Gross, 1998; Nyklíček, Vingerhoets, & Denollet, 2002; Ochsner & Gross, 2005; Woodward, Shurick, Alvarez, Kuo, Nonyieva, Blechert et al., 2015).

An extensive research exists relating emotion (dys)regulation to different internalizing and externalizing psychological disorders in adolescents (Garnefski, Kraaij, & van Etten, 2005; McLaughlin, Hatzenbuehler, Mennin, & Nolen-Hoeksema, 2011; Silk, Steinberg, & Morris, 2003; Southam-Gerow & Kendall, 2002). For example, the use of less effective emotion regulation strategies in down-regulating negative affect was found to be related to higher levels of depressive symptoms and problem behavior (Silk et al., 2003). Emotion dysregulation predicted increases in anxiety symptoms, aggressive behavior, and eating pathology after controlling for baseline symptoms (McLaughlin et al., 2011). Higher depressive symptoms, higher neuroticism, lower scores on extraversion, agreeableness, and conscientiousness, were associated with a greater use of the suppression strategy by adolescents (Gullone & Taffe, 2012; Larsen et al., 2012).

Other studies investigated the impact of emotion regulation on the positive development of adolescents. Gumora and Arsenio (2002) found that emotion regulation is associated with positive educational outcomes, like the student's ability to learn and to develop social competence. Fried (2011) showed that antecedent emotion regulation strategies are positively correlated with students' personal skills whereas response-focused strategies are negatively correlated with students' social skills and with academic engagement in the classroom. Cognitive reappraisal strategy has been associated with healthier and positive indicators of psychological functioning in adolescence (higher extraversion and openness to experience; higher self-esteem and life satisfaction), while suppression has been linked to maladaptive outcomes (Freire & Tavares, 2011; Gullone & Taffe, 2012; Teixeira et al., 2015). However, this is not without its critics and some authors challenge this perspective of a higher effectiveness of one strategy over another (Koole, van Dillen, & Sheppes, 2011). Gross and colleagues (Gross, 2013; Gross & Thompson, 2007) adopt a functionalist perspective and make an important remark by assuming that the adaptability of emotion regulation processes will depend on the context.

Other theoretical models of emotion regulation present some commonalities with Gross's process model. The control-value theory focuses on achievement emotions in learning contexts (Pekrun, 2006; Pekrun, Frenzel, Goetz, & Perry, 2007). It is a more integrative theoretical framework, which builds on assumptions from different psychological theories. It considers the antecedents of achievement emotions (appraisals of value and control; goals; beliefs), the social environments, the achievement emotions and their effects on learning, embedded in a cyclical process of reciprocal causation. According to this theory, emotions can be regulated by targeting any element of this circulatory loop: the appraisals (appraisal-oriented regulation), the environments (selection and design of environments), the emotion itself (emotion-oriented regulation), or the capacity for learning (problem-oriented regulation) (Pekrun et al., 2007). Gross's process model and the control-value theory share common ground regarding the main core features in emotion regulation (Gross, 2014). They account for similar strategies to regulate emotions (cognitive modification, situation modification, and behavioral/response modification), the importance of goals, and the emotion regulation outcomes (affective, cognitive and social consequences or, more specifically, the effects of different emotion regulation strategies on learning and achievement).

4.1 Emotion regulation and flow

Research concerning the impact of emotion regulation on the occurrence of flow experience is practically inexistent. Only a few studies in sport psychology address this issue but they do so with adult population (and not with adolescent samples). Jackson, Thomas, Marsh, and Smethurst (2001) found that a set of cognitive skills are particularly important for attaining flow experience and, subsequently, optimal performance in leisure sports settings. One of these psychological skills was the use of good emotional control, which helped to explain the variation of dispositional and state flow in athletes with aged between 16 to 73 years.

A recent investigation of Swann, Piggott, Crust, Keegan, and Hemmings (2015) with European tour golfers identified the factors that influenced the nine dimensions of flow experience in a particular way. Concentration was the most influenced dimension of flow. Among the facilitators of heightened concentration were the psychological skills of the players which seemed to facilitate the entering and the managing of flow states. These self-reported psychological skills referred to the golfers' attempts to "avoid disruption or conscious interference, by taking their mind away from the importance of the situation" (p.

65). Interestingly, this seems to refer to a particular kind of emotion regulation strategy - the distraction strategy preconized in Gross's model (1998).

Indirect evidence also comes from studies about the effectiveness of sport training programs in the enhancement of the quality of athletic performance. Emotion regulation techniques are one of the skills commonly targeted in these interventions. Findings showed that the use of emotion self-regulation is an effective tool for the improvement of the athletes' optimal zones of performance (Cohen et al., 2006; Robazza, Pellizzari, & Hanin, 2004).

5. Linking flow experience, attentional control, and emotion regulation

Flow experience is a cognitively highly demanding experience. Being in a flow state means being deeply focused, highly concentrated and totally absorbed in the activity at hand. It is reasonable to assert that flow experience can be facilitated if adolescents have the ability to be better focused and to avoid external and internal distractions (Csikszentmihalyi, 1975). This ability to be better focused on the momentary experience can be associated with a general capacity or temperamental characteristic like attentional control. This one should not be necessary during the flow state since it requires awareness of the self, which is contrary to the flow dimension of loss of self-consciousness. Therefore, attentional control should be seen as an important individual capacity that actuates before the occurrence of flow experience, helping to reach it. This assumption is in agreement with the distinction we have previously mentioned between effortless attention and effortful attention (attentional control) (Ullén et al., 2010). The former referring to the high concentration (without effort) felt during the flow state and the latter representing a different kind of concentration, which requires a voluntary mental effort.

However, being a multifaceted construct, flow experience involves the commitment of other internal dimensions besides cognition. Motivational and emotional dimensions should also be considered. During the performance of activity, attractive alternative actions can compromise the involvement in the activity by distracting the adolescent (Fries, Dietz, & Schmid, 2008). This situation leads probably to motivational interference, and consequently, increases the difficulty to reach a flow state (Kuhnle & Sinclair, 2011), since flow is a highly intrinsically motivated state by nature. So, adolescents need to have a good attentional control to maintain their focus on the activity and to guarantee an optimal level of motivation for reaching a flow state. On the other hand, negative emotions can interfere with the occurrence of flow experience (Csikszentmihalyi, 1997). Using effective emotion regulation strategies can guarantee that these emotions do not disrupt the concentration needed to be in that absorbing state. Moreover, emotion

regulation can enhance the positive affect associated to flow experience. Therefore, adolescents who have a better attentional control and use effective emotion regulation strategies could have probably a better chance to reach a state of flow. Kuhnle et al. (2012) referred to a self-control capacity that can help guiding adolescents' behavior towards a specific goal and to the pursuit of a chosen activity, by controlling impulses, emotions, and other cognitive processes. Based on the ideas of Csikszentmihalyi and LeFevre (1989), the authors argued that adolescents with higher self-control are more protected from distractions of other concurrent intentions and by this way reach more easily a flow state (Kuhnle et al., 2012). The authors found that self-control is a predictor of flow in adolescence. A self-report questionnaire was used to assess self-control as the capacity to regulate adolescent's attention, emotion, and behavior.

Many of the studies revised along this paper, especially in sport psychology, point toward the importance of self-control abilities, namely a greater control over attention and emotion, for the occurrence of flow experience (e.g. Esteban-Millat et al., 2014; Jackson et al., 2001; Swann et al., 2012; Swann et al., 2015). In a recent systematic review, Swann et al. (2012) conclude that flow seems to be influenced by a range of different variables: internal states (such as focus and thoughts/emotions), behavior (e.g. preparation) and environmental conditions. However, focus and thoughts/emotions seem to be central concepts as they have been found in every study and in all the three categories: facilitate, prevent and disrupt flow experience. Moreover, applied sport psychology interventions that target psychological skills that help athletes to regulate their mental and emotional states have been shown to be effective in achieving optimal states (e.g. Cohen et al., 2006).

Despite being conceptually separate constructs, the relationship between these two self-control abilities – attentional control and emotion regulation - must be regarded, since there is evidence showing that controlling attention is itself a crucial component of emotion regulation processes (Todd et al., 2012; Wadlinger & Isaacowitz, 2011). Eisenberg, Fabes, Guthrie, and Reiser (2000) suggest that, besides neurophysiological processes, emotion regulation is also attained through the effortful management of attention such as attention shifting, attention focusing, and distraction. Individuals with low levels of attention-executive control are poor at regulating emotions (Derryberry & Rothbart, 1988, 1997; Rothbart, Ellis, & Posner, 2004). Indeed, difficulties in attentional control are related to the use of maladaptive emotion regulation strategies (e.g. suppression and rumination) (Tortella-Feliu et al., 2013). Fox and Calkins (2003) reviewed studies concerning the association between attentional control and control of emotions in children. A higher capacity of attentional was associated to greater self-control of emotion.

Along our paper, we analyzed attentional control and emotion regulation as interrelated but independent constructs, both part of the broader psychological construct of self-regulation. However, a distinct theoretical approach defends that different self-regulation processes (attention regulation, emotion regulation, and behavioral regulation) cannot be separated because they interrelate in such complex ways (Diamond & Aspinwall, 2003; Fox & Calkins, 2003). This approach considers self-regulation an integrated psychological construct. These authors suggest that children and adolescents put in action simultaneously diverse dimensions of self-regulation to respond to the challenges of everyday life experience. Raffaelli et. al. (2005) empirically tested this assumption, confirming that a one-factor model represents better self-regulation as an integrated construct. Such approach suggests that researching in isolation the different forms of self-regulation might compromise our understanding of the phenomenon of self-regulatory abilities, concerning its underlying mechanisms, its relation with contexts and its developmental trajectory.

Therefore, considering the relationship between attentional control and emotion regulation, it will be more enriching and promising for research to include them both when studying the influence of self-regulatory processes on adolescents' optimal functioning.

6. Conclusion

By recognizing the importance of voluntary self-regulation processes in the development of optimal experience and functioning, we assume that adolescents have an active role in the co-construction of their development pathway (Gestsdottir & Lerner, 2008; Lerner, 1982).

However, besides the influence of temperamental characteristics, contextual factors seem also to play an important role in eliciting optimal states in youth lives (Bassi & Delle Fave, 2004; Mesurado, 2009). Theoretical models and empirical evidence of flow experience showed that this optimal psychological state is complex and involves dispositional and situational factors (Schmidt et al., 2007). Thus, crossing personal and contextual characteristics is essential for understanding and explaining flow experience. Embracing an ecological or contextual perspective (Bronfenbrenner, 1979) about adolescent development and optimal experience places the interaction among the adolescent, others and locations in a prominent place within research (Freire, 2006, 2011). This approach has a direct implication on the type of measurement used to assess optimal experience and adolescent psychological functioning. The use of measures that guarantee an ecological validity is necessary to capture these phenomena as they occur in the natural contexts of adolescents' daily lives. Real-time measures, particularly the Experience Sampling Method (ESM; Csikszentmihalyi et al., 1977; Hektner, Schmidt, & Csikszentmihalyi, 2007) are

a good example. Daily life methodologies allow the analysis of the interaction between social, psychological, and physiological processes within their natural contexts, by tapping adolescents' ongoing experience (Reis, 2011).

However, some authors defend that although recognizing the importance of contextual components for attaining flow, it is essentially under the control of the mind (attention) that we have the possibility of reaching the psychological state of flow (Jackson & Csikszentmihalyi, 1999). As Csikszentmihalyi and Larson (1984) postulates "it is not the context itself that determines whether a teen is happy or sad but the way he or she uses the constraints and opportunities in each" (p. 119).

Promising directions for future research on adolescents' optimal experience should include the investigation of self-regulation abilities in conjunction with contextual features and the underlying mechanisms through which these different antecedents or factors operate. The majority of the empirical research reviewed had assessed only correlational relationships, and some tested the predictive value of psychological factors on flow experience. So we must be cautious as these findings did not test causality relationships. More research is needed with longitudinal designs and mixed methodologies to identify the psychological factors and associated situational features which enhance or diminish the frequency and intensity of flow experiences. This type of research may highlight important causalities and could identify youth specific profiles associated with common positive developmental pathways or trajectories (Larson & Tran, 2014). These would provide the basis for the development of comprehensive theoretical models addressing the occurrence and development of optimal experiences and optimal functioning in youth.

Knowing what individual abilities foster flow experience in normative adolescence and how these processes occur and develop over time, can inform positive clinical interventions, especially those that target disorders marked by apathy, boredom, and absence of enjoyment. If in some cases, we can change and manage the activities structure and the environment to create the conditions for flow occurrence (e.g. school setting), other times we have to work directly with the adolescent to help him/her to have a proactive role and find flow experience in daily life. Self-regulation processes are available to consciousness and can be selected and controlled by adolescents (Gestsdottir & Lerner, 2008). Recent literature suggests that the processes involved in attentional and emotion regulation can be improved through practice (Wadlinger & Isaacowitz, 2011). Therefore, learning to manage self-regulatory capacities could be a central point in different interventions with adolescents for attaining optimal everyday functioning.

7. References

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CHAPTER II

Internal and External Factors Underlying Variations in Adolescents' Daily Optimal Experiences[3]

Abstract

This study investigated how the internal psychological states (i.e., challenge–skill perception, positive and negative affect, and effortless attention) and contextual features (i.e., activity and company) of momentary experiences relate to optimal experience in adolescents' lives. Data were collected from 245 Portuguese adolescents (14–19 years old, 63% female) by using the experience sampling method. Multilevel modeling revealed that challenge–skill and positive affect were positively associated with optimal experience, while negative affect was negatively associated with optimal experience. Effortless attention mediated the associations between internal states and optimal experience, while activity and company only moderated some of these associations. These findings will inform practitioners about the factors that should be addressed in interventions with adolescents to promote optimal experiences in their lives.

Keywords: optimal experience, adolescents, daily life, experience sampling method.

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1. Introduction

Adolescence is a period of remarkable changes and opportunities for growth and development. The study of adolescent daily life has resulted in relevant insights for understanding the many processes of momentary psychological functioning that are embedded in one's natural settings (Schmidt, Shernoff, & Csikszentmihalyi, 2007). Findings have consistently shown that a specific momentary psychological state, known as a flow experience or an optimal experience, is associated with the most positive momentary patterns of cognitive, emotional, and motivational functioning in adolescents (Bassi & Delle Fave, 2012; Freire, Lima, & Fonte, 2009). Flow is defined as a gratifying state of deep involvement, absorption, and enjoyment that individuals report when performing an activity (EFRN, 2016). When in this particular state, the individual is highly focused on the task immediately at hand and has a sense of effortless functioning, feeling that everything is flowing smoothly and synchronously (Csikszentmihalyi, 1990). Considering that flow is perceived as such an enjoyable state, the individual wants to repeat the experience he/she had in that particular activity. This cyclical pattern of involvement and enjoyment in the activity leads to the progressive advancement of the required skills and, consequently, fosters individual development (Massimini & Delle Fave, 2000).

Experiencing flow can indeed be a rewarding optimal experience, but its impact goes far beyond this effect, contributing to short- and long-term positive influence regarding children and adolescents' functioning and development (Bassi & Delle Fave, 2004; Hektner & Csikszentmihalyi, 1996). The flow experience has been associated with positive outcomes in adolescents, such as greater positive affect (Rogatko, 2009), satisfaction with life (Bassi, Steca, Monzani, Greco, & Delle Fave, 2014), happiness (Csikszentmihalyi & Hunter, 2003), sociability (Hektner, Asakawa, Knauth, & Henshaw, 2000), psychological well-being and self-esteem (Nakamura & Csikszentmihalyi, 2002; Steele & Fullagar, 2009), and engagement in learning and achievement (Shernoff, Csikszentmihalyi, Schneider, & Shernoff, 2003).

Despite decades of scientific evidence concerning the flow experience, researchers still need to understand how specific elements of flow-related cognitive and affective dimensions are associated with having an optimal experience. The present study investigated how adolescents' cognitive and emotional states, such as challenge–skill perception, effortless attention, positive affect, and negative affect, are associated with daily optimal experiences. Moreover, this study tested whether these internal factors also have an indirect effect on optimal experience through the mediation of effortless attention. In addition to the influence of these internal factors, we sought to understand how external factors such as the type of

activity and company (daily contexts) moderated the association between internal factors and optimal experience.

1.1 Conditions for the flow experience: The challenge–skill relationship

Csikszentmihalyi's (1975) flow theory states that there are three conditions that must be met for the occurrence of a flow experience: a balance between perceived challenge and perceived skill, clear goals, and immediate feedback in the activity being performed. The challenge–skill condition has received the greatest amount of attention from researchers (Fong, Zaleski, & Leach, 2014). Some studies have shown that the existence of challenge–skill balance is a determinant for attaining a flow state (Keller, Ringelhan, & Blomann, 2011). In contrast, others have contested the centrality of this condition, showing that in some situations, the existence of an imbalance between high challenge and high skill levels is more likely to result in flow (Moneta & Csikszentmihalyi, 1996). Despite these divergences, it is widely accepted in the literature that the perception of high challenge and high skill levels relates, directly or indirectly, to the flow experience.

In this sense, according to flow theory, a flow experience is more likely to occur if the challenge and skill levels are above the person's average, that is, in a high challenge/high skill condition (Nakamura & Csikszentmihalyi, 2002). Consistently, researchers have shown that a high challenge/high skill condition is associated with more positive affect, enhanced motivation, and higher levels of concentration and involvement in different contexts of adolescents' lives (Bassi & Delle Fave, 2004; Delle Fave & Massimini, 2005).

Considering these aspects, one aim of this study was to replicate the association between high challenge/high skill condition and an optimal experience in a sample of Portuguese adolescents. We aimed to investigate the effect that high challenge and high skill levels have on adolescents' optimal experience when considering affective and other cognitive features of an individual momentary subjective experience (i.e., positive affect, negative affect, and effortless attention).

1.2 Flow experience and affect

The existence of a stable cognitive core that characterizes optimal experience is widely recognized, but affect has also emerged as an important correlate of this psychological state (Delle Fave & Massimini, 2005). It seems that adolescents who experience the highest level of concentration also report more positive affect (Csikzsentmihalyi, 1990). Neuroimaging research has reinforced this idea by showing the

activation of brain regions involved in emotion and higher dopamine D2-receptor availability, which has been linked to emotional stability and positive affect, when in a flow state (e.g., de Manzano et al., 2013).

Researchers have predominantly focused on positive rather than negative affect. Empirical studies have confirmed that positive affect is an important correlate (Asakawa, 2010) and is an immediate and long-term result of an optimal experience (Esteban-Millat, Martínez-López, Huertas-García, Meseguer, & Rodríguez-Ardura, 2014; Rogatko, 2009). Two studies have shown the existence of the opposite relationship, in which positive affect was a significant predictor of college students experiencing flow in school and leisure activities (Freire & Tavares, 2016; Kopač ević , Rogulja, & Tomić , 2012). Some researchers have shown that positive emotions could broaden the scope of people's attention, cognition, and action, promoting cognitive efficiency and the development of strengths and resources (Fredrickson & Branigan, 2005).

As for negative affect, most adolescents report high negative emotionality and affective variability during a significant portion of their daily life (Larson, Moneta, Richards, & Wilson, 2002). Furthermore, daily affective fluctuation and negative affect are associated with psychological problems in adolescence (Neumann, van Lier, Frijns, Meeus, & Koot, 2011) and can impair deep involvement in activities (Larson, Csikszentmihalyi, & Graef, 1980). These findings make research concerning negative emotions in flow experience a relevant issue. The few existing studies on the influence of negative affect on flow found that higher levels of negative affect predicted lower levels of flow experience in college students and across leisure and study activities (Freire & Tavares, 2016; Kopač ević et al., 2012). Neuroimaging studies have corroborated this preliminary evidence by showing a decrease in the activation of the amygdala during flow, which is associated with a reduction in negative affect (Ulrich, Keller, & Grön, 2016). Experimental studies found that negative mood inhibited the experience of flow while playing a videogame in a laboratory setting (Cabo, Kleiman, McCauley, & Parks, 2004). These results highlight the possible detrimental effect of negative affect on an optimal experience. In view of these findings on affect, we included both positive and negative affect in our study, in an attempt to understand their relationship with optimal experience in Portuguese adolescents' daily lives.

1.3 The central role of effortless attention

Flow theory highlights the importance of attention and concentration in the flow experience, arguing that it is a primordial cognitive resource for controlling consciousness and for entering into and staying in a flow state (Nakamura & Csikszentmihalyi, 2002). Some researchers have found that focused attention,

rather than being an indicator of the flow state, is a primary antecedent condition for experiencing flow (e.g., Esteban-Millat et al., 2014). Others have shown that attentional processes seem to explain the experiential dimensions of flow, such as reduced self-awareness and sense of control (Harris, Vine, & Wilson, 2017). This evidence suggests that attentional processes may have a greater influence on fostering flow than was initially assumed. If we consider that adolescence is a period in which attentional habits are still being developed and everyday life takes place in a wide range of contexts with different demands on attention (Csikszentmihalyi & Nakamura, 2010), these findings assume even more importance.

Regarding these attentional processes, researchers have identified the related construct of effortless attention – a heightened state of attention that is not perceived as being effortful – as a main feature of the flow experience (Bruya, 2010). In flow, subjects report high levels of focused attention, exercising control over what is happening without the subjective feeling of applying much effort (Csikszentmihalyi & Csikszentmihalyi, 1988). This state of effortlessness characterizes flow and distinguishes it from other high-level performances (mostly in sports) in which individuals perceive attention to be effortful (Swann, Keegan, Piggott, & Crust, 2012). To clarify this phenomenon, Dietrich and Stoll (2010) proposed the hypothesis of transient hypofrontality leading to a decrease in executive attention when in a flow state, but some studies have not been able to replicate this result (e.g., Yoshida et al., 2014). Indeed, neuroimaging and physiological studies have shown that flow is associated with an increase in executive attention (Ulrich et al., 2016) and with an increase in the objective physiological measures of arousal and mental effort (Peifer, Schächinger, Engeser, & Antoni, 2014). Overall, these findings suggest that a flow experience is not entirely automatic and has some degree of objective mental effort and executive control, while simultaneously being perceived as effortless.

Csikszentmihalyi and Nakamura (2010) found that high school students experienced effortless attention when they perceived a combination of high challenge and high skill levels and that the quality of their subjective experience, in its several experiential dimensions, was significantly better when attention was effortless than when it was effortful. When in momentary state of effortless attention, students felt more enjoyment, were more involved, felt more in control of the situation, and were less self-conscious than when in an effortful state. Moreover, this relationship remained valid regardless of whether the activity was freely chosen or compulsory/obligatory.

Effortless attention is emerging as a flow-related construct, although its relationship with the flow experience needs to be more consistently studied. We addressed this issue in the present study, seeking

to understand how effortless attention is associated with optimal experience in Portuguese adolescents' daily lives. Considering the relation between effortless attention and the other flow-related variables present in the current study, some studies have confirmed the influence of challenge–skill perception on attentional processes (Abuhamdeh & Csikszentmihalyi, 2012), particularly that challenge–skill perception is associated with effortless attention (Csikszentmihalyi & Nakamura, 2010). Other studies have found that higher levels of negative affect decreased levels of attention in students (Larson, 1988) and that positive affect broadened attentional capacities (Fredrickson & Branigan, 2005). Although not focusing specifically on the construct of effortless attention, these previous studies shed some light on the possible mediating role of effortless attention. Therefore, in our study, we also wanted to understand the role of effortless attention in the relationship between the studied constructs (i.e., challenge–skill perception, positive affect, and negative affect) and optimal experience.

1.4 Flow experience and context

Reviewed literature has shown that the context of adolescents' daily lives essentially provides the conditions for attaining flow. Structured contexts are more favorable towards the occurrence of flow (Freire et al., 2009; Shernoff et al., 2003). Among this type of contexts, structured leisure activities emerge as the preferential context for achieving an optimal experience because they allow high levels of engagement and intrinsic motivation (Bassi & Delle Fave, 2004; Mesurado, 2009), are freely chosen, and offer immediate feedback (Perkins & Nakamura, 2013). In fact, research has shown that the majority of adolescents have experienced flow mostly during leisure activities, in contrast with school activities (Freire, Tavares, Silva, & Teixeira, 2016). Performing a school activity was associated with lower levels of intrinsic motivation, higher levels of boredom, and higher attentional effort for adolescents (Freire et al., 2016; Massimini & Delle Fave, 2000). Socializing seems to be an activity in adolescents' lives in which the occurrence of an optimal experience is highly likely (e.g., Delle Fave, Bassi, & Massimini, 2002). The people with whom adolescents interact, such as family and peers, also emerge as key contextual factor for improving adolescents' optimal experience (Rathunde, 2001). However, the pattern of family interactions can facilitate or hamper the cultivation of optimal activities (Delle Fave & Bassi, 2016). Freire et al. (2016) found that being with family was associated with an average quality of experience when compared to a higher quality of experience in study or leisure situations.

Considering the influence of context in adolescents' flow experiences, in this study, we aimed to understand how the activity in which they are involved and the company they are with are associated with

optimal experience. Furthermore, we wanted to know how the activity and the company may influence the relationship between the internal dimensions (challenge–skill perception, positive affect, negative affect, and effortless attention) and optimal experience.

1.5 The current study

According to the revised literature and raised questions, the present study aimed to investigate how individual psychological states (challenge–skill perception, positive and negative affect, and effortless attention) and specific contexts (e.g., type of activity and company) are associated with adolescents' daily optimal experiences. Although the influence of challenge–skill perception and positive affect in optimal experience has been well documented in the flow literature, the role of negative affect and effortless attention is still understudied. For this, we proposed a conceptual model (Figure 1) to investigate the associations between individual variables (challenge–skill perception, effortless attention, positive affect, and negative affect) and optimal experience, simultaneously testing the moderator role of the type of activity and the company. In line with our conceptual model, we defined the following hypotheses:

Hypothesis 1: Higher levels of perceived challenge and skill will predict an increase in optimal experience.

Hypothesis 2: Higher levels of positive affect will predict an increase in optimal experience.

Hypothesis 3: Higher levels of negative affect will predict a decrease in optimal experience.

Hypothesis 4: Higher levels of effortless attention will predict an increase in optimal experience.

Hypothesis 5: The activity adolescents were performing at the moment they were assessed and the company they were with, specifically, performing leisure activities and being with family and friends, will be associated with higher optimal experience.

Hypothesis 6: The activity (school activity, leisure, maintenance activity, or socializing) and the company (alone, family, or friends) at the moment of assessment will moderate the associations between individual psychological states (challenge–skill perception, effortless attention, positive affect, and negative affect) and optimal experience. The direction of each moderation effect will be explored to test how different types of activities and company interact with the relationship between those individual variables and optimal experience.

FIGURE 1. Conceptual model for predicting optimal experience in adolescents, with the moderation of contextual variables.

Additionally, this study tested the mediating role of momentary effortless attention. Three multilevel mediation models were estimated to evaluate whether effortless attention mediates the relationships between internal psychological states (challenge-skill perception, positive affect, and negative affect) and optimal experience. In line with these multilevel mediation models, we defined the following hypotheses:

Hypothesis 7: Effortless attention will mediate the association between challenge–skill perception and optimal experience.

Hypothesis 8: Effortless attention will mediate the association between positive affect and optimal experience.

Hypothesis 9: Effortless attention will mediate the association between negative affect and optimal experience.

2. Method

2.1 Experience sampling method

We used the experience sampling method (ESM; Hektner, Schmidt, & Csikszentmihalyi, 2007) to collect data concerning adolescents' affective and cognitive dimensions and the contextual characteristics of momentary experience. ESM is a real-time, ecological method that assesses the daily subjective

experience of participants within real-life contexts. This method allows researchers to collect repeated samples of momentary experiences across one week of participants' daily lives. Researchers can then analyze the data at the within- and between-person levels; in the former case, multiple observations for each individual are analyzed, while in the latter case, the variables' measures represent the average of each participant's responses across one week. The literature has shown that ESM measures have high internal and ecological validity and good reliability (e.g., Hektner et al., 2007; Larson et al., 2002).

In the current study, each participant carried an electronic device (Psychobeeper; Machado, Gomes, & Freire, 2009) that randomly emitted an acoustic signal (beep) eight times each day, between 8:00 a.m. and 10:00 p.m., for one week (seven days), resulting in a possible maximum of 56 beeps for each respondent. Immediately after each beep, participants answered questions related to the context (i.e., the company they were with and the activity being performed) and internal dimensions of the momentary experiences (cognitive, affective, and motivational) using a Likert scale and open-ended responses in a separate paper booklet for each day. An average beep response rate of 61% was obtained, which is consistent with the results reported in ESM research (Christensen, Barrett, Bliss-Moreau, Lebo, & Kaschub, 2003; Hektner et al., 2007). We only considered the momentary responses that were completed within 20 minutes after the beep signal to be valid to avoid distortions due to retrospective recall (Larson & Delespaul, 1992). We excluded participants who had fewer than 15 ESM valid assessments, which is considered the minimum number of reports to ensure external validity in ESM research (Hektner et al., 2007).

2.2 Participants

Data were collected in 2015. Of the total students contacted in the school context ($N = 817$), 35% volunteered to participate ($N = 284$), but 28 students who volunteered dropped out before starting the data collection process, resulting in 256 participants. During data entry, five participants were eliminated: two were eliminated because they were 20 years old or older (far beyond the average high school age), and the other three were eliminated because they had reported fewer than 15 valid assessments in ESM. This resulted in the remaining 251 participants. Then, six participants with missing data were excluded from analysis using listwise deletion, which resulted in a final sample of 245 participants and 7,967 observations.

The participants in this study were 14 to 19 years old ($M = 16.58$; $SD = .83$). Over half of the sample was female (63%). The researchers recruited participants from four high schools in two urban

cities in the northern region of Portugal. Almost all participants were Portuguese (99%). Twenty-four percent of the participants were in the 10th grade, 59% were in the 11th grade, and 17% were in the 12th grade. Six percent of participants perceived their academic achievement to be below average, 72% average and 22% above average. Concerning their socioeconomic status, 94% of participants reported being from a middle-class background, while the other 6% of participants reported being from an upper-class background. The majority of participants (84%) lived with their parents or with their parents and siblings, and 7% lived with a single parent. Another 6% lived with one parent and siblings or one parent and extended family. Few participants (3%) lived with extended family and no parent.

2.3 Measures

In the present study, most of the constructs were measured as composite variables, which is a typical procedure in ESM research (Hektner et al., 2007).

Challenge–skill perception. We measured the challenge–skill construct using two items: the level of challenge ("How challenging was the activity?") and the level of skill ("Did you have the adequate skills to perform the activity?"). Participants answered these two items on a 7-point Likert scale that ranged from 1 (*not at all*) to 7 (*very much*). With these two items, we then created the composite variable challenge–skill perception. Researchers have used different mathematical combinations of challenges and skills for constructing a continuous measure of the intensity of this condition for flow (e.g., Hektner & Csikszentmihalyi, 1996; Moneta & Csikszentmihalyi, 1996). In this study, we computed the square root of the raw-scored challenge–skill product (i.e., geometric mean) as used by Hektner and Csikszentmihalyi (1996). The geometric mean better differentiates the results of different pairs of challenge–skill values than the arithmetic mean. Unlike the arithmetic mean, the geometric mean produces a lower result when a) challenge and skill are imbalanced than when they are balanced and b) one of the parts of the product has a low value (e.g., 5-5 and 2-8 both produce an arithmetic mean of 5 but produce geometric means of 5 and 4, respectively). Several analyses showed that the measure of challenge–skill perception correlated highly with other indicators of flow, thus demonstrating adequate construct validity (Hektner & Csikszentmihalyi, 1996). Higher scores on this measure indicated higher levels of challenges and skills perceptions. To address the reliability of the challenge–skill perception measure, we averaged each individual's scores from the first and second half of the sampling week and computed the correlation between the two halves, which is a common approach employed in ESM

research (Hektner et al., 2007). The correlation between adolescents' mean for the first half of the week and the mean for the second half was .70, showing acceptable reliability.

Optimal experience. We created a composite variable to measure the construct of optimal experience. This composite variable was computed as the average of four ESM items: involvement ("Did you feel involved in the activity?"); control ("Did you feel like you were in control?"); satisfaction ("How satisfied were your feeling when you were beeped?"); and time perception ("At the time of the beep, the time was passing..."). According to flow theory and empirical research, these item scores are usually high when adolescents are in a flow state (Asakawa, 2004; Csikszentmihalyi & Csikszentmihalyi, 1988). All items used a 7-point Likert scale, ranging from 1 (*not at all*) to 7 (*very much*), except for time perception question, which ranged from 1 (*slow*) to 7 (*fast*). This procedure is consistent with previous ESM research in which other researchers used similar composite variables for assessing an optimal state of experience, sometimes using more or fewer dimensions (e.g., Chen, Wigand, & Nilan, 1999; Csikszentmihalyi & Nakamura, 2010). In the present study, the optimal experience measure demonstrated an acceptable reliability, with the aggregated values having a Cronbach's alpha of .79.

Effortless attention. We measured the construct of effortless attention with two items: the level of attention/concentration in the activity ("Were you concentrating?") and the level of difficulty of concentrating ("Was it hard to concentrate?"). Participants answered these two items on a 7-point Likert scale that ranged from 1 (*not at all*) to 7 (*very much*). We reversed the scores of the item about difficulty in concentrating, obtaining a measure for the ease of concentration. To obtain a measure of effortless attention, we created a composite variable by calculating the average of the participants' responses on these two items. Csikszentmihalyi and Nakamura (2010) used the same items to measure effortless attention in the everyday lives of a sample of adolescents. The authors classified the situations of high concentration and high ease of concentration as moments of effortless attention. In the present study, the two items were significantly correlated, $r = .36$, $p < .001$. A higher score in this composite measure indicated higher levels of effortless attention. The effortless attention measure showed acceptable reliability ($r = .71$) between the two halves of the sampling week.

Positive and negative affect. Adolescents rated the extent to which they felt several positive and negative emotions at the moment they were beeped on a 7-point Likert scale (1 = *not at all*, 7 = *very much*). Positive affect was assessed by averaging participants' responses to the items "happy", "strong", "joyful", "sociable", "active", "contented", "free", "cheerful", "creative", and "relaxed". Negative affect was measured by using the participants' average responses to the items "apathetic", "alone", "anxious",

"angry", "sleepy", "bored", "sad", and "tired". Similar multiple-item scales have been used in prior ESM research for assessing positive and negative affect in adolescents, supporting good reliability (e.g., Csikszentmihalyi, Rathunde, & Whalen, 1993). In our study, both measures showed good reliability, with the aggregated values having a Cronbach's alpha of .94 for positive affect and .90 for negative affect.

   Contextual variables: activity and company. Both the activity adolescents were performing and the company they were with when signaled were assessed through open-ended questions in the ESM booklet: activity ("What were you doing?") and company ("Who were you with?"). Two well-trained researchers coded participants' written answers using a codebook with predefined broad categories for activity and company. A third independent senior coder resolved any disagreements. Cohen's kappa coefficient was computed to measure the level of agreement between the two coders. Cohen's kappa values were 88% and 95% for activity and company, respectively, indicating excellent interrater reliability for both variables. The coding process resulted in a set of five categories for the activity variable (1 = school; 2 = leisure; 3 = maintenance; 4 = socializing; 5 = other) and four categories for the company variable (1 = family; 2 = friends; 3 = alone; 4 = other). These categorical variables were then transformed into dummy coded variables.

   Demographic variables. Basic demographic information about participants, including gender, age, academic grade, perceived academic achievement, socioeconomic status, and household status, was collected using a sociodemographic questionnaire.

2.4 Procedure

   After receiving the approval of the directors of the secondary schools that were enrolled in this study, our research team met with the students in their classrooms. Students received a handout explaining the aims of the study and the procedures of assessment, as well as informed consent forms for them and for their parents to review and sign. Researchers informed students that their participation was voluntary and anonymous. The students who volunteered to participate returned their and their parents' written consent and scheduled a briefing session with our research assistant. The briefing session occurred in the schools after classes, individually or in groups. In the briefing session, the research assistant explained the study in more detail, provided instructions concerning the ESM procedure, and delivered the respective materials and equipment. Participants also completed the demographic questionnaire in this session. In a final debriefing session, after the data collection week, the research assistant collected the booklets and the materials and checked for any questions about the

assessment process that occurred during the week. Participants received a certificate for their participation in the study. The university ethical committee approved the present study.

2.5 Data analysis

Considering the nested nature of our data (multiple observations nested within individuals), we performed hierarchical multilevel modeling (Raudenbush & Bryk, 2002). Two-level models with repeated measures of variables within persons were utilized. Each model consisted of a within-person (Level 1) and a between-person (Level 2) variance component. This allowed us to analyze data at both the between-person level (participants' cross-time average) and the within-person level (individual's variation across a week).

The multilevel models were estimated using the R package nlme (Pinheiro, Bates, DebRoy, Sarkar, & the R Development Core Team, 2007). Four models were run for the outcome optimal experience, with a set of variables added in each model. The first model predicted optimal experience with a set of individual variables (challenge–skill perception, effortless attention, positive affect, and negative affect). The second model added the contextual variables (activity and company). The third model added the interactions between the individual variables and activity variable on this same outcome. Finally, the fourth model added the interactions between individual variables and company variable. To calculate the amount of variance explained by each model and the incremental change in the amount of variance accounted for by the added variables, we computed pseudo-R^2 statistics (Singer & Willet, 2003). This statistic was also used to estimate global effect sizes (variance explained by all predictor variables in a model) for each multilevel model (Peugh, 2010). We also computed an estimate of effect size (ES) for each predictor variable, comparable to Cohen's d (Cohen, 1992), in the context of multilevel modeling. This was calculated as the regression coefficients divided by the square root of the residual Level 1 variance (Shernoff & Schmidt, 2008).

To separately test between- and within-person associations, all between-person predictors (Level 2 predictors: overall challenge–skill, overall effortless attention, overall positive affect, and overall negative affect) were person means and all within-person predictors (Level 1 predictors: challenge–skill, effortless attention, positive affect, and negative affect) were person-mean centered (Kishida & Elavsky, 2015; Snijders & Bosker, 1999). To illustrate in our case, a person i's mean score across all beeps constituted her Level 2, between-person variable (e.g., overall challenge–skill). The difference between her beep score and her mean score constituted the Level 1 (within-person) person-centered variable, representing beep-

to-beep deviations relative to her average across the beeps. This statistical procedure makes the intercept value more easily interpretable and removes between-person variances when testing within-person relationships (Radenbusch & Byrk, 2002).

Additionally, we estimated three multilevel mediation models to test if 1) effortless attention mediated the association between challenge–skill perception and optimal experience (Figure 2); 2) effortless attention mediated the association between positive affect and optimal experience (Figure 3); and 3) effortless attention mediated the association between negative affect and optimal experience (Figure 4). We adopted the 1-1-1 multilevel mediation model proposed by Zhang, Zyphur, and Preacher (2009) because the variables were all measured at a lower level of analysis (Level 1: beep level), but the Level 1 units were nested within the Level 2 units (persons). Testing multilevel mediation at both the between-person (Level 2) and within-person (Level 1) levels allowed us to avoid the confounding of the Level 1 effect with the Level 2 effect. In the mediation model in Figure 2, the first step in testing the mediation effect was to establish a relationship between challenge–skill perception and optimal experience (Path c to optimal experience). The second step was to show a relationship between challenge–skill perception and effortless attention (Path a to effortless attention). Finally, the third step was to show, after adding effortless attention to the model, that the effect of challenge–skill perception on optimal experience had a reduced magnitude (c to c'), whereas effortless attention was still a statistically significant predictor of optimal experience (Path b to optimal experience). The same procedure was also applied to the mediation models in Figures 3 and 4.

The indirect effects (product of the a and b paths) were examined to test the mediating pathways in those three multilevel mediation models. To test the significance of the indirect effect, we applied a Monte Carlo bootstrapping procedure with 20,000 replications. The appropriate between-person and within-person coefficients were used to generate separate confidence intervals (CIs) for each level (Selig & Preacher, 2008).

FIGURE 2. Illustration of the application of Zhang's et al. (2009) procedure to the first multilevel mediation model (1-1-1), with effortless attention as the mediator between challenge-skill and optimal experience.

FIGURE 3. Illustration of the application of Zhang's et al. (2009) procedure to the second multilevel mediation model (1-1-1), with effortless attention as the mediator between positive affect and optimal experience.

FIGURE 4. Illustration of the application of Zhang's et al. (2009) procedure to the third multilevel mediation model (1-1-1), with effortless attention as the mediator between negative affect and optimal experience.

3. Results

3.1 Descriptive statistics

The means, standard deviations, intraclass correlations (ICC), and between- and within-person correlations of the study variables are presented in Table 1. Participants reported moderate average levels of challenge–skill perception, positive affect, and optimal experience (on a 0-7 scale). Regarding effortless attention, participants reported moderate to high levels. In contrast, participants reported relatively low mean levels of negative affect. As indicated by the ICC estimates, 74% of the variability in challenge–skill perception was attributed to within-person differences (ICC = .26), 74% of the variability in effortless attention was attributed to within-person differences (ICC = .26), 51% of the variability in positive affect was attributed to within-person differences (ICC = .49), 46% of the variability in negative affect was attributed to within-person differences (ICC = .54), and 64% of the variability in optimal experience was attributed to within-person differences (ICC = .36).

TABLE 1

Means, standard deviations, intraclass correlations, and correlations of predictors and optimal experience

	M	SD	ICC	1	2	3	4	5
1. Challenge-Skill	3.68	.80	.26	-	.18**	.29***	-.03	.46***
2. Effortless Attention	5.10	.70	.26	.24	-	.26	-.54***	.62***
3. Positive Affect	4.03	.79	.49	.20***	.24***	-	-.11	.56***
4. Negative Affect	2.55	.76	.54	-.14**	-.22***	-.46***	-	-.34***
5. Optimal Experience	4.42	.67	.36	.31***	.46***	.25***	-.16**	-

Note. Means and standard deviations are at the person-level. ICC represents the proportion of between-person variability. Between-person correlations are presented above the diagonal and within-person correlations below the diagonal.
*p < .05; **p < .01; ***p < .001

3.2 Preliminary analyses

We checked for the effects of the unconditional multilevel model to ensure that variability between participants was sufficient to justify multilevel analyses for our outcome variable. The ICC from the null model for optimal experience (ICC = .36) was higher than .05, indicating the appropriateness of conducting multilevel modeling for this outcome variable (Peugh, 2010).

3.3. Multilevel modeling for predicting optimal experience

We estimated four separate multilevel models with random intercepts for testing the association between the predictor variables and optimal experience. Unstandardized parameter estimates from each model are presented in Table 2. The individual variables (challenge–skill perception, effortless attention, positive affect, and negative affect) in Model 1 explained 58.57% of variance at the between-person level (pseudo-R^2 = .5857) and 39.83% of variance at the within-person level (pseudo-R^2 = .3983). The contextual variables (activity and company) added in Model 2 explained another 0.52% of the variance at the between-person level (pseudo-R^2 Δ = .0052) and 4.15% at the within-person level (pseudo-R^2 Δ = .0415). Adding the interactions between individual states and type of activity in Model 3 explained another 0.07% of the variance in optimal experience at the between-person level (pseudo-R^2 Δ = .0007) and 0.75% at the within-person level (pseudo-R^2 Δ = .0075). Finally, the addition of the interactions between individual states and type of company in Model 4 accounted for an additional 0.46% of the variance in optimal experience at the between-person level (pseudo-R^2 Δ = .0046) and 0.36% at the within-person level (pseudo-R^2 Δ = .0036). The fit of the model increased with the addition of the contextual variables (Model 2; Δ χ^2 (7) = 562.0253, p < .001), the addition of the activity interactions (Model 3; Δ χ^2 (16) = 123.445, p < .001), and the addition of the company interactions (Model 4; Δ χ^2 (12) = 64.420, p < .001). We considered Model 4 as the final predictive model since it presented the best fit to the data. The results concerning the unstandardized coefficient (B), the p-value (p), and the effect size (ES) for each predictor of Model 4 are presented below.

As hypothesized, challenge–skill perception (B = .26, p < .001, ES = .40), effortless attention (B = .34, p < .001, ES = .52), and positive affect (B = .29, p < .001, ES = .45) were associated with an increase in optimal experience at the between-person level. Adolescents who had higher average levels of challenge–skill perception, effortless attention, and positive affect also reported higher average levels of optimal experience. Independent of these Level 2 associations, challenge–skill perception (B = .21, p < .001, ES = .32), effortless attention (B = .25, p < .001, ES = .38), and positive affect (B = .30, p < .001, ES = .46) were also associated with an increase in optimal experience at the within-person level. When adolescents experienced moment-to-moment increases in challenge–skill perception, effortless attention, and positive affect beyond their own cross-time average, they reported higher levels of optimal experience. In turn, negative affect was associated with lower levels of optimal experience, but only at the between-person level (B = -.09, p = .03, ES = -.14). Adolescents who had higher average levels of negative affect reported lower average levels of optimal experience.

The type of activity, as well as the company, had a significant influence on the levels of optimal experience, as expected. Specifically, performing a leisure activity ($B = .31$, $p < .001$, $ES = .48$), performing a maintenance activity ($B = .34$, $p < .001$, $ES = .52$), socializing ($B = .26$, $p = .01$, $ES = .40$), and engaging in other types of activities ($B = .15$, $p < .001$, $ES = .23$) were associated with increases in optimal experience when compared with performing a school activity. Being with family ($B = -.05$, $p = .01$, $ES = -.08$), friends ($B = -.16$, $p < .001$, $ES = -.25$) or others ($B = -.19$, $p = .01$, $ES = -.29$) was associated with a decrease in optimal experience compared with being alone.

Concerning interactions, activity moderated the association between challenge–skill perception and optimal experience, indicating that this association was stronger when adolescents performed school activities than when they were performing leisure activities ($B = -.08$, $p < .001$, $ES = -.12$), maintenance activities ($B = -.09$, $p < .001$, $ES = -.14$) or socializing ($B = -.08$, $p < .001$, $ES = -.12$). The activity did not moderate the relationship between effortless attention and optimal experience (leisure: $B = -.03$, $p = .17$, $ES = -.05$; maintenance: $B = -.02$, $p = .21$, $ES = -.03$; socializing: $B = -.04$, $p = .13$, $ES = -.06$; other: $B = -.04$, $p = .25$, $ES = -.06$ compared with school activities). Furthermore, the activity also moderated the association between affect and optimal experience. Specifically, the association between positive affect and optimal experience was stronger when adolescents were socializing ($B = .08$, $p = .03$, $ES = .12$) than when they were performing a school activity. Additionally, the association between negative affect and optimal experience was stronger in maintenance activities ($B = .12$, $p = .01$, $ES = .19$) than in school activities.

Regarding company, this contextual variable did not moderate the relationship between challenge–skill perception and optimal experience (family: $B = -.004$, $p = .80$, $ES = -.01$; friends: $B = -.03$, $p = .08$, $ES = -.05$; others: $B = .07$, $p = .25$, $ES = .11$ compared with being alone) or the relationship between negative affect and optimal experience (family: $B = -.06$, $p = .06$, $ES = -.09$; friends: $B = -.05$, $p = .11$, $ES = -.08$; others: $B = -.20$, $p = .25$, $ES = -.31$ compared with being alone). Nevertheless, the company did moderate the association between effortless attention and optimal experience, showing that this relationship was weaker when adolescents were with their family compared to being alone ($B = -.05$, $p = .01$, $ES = -.08$). Company also moderated the association between positive affect and optimal experience, indicating that this association was stronger when they were with family ($B = .11$, $p < .001$, $ES = .17$) and friends ($B = .15$, $p < .001$, $ES = .23$) than when they were alone. The between- and within-person variation explained by the final predictive model (Model 4) was 59.62% and 45.09%, respectively, as indicated by the pseudo-R^2 statistic (see Table 2).

TABLE 2

Two-level multilevel analyses on optimal experience outcome

Variable	Model 1 B (SE)	Model 2 B (SE)	Model 3 B (SE)	Model 4 B (SE)
Fixed effects				
Intercept	.79** (.30)	.74* (.30)	.71* (.30)	.67* (.30)
Overall challenge-skill	.25*** (.04)	.26*** (.04)	.26*** (.04)	.26*** (.04)
Challenge-skill	.10*** (.01)	.15*** (.01)	.19*** (.01)	.21*** (.02)
Overall effortless attention	.35*** (.05)	.34*** (.04)	.34*** (.04)	.34*** (.04)
Effortless attention	.24*** (.01)	.22*** (.01)	.24*** (.01)	.25*** (.02)
Overall positive affect	.30*** (.04)	.30*** (.04)	.29*** (.04)	.29*** (.04)
Positive affect	.42*** (.01)	.40*** (.01)	.41*** (.02)	.30*** (.03)
Overall negative affect	-.09* (.04)	-.09* (.04)	-.09* (.04)	-.09* (.04)
Negative affect	-.05*** (.01)	-.06*** (.01)	-.07** (.02)	-.03 (.03)
Activity (leisure)		.29*** (.02)	.31*** (.02)	.31*** (.02)
Activity (maintenance)		.35*** (.02)	.34*** (.02)	.34*** (.02)
Activity (socializing)		.27*** (.03)	.26*** (.03)	.26*** (.03)
Activity (other)		.14*** (.04)	.15*** (.04)	.15*** (.04)
Company (family)		-.09*** (.02)	-.07*** (.02)	-.05* (.02)
Company (friends)		-.20*** (.02)	-.18*** (.02)	-.16*** (.02)
Company (other)		-.24** (.07)	-.22** (.07)	-.19* (.08)
Challenge-skill × activity (leisure)			-.07*** (.02)	-.08*** (.02)
Challenge-skill × activity (maintenance)			-.08*** (.02)	-.09*** (.02)
Challenge-skill × activity (socializing)			-.08*** (.02)	-.08*** (.02)
Challenge-skill × activity (other)			-.04 (.03)	-.05 (.03)
Effortless attention × activity (leisure)			-.04* (.02)	-.03 (.02)
Effortless attention × activity (maintenance)			-.03 (.02)	-.02 (.02)
Effortless attention × activity (socializing)			-.05 (.02)	-.04 (.03)
Effortless attention × activity (other)			-.05 (.04)	-.04 (.04)
Positive affect × activity (leisure)			.01 (.03)	.03 (.03)
Positive affect × activity (maintenance)			-.05 (.03)	-.001 (.03)
Positive affect × activity (socializing)			.09* (.04)	.08* (.04)
Positive affect × activity (other)			.02 (.05)	.06 (.05)
Negative affect × activity (leisure)			-.06 (.03)	-.06 (.04)
Negative affect × activity (maintenance)			.12*** (.03)	.12*** (.04)
Negative affect × activity (socializing)			-.04 (.04)	-.03 (.05)
Negative affect × activity (other)			-.02 (.06)	-.01 (.06)
Challenge-skill × company (family)				-.004 (.02)
Challenge-skill × company (friends)				-.03 (.02)
Challenge-skill × company (other)				.07 (.06)

Effortless attention × company (family)				-.05* (.02)
Effortless attention × company (friends)				-.002 (.02)
Effortless attention × company (other)				-.02 (.07)
Positive affect × company (family)				.11*** (.03)
Positive affect × company (friends)				.15*** (.03)
Positive affect × company (other)				-.03 (.10)
Negative affect × company (family)				-.06 (.03)
Negative affect × company (friends)				-.05 (.03)
Negative affect × company (other)				-.20 (.11)
Random effects	SD (CI)	SD (CI)	SD (CI)	SD (CI)
Intercept	.42* (.38 - .47)	.42* (.38 - .46)	.42* (.38 - .46)	.42* (.38 - .46)
Residual	.68* (.66 - .69)	.65* (.64 - .66)	.65* (.64 - .66)	.65* (.64 - .66)
Pseudo-R^2 between	.5857	.5909	.5916	.5962
Pseudo-R^2 within	.3983	.4398	.4473	.4509

Note. Unstandardized estimates and standard errors. Level 2 predictors: overall challenge-skill, overall effortless attention, overall positive affect, and overall negative affect. Level 1 predictors: challenge-skill, effortless attention, positive affect, and negative affect.
*$p < .05$; **$p < .01$; ***$p < .001$

3.4 Multilevel mediation analyses with effortless attention as the mediator

Following the procedure of Zhang et al. (2009), three multilevel mediation models were estimated to evaluate the direct and indirect associations between challenge–skill perception and optimal experience, between positive affect and optimal experience, and between negative affect and optimal experience. The results are presented in Tables 3, 4, and 5, respectively. The unstandardized coefficients of the indirect effects (product of the *a* and *b* paths) are presented in the text.

Regarding the first mediation model (Table 3), the results showed that challenge skill perception had a significant positive association with effortless attention at both the between-person ($B = .16$, $p = .01$) and within-person ($B = .22$, $p = .01$) levels. Similarly, effortless attention was associated with an increase in optimal experience at both the between-person ($B = .47$, $p < .001$) and within-person ($B = .30$, $p < .001$) levels. The results demonstrated a significant indirect effect of effortless attention at both the between-person ($a^*b = .08$; 95% CI [.02, .13]) and within-person ($a^*b = .07$; 95% CI [.06, .07]) levels. As hypothesized, the concurrent association between challenge–skill perception and optimal experience was partly explained through its correlation with effortless attention.

TABLE 3

Multilevel mediation model (1-1-1) with effortless attention mediating the relationship between challenge-skill intensity and optimal experience

Variable	Path *c* to optimal experience (Step 1) B (SE)	Path *a* to effortless attention (Step 2) B (SE)	Path *b* and *c'* to optimal experience (Step 3) B (SE)
Fixed effects	B (SE)	B (SE)	B (SE)
Intercept	3.02**(0.18)	4.39** (.22)	.95** (.24)
Overall challenge-skill	0.39**(0.05)	0.16* (.06)	.31** (.04)
Challenge-skill	0.21**(0.01)	0.22** (.01)	.14** (.01)
Overall effortless attention			.47** (.04)
Effortless attention			.30** (.01)
Random effects	SD (CI)	SD (CI)	SD (CI)
Intercept	.58* (.53 - .64)	0.69* (.63 - .76)	.48* (.43 - .53)
Residual variance	.83*(.81 - .84)	1.13* (1.12 - 1.16)	.75* (.74 - .77)

Note. Unstandardized coefficients and standard errors. From step 1 to step 3, incremental pseudo-R^2 statistic indicated that the within-person variance explained by the model increased 8.4 % and that the between-person variance increased 20.5 %.
*$p < .05$; **$p < .01$

Concerning the second multilevel model (Table 4), the results showed that positive affect also had a significant positive association with effortless attention at both the between-person ($B = .02$, $p < .001$) and within-person ($B = .35$, $p = .01$) levels. In addition, effortless attention was associated with an increase in optimal experience at both the between-person ($B = .43$, $p < .001$) and within-person ($B = .26$, $p < .001$) levels. The results confirmed the hypothesis that the concurrent association between positive affect and optimal experience was partly explained through its correlation with effortless attention, but only at the within-person level ($a*b = .09$; 95% CI [.08, .10]). The indirect effect of effortless attention was insignificant at the between-person level ($a*b = .01$; 95% CI [-.20, .22]).

TABLE 4

Multilevel mediation model (1-1-1) with effortless attention mediating the relationship between positive affect and optimal experience

Variable	Path c to optimal experience (Step 1)	Path a to effortless attention (Step 2)	Path b and c' to optimal experience (Step 3)
Fixed effects	B (SE)	B (SE)	B (SE)
Intercept	2.57** (.19)	3.99** (.23)	.86** (.24)
Overall positive affect	0.46**(.01)	0.02** (.25)	.31** (.04)
Positive affect	0.55**(.05)	0.35** (.02)	.46** (.01)
Overall effortless attention			.43** (.04)
Effortless attention			.26** (.01)
Random effects	SD (CI)	SD (CI)	SD (CI)
Intercept	.55*(.50 - .60)	0.68* (.61 - .75)	.47* (.42 - .51)
Residual variance	.75*(.74 - .76)	1.14* (1.12 - 1.16)	.69* (.68 - .70)

Note. Unstandardized coefficients and standard errors. From step 1 to step 3, incremental pseudo-R^2 statistic indicated that the within-person variance explained by the model increased 11.92% and that the between-person variance increased 20.21%.
*p < .05; **p < .01

TABLE 5

Multilevel mediation model (1-1-1) with effortless attention mediating the relationship between negative affect and optimal experience

Variable	Path c to optimal experience (Step 1)	Path a to effortless attention (Step 2)	Path b and c' to optimal experience (Step 3)
Fixed effects	B (SE)	B (SE)	B (SE)
Intercept	5.16** (.14)	6.12** (.15)	2.09** (.36)
Overall negative affect	-0.29**(.01)	-0.45** (.06)	-0.06 (.05)
Negative affect	-0.39**(.05)	-0.37** (.02)	-0.28** (.01)
Overall effortless attention			0.50** (.05)
Effortless attention			0.30** (.01)
Random effects	SD (CI)	SD (CI)	SD (CI)
Intercept	.62*(.57 - .69)	0.62* (.56 - .68)	.54* (.49 - .59)
Residual variance	.83*(.82 - .84)	1.14* (1.13 - 1.16)	.75* (.74 - .76)

Note. Unstandardized coefficients and standard errors. From step 1 to step 3, incremental pseudo-R^2 statistic indicated that the within-person variance explained by the model increased 15.77% and that the between-person variance increased 23.46%.
*p < .05; **p < .01

In the third mediation model (Table 5), negative affect showed a significant negative association with effortless attention at both the between-person ($B = -.45$, $p < .001$) and within-person ($B = -.37$, $p < .001$) levels. Effortless attention was associated with an increase in optimal experience at both the between-person ($B = .50$, $p < .001$) and within-person ($B = .30$, $p < .001$) levels. The results showed a significant indirect effect of effortless attention at both the between-person ($a*b = -.23$; 95% CI [-.30, -.16]) and within-person ($a*b = -.11$; 95% CI [-.13, -.10]) levels. As expected, the concurrent association between negative affect and optimal experience was partly explained through its correlation with effortless attention.

4. Discussion

The present study offers new insights into understanding the role of particular cognitive and affective variables and their interaction with features of daily contexts in explaining adolescents' daily optimal experiences. In particular, we investigated how challenge–skill perception, effortless attention, positive affect, and negative affect were associated with optimal experience and how contextual factors, such as the type of activity and company, moderated these relationships. Moreover, we examined whether effortless attention mediated the relations between challenge–skill perception and optimal experience, positive affect and optimal experience, and negative affect and optimal experience. In general, the findings supported the proposed hypotheses.

4.1 Predictors of adolescents' optimal experience: Individual and contextual influences

Adolescents who perceived an activity to be more challenging and requiring more skills, and simultaneously felt more positive affect and more effortless attention also experienced higher levels of optimal experience by feeling more involved, more in control, more satisfied and perceiving time as passing more quickly than usual, confirming hypotheses 1, 2, and 4. These findings are in line with our expectations and with previous research using ESM, in which perceiving higher challenges/higher skills, feeling positive emotions, and being in an effortless state of attention is related to experiencing a flow state (Csikszentmihalyi & Nakamura, 2010; Asakawa, 2010; Fong et al. 2014). It is important to note that our study provides valuable additional information by showing that these associations were present in adolescents' overall experience, as well as in their momentary experience, evidencing between-person and intraindividual differences, respectively.

Previous research has focused predominantly on positive affect rather than negative affect as a correlate of the flow experience. Therefore, we also tested the relationship between negative affect and optimal experience. We found that negative affect was negatively associated with optimal experience, confirming hypothesis 3. Adolescents who had higher levels of negative affect were, on average, less likely to have an optimal experience. This finding touches on a neglected field in flow research concerning the inhibitors of the flow experience. For example, research in sports psychology has identified some inhibitors of the occurrence of flow in sports players (for a review, see Swann et al., 2012), suggesting that the presence of negative emotions can inhibit the occurrence of flow in athletes. Only a few previous studies have presented evidence in line with this result in adolescents and college students, but none has used multilevel analysis (Freire & Tavares, 2016; Kopačević et al., 2012; Ulrich et al., 2016). In our study, we tested the association between negative affect and optimal experience at between- and within-person levels. We found a between-person negative effect but no within-person effect, which indicates that momentary negative affect did not predict intraindividual fluctuations in optimal experience. This interesting result raises questions about how optimal experience is related to stable personality traits. Research on this topic has highlighted that individuals with an autotelic personality have a set of meta-skills that make them more prone to enter into and stay in the flow experience by actively matching their levels of perceived challenges and skills (Asakawa, 2004; Nakamura & Csikszentmihalyi, 2002). Our finding on trait negative affect also seems to point to characteristics of personality, perhaps indicative of the idea that higher levels of neuroticism (i.e., a stable predisposition to experience negative affect) are inimical to optimal experience. This is in line with previous research showing that neuroticism is associated with lower levels of flow experience in childhood (Mesurado & de Minzi, 2013) and young adulthood (Heller, Bullerjahn, & von Georgi, 2015). Our study extends the previous research by showing that negative affectivity was associated with lower levels of optimal experience in adolescents.

Contextual features of momentary experience had a direct influence on adolescents' optimal experience, as expected. Our results showed that activities that are not school-related, such as leisure, maintenance or socializing, were associated with higher levels of optimal experience. Some contexts seem to facilitate the occurrence of flow, with leisure being one of the contexts in which adolescents usually report higher levels of positive subjective experience (Freire et al., 2009; Shernoff et al., 2003). In contrast to our expectations and part of hypothesis 5, being with others (family, friends or other persons) was associated with lower levels of optimal experience than when alone. This finding did not confirm previous research showing that performing a task in the company of others is associated with higher levels of

optimal experience in adolescents compared with doing the task alone (Mesurado, 2009). Due to this result, the types of activities adolescents are involved in when alone should be considered. Currently, adolescents spend a large part of their free time playing video games, in which they are completely immersed and experience a positive experience (David-Ferdon & Hertz, 2007). It seems that although they are solitary, video games can elicit a flow state. Future studies should examine the interaction of the type of activity with the type of company, creating new categories to capture a more detailed picture of the influence of context. In addition, we must be aware that adolescents sometimes play video games alone but also sometimes play them on online platforms, interacting with peers in real time. This raises questions concerning the measurement of social contexts. Although the instructions for answering the daily ESM reports were to give explicit details regarding with whom they were exactly, adolescents might have marked "alone" even if they were in the presence of others virtually. Therefore, future research needs to address questions about what adolescents do while alone to know about the physical presence and nearness of others and online interactions.

4.2 The moderating role of daily contexts: Activity and company

In addition to the direct influence of context on optimal experience, our results demonstrated that activity and company moderated some of the associations between individual psychological states and optimal experience, confirming hypothesis 6. Our exploratory analysis revealed some interesting results concerning the direction of the moderation effect. The occurrence of optimal experience depended more on the level of challenge and skill when doing school tasks than when participating in leisure or socializing. These findings are in line with previous research showing that high school students experienced increased engagement in schoolwork when the perceived challenge and skill levels were high and in balance (Shernoff et al., 2003). Creating challenging tasks that are adequate to the students' skill level seems more pertinent in school settings than in other contexts, which has relevant implications for practitioners. As Moneta and Csikszentmihalyi (1996) noted, the challenge–skill condition may be more relevant for activities in which achievement plays a dominant role, such as schoolwork.

On the other hand, optimal experience was more dependent on the positive affect of teenagers when they are socializing with family and friends than when they are alone. Some studies have shown that social connectedness with family and peers predicts higher positive affect in adolescents (Jose, Ryan, & Pryor, 2012), and family and peer support is associated with adolescents' daily positive and negative affect (Weinstein, Mermelstein, Hedeker, Hankin, & Flay, 2006). These previous findings could help

explain why being with significant others such as family and friends seems to boost the relationship between positive affect and optimal experience more than being alone does.

Additionally, the occurrence of optimal experience depended more on the effortless attention the teenager felt when alone than when with family. It is interesting that being alone seems to be an advantage for attaining an effortlessness state that, in turn, is conducive to optimal experience. In line with Csikzsentmihalyi and Nakamura (2010), effortless attention seems to be dependent on external conditions. In sum, the impact of individual factors on optimal experience is not always straightforward and has to account for the specificities of different external factors, such as what the adolescents are doing and who they are with.

4.3 Effortless attention as a mediator

Our findings on the multilevel mediation processes estimated from cross-sectional associations, provided preliminary evidence for the idea that effortless attention is a significant mediator of the different associations between individual predictors (challenge–skill perception and positive and negative affect) and optimal experience (i.e., hypotheses 7, 8, and 9, respectively), adding knowledge to previous studies (Abuhamdeh & Csikszentmihalyi, 2012; Fredrickson & Branigan, 2005; Ullén, de Manzano, Theorell, & Harmat, 2010). It is interesting to note the existence of a between-person effect and a within-person effect, showing that the mediation mechanism for the predictors of challenge–skill perception and negative affect varied between adolescents and throughout each adolescent's experiential moments. For positive affect, the mediation effect was only present at the within-person level, suggesting that effortless attention was more relevant for momentary states of positive affect than for an individual trait of positive affectivity. Overall, these findings unveiled the role of effortless attention as a possible psychological mechanism through which the effects of different internal states on adolescents' optimal experience operate, evidencing the importance of promoting this state of effortlessness in adolescents' momentary experiences.

4.4 Limitations, future research, and implications

This study provides important insights into the relationship between internal psychological states, contextual features and optimal experience in adolescents' daily lives. Nevertheless, there are several limitations that need to be addressed when interpreting the results. The use of a convenience sample limits the conclusions that can be drawn, as we are unable to generalize our results. Furthermore, we did

not analyze data to be able to infer causality or assign definitive directionality in the relations between the variables. Future research should therefore use longitudinal designs to test causality between the constructs. A possible overlap in the constructs' definition of positive affect and optimal experience requires specific acknowledgment. Although we measured the validity and reliability of these constructs, the similarity between some items used in their measurement makes it difficult to ascertain that they are different constructs rather than just dimensions of the same underlying experience.

In addition, future research should focus on the role of effortless attention on optimal experience. Specifically, studies should go beyond cross-sectional multilevel mediation, testing mediational processes with time-lagged multilevel mediation models, to provide stronger evidence for indirect effects and the directionality of the processes (Cain, Zhang, & Bergeman, 2018). Researchers should also include a motivational dimension of subjective experience in their models, as the literature shows that intrinsic motivation is related to attentional resources (Abuhamdeh & Csikszentmihalyi, 2012), and these factors work together with cognitive and emotional dimensions to attain an optimal state of functioning (Freire, 2011).

Finally, the findings of the current study highlight some implications for youth interventions aimed at creating or intensifying optimal experience within adolescents' lives. Practitioners should involve adolescents in activities that are adequately challenging and that demand the appropriate skill level, thus providing them with the conditions for the emergence of optimal experiences in school, leisure, and social activities. Notably, experiencing flow while with family or friends depends more on positive affect than negative affect, making direct interventions into the affective dimension and into the relationships teenagers have with their significant others relevant. Adolescents who generally feel more negative affect have lower levels of optimal experience, and this association is independent of the type of company. Learning how to manage negative emotions could be a central point in interventions with adolescents. Adolescents could thus be active agents in the regulation of their own emotional experiential states, taking advantage of what immediate contexts have to offer them (Gestsdottir & Lerner, 2008).

5. Conclusion

This study provided additional knowledge for the existing conceptual frameworks on optimal experience. Our findings suggested a possible deleterious effect of trait negative affect on adolescents' optimal functioning. In addition, we presented preliminary evidence concerning the mediating role of

effortless attention on the association between adolescents' psychological states and optimal experience. Finally, this study showed that performing leisure and school activities, socializing, being alone, with family or with peers should acquire renewed relevance in adolescents' daily lives because these activities and types of company not only had a direct influence on optimal experience but also moderated the relationships between internal states and optimal experience.

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CHAPTER III

Predicting Adolescents' Optimal Experience in Daily Life: the Role of State and Trait Levels of Attentional Control and Emotion Regulation and the Moderation of Daily Contexts.[4]

Abstract

Optimal experience is a state of psychological functioning linked to several positive development outcomes in adolescence. Research has identified several individual and situational factors associated with variations in optimal experience. Some of these factors refer to dispositions or trait characteristics, while others are context-related. Despite the growing body of literature, few studies have addressed the role of self-regulation abilities, such as attentional control and emotion regulation, in optimal experience. The present study aimed to examine the influence of these psychological constructs in adolescents' daily optimal experience, crossing the effect of daily contexts and combining a trait and state perspectives. We collected data using global self-reports and a real-time measure (i.e., experience sampling method) from 110 Portuguese adolescents (14-19 years old, 72% female). Multilevel modelling revealed that attentional control has a consistently positive effect in optimal experience across trait and state levels. Cognitive reappraisal strategy predicted a decrease in optimal experience intensity at the between- and within-person levels, while expressive suppression strategy predicted an increase at the between-person level. Contextual features such as the type of activity and company moderated some of these relationships. These findings highlight the importance of promoting the ability to control attention in this age period to enhance the quality of daily subjective experience. Moreover, it unveils the context-dependency of the use of emotion regulation strategies, and it underscores the relevance of promoting a flexible and effective use of these strategies across the different contexts of daily life.

Keywords: adolescents, optimal experience, attentional control, emotion regulation strategies, contexts.

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[4] This chapter corresponds to a paper under preparation for submission: Tavares, D., Freire, T., & Faria (2020). Predicting adolescents' optimal experience in daily life: The role of state and trait levels of attentional control and emotion regulation and the moderation of daily contexts.

1. Introduction

Daily life is a suited scenario for studying subjective human experience. It is in the everyday momentary experience that researchers can access the fluctuations of emotions, cognitions, and motivations and their interplay with the natural settings in which they occur (Reis, 2012). Adolescence is a critical period of life in which these fluctuations are on the rise. The multiple and expected transformations in this age bring known risks but also new challenges and opportunities for the construction of a positive developmental trajectory (Tolan, 2014). Assessing adolescents' daily life allows researchers to identify patterns of optimal functioning that are associated with positive psychological outcomes. Flow experience is a central construct within the field of optimal functioning. Flow experience is defined as an optimal psychological state, in which the person is deeply involved and immersed in the task at hand with high levels of intrinsic motivation (Csikszentmihalyi, 1990). Research showed that flow or optimal experience could have positive and long-term implications in individuals' development by contributing both to personal well-being and positive functioning in daily life (EFRN, 2016). Knowing what can predict this positive psychological state in adolescents, and under what conditions, brings new possibilities for practitioners to promote optimal experience in this age.

A consistent body of research has identified some factors that are associated with an increase in optimal experience, such as sociodemographic characteristics (Riva et al., 2017), personality traits (Bassi, Steca, Monzani, Greco, & Delle Fave, 2014), and psychological states such as positive and negative affect (Freire & Tavares, 2016; Kopačević, Rogulja, & Tomić, 2012).

Although critical scientific contributions have been made in this area, there is still a lack of knowledge about other individual characteristics that can enhance or dampen optimal experience, such as self-regulation capacities. Having the ability to control our attention is the hallmark to enter and stay in an optimal state, according to flow theory (Csikszentmihalyi, 1990). It is through the control of attention that individuals choose what enters in their consciousness and what stays out. Existent research has reported that attentional control is linked to psychopathology in children and adolescents (Muris, Mayer, Lint, & Hofman, 2008), but can also have a protective factor in the development of psychological problems (Vasey, Harbaugh, Mikolich, Firestone, & Bijttebier, 2013). However, little empirical evidence exists about whether this individual capacity has an impact in optimal experience. Moreover, the few existent studies that have demonstrated a positive association between attentional control and optimal experience have been done with adults or college samples (e.g. Cermakova, Moneta, & Spada, 2010).

Another crucial self-regulation capacity is the ability to control or regulate emotions. Emotion regulation is at the cutting edge of psychological research in general. Studies have linked emotion regulation to psychopathology and several psychological problems in youth (Compas et al., 2017), but also to positive psychological functioning (Morrish, Rickard, Chin, & Vella-Brodrick, 2018). Recent research has demonstrated that the tendency to use specific emotion regulation strategies, such as cognitive reappraisal and expressive suppression is associated with positive and negative outcomes in adolescence (Verzeletti, Zammuner, Galli, & Agnoli, 2016). Although the majority of studies focused on emotion regulation as a trait, some research started to show the effects of these same strategies on adolescents' subjective experience when measured as a state (Silva, Freire, & Faria, 2018).

Literature has demonstrated that daily contexts also have an essential differential impact on adolescents' optimal experience besides individual factors. When comparing different daily contexts such as type of activity, place, and company, differences emerge showing that some contexts are consistently associated with higher frequency or intensity of optimal experience, as it is the case for structured leisure activities (Bassi & Delle Fave, 2004; Freire, Tavares, Silva, & Teixeira, 2016). It is through the interplay between the characteristics or opportunities provided by the contexts and the person's skills that optimal experience can arise (Nakamura & Csikszentmihalyi, 2002).

The use of a daily life method, such as the Experience Sampling Method (ESM; Hektner, Schmidt, & Csikszentmihalyi, 2007), is an appropriate way of assessing the influence of the person-context interaction. Due to its ecological and real-time nature, it allows researchers to test the influence of external dimensions (contexts) and internal dimensions (e.g. cognitions, emotions) on an immediate basis. By allowing to collect data at the person and moment levels, it also provides the opportunity for researchers disentangle trait and state influences, respectively, on a multilevel framework of analysis.

In the present study, we aim to understand how attentional control and emotion regulation at the state and trait levels operate to increase adolescents' optimal experience. Specifically, and using ESM, we examined how momentary states of attentional control and momentary use of two emotion regulation strategies (cognitive reappraisal and expressive suppression) can influence momentary levels of optimal experience in adolescents when controlling the levels of momentary positive and negative affect. We also investigated how this influence is moderated by daily contexts, namely the type of activity performed by adolescents (school activity, leisure, or socializing) and with whom they are (family, friends, or alone). We also examined whether attentional control and emotion regulation strategies conceptualized as dispositional characteristics predicted or moderated adolescents' optimal experience. For this, we

included in the models these individual traits dispositions measured as one-time scores (provided by global self-reports) and as aggregate scores (i.e., person-mean of the weekly assessed states provided by ESM).

1.1 Optimal experience and positive consequences for adolescents' development

Flow experience is a gratifying psychological state of deep involvement and absorption that individuals experience when performing a challenging activity for which they perceive having adequate skills (EFRN, 2016). When in flow, individuals are intrinsically motivated and report high levels of concentration in the task at hand, deep involvement, and a personal sense of high control (Csikszentmihalyi, 1990). Given its positive characteristics, flow has been considered an optimal experience. Indeed, when in a flow state, individuals report the most positive cognitive, emotional and motivational dimensions of subjective experience (Bassi & Delle Fave, 2012). Besides these characteristics, flow theory postulates that there are three conditions for entering in a flow state when performing an activity: a balance between the challenges and skills perceived, clear goals, and immediate feedback (Nakamura & Csikszentmihalyi, 2002). Most of the research has focused on the challenge-skill relationship and has shown that flow experience is more likely to occur in a high challenge high skill condition (Fong, Zaleski, & Leach, 2014).

Being flow such an enjoyable and rewarding psychological state, the person seeks to repeat it. By trying to achieve or maintain an optimal balance between challenge and skill in the activity, the person enters in a cycle of challenge-seeking and skill-building, proceeding to higher levels of psychological complexity (Csikszentmihalyi, 1990). This dynamic process reinforces the development of skills and expertise in an activity, and ultimately fosters individual development (Massimini & Delle Fave, 2000). Besides the progressive enhancement of skills and the increase in self's complexity, optimal experience is also associated with a series of short and long-term positive outcomes in children and adolescents' development (Bassi & Delle Fave, 2004; Hektner & Csikszentmihalyi, 1996), namely psychological well-being and self-esteem (Nakamura & Csikszentmihalyi, 2002; Steele & Fullagar, 2009), satisfaction with life (Bassi et al., 2014), sociability (Hektner, Asakawa, Kanuth, & Henshaw, 2000), positive affect (Rogatko, 2009), happiness (Csikszentmihalyi & Hunter, 2003), and engagement in learning and achievement (Shernoff, Csikszentmihalyi, Schneider, & Shernoff, 2003). Optimal experience should, therefore, be considered a crucial component in the promotion of healthier and positive developmental trajectories in adolescence.

1.2 Factors underlying variations in adolescents' optimal experience

Several researchers have demonstrated the existence of some variability in optimal experience between adolescents and across activities (Bassi & Delle Fave, 2012; Freire, Lima, & Fonte, 2009). Nevertheless, the major variation occurs within the same adolescent across time than between adolescents (Schmidt, Shernoff, & Csikszentmihalyi, 2007; Tavares, Freire, & Faria, 2019). The factors associated with these fluctuations in adolescents' optimal experience can come from multiple sources. Research in this area has provided considerable evidence that both situational and individual factors are significant contributors to variations of optimal experience (Schmidt et al., 2007; Tavares & Freire, 2016). Indeed, researchers from different fields of psychology consider that human behavior is situated and context-sensitive. Therefore, it should be studied in a contextualized way, accounting for both the external and internal dimensions of individual experience (Schwarz, 2012). This ecological and interactionist perspective is also present in the conceptualization of optimal experience and related empirical research. It considers the contexts, the person, and their interaction as main components for the emergence of an optimal state of functioning (Csikszentmihalyi, 1990; Freire, 2011).

Situational factors: The emergence of optimal experience in daily contexts

The different contexts where adolescents move throughout the day represent the external dimensions of their individual experience. These external or contextual factors provide a diversity of situational opportunities to engage in flow inducing activities. Consistent findings have found that some activities are associated with higher levels of optimal experience, although individuals can experience flow in all kind of activities. Structured leisure activities are among the most flow-promoting activities for adolescents (Freire et al., 2016; Tavares et al., 2019). They are an excellent example of a type of activity that brings together the fundamental elements to achieve flow. They are more structured, offer clear goals and immediate feedback, allow the development of skills by presenting some degree of challenge, and allow adolescents to be more in control and to be more autonomous (Mesurado, 2009; Perkins & Nakamura, 2013; Shernoff et al., 2003). Several studies have found that adolescents experienced more flow in structured leisure activities that in school activities (Bassi & Delle Fave, 2004; Freire et al., 2016; Schmidt et al., 2007). Also, socializing, with family or peers, is an essential source for the occurrence of optimal experience in adolescents (Delle Fave, Bassi, & Massimini, 2002; Rathunde, 2001). Even in the school context, adolescents reported more flow when socializing with peers than when performing curricular activities (Freire et al., 2009). In line with this, a study by Walker (2010) claims that "doing it

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together is better than doing it alone" (p. 9). The author has found that solitary flow is not as enjoyable as social flow. Flow in social contexts can be a qualitatively different experience than flow experienced alone. This difference occurs because social contexts bring additional elements such as social interdependence and emotional contagion that may facilitate flow experience (Walker, 2010). Mesurado (2009) had also found that when adolescents carried out tasks in the company of others, they reported higher optimal experience that when they did so alone.

In light of the literature review, we aimed to replicate some of these findings by testing if the type of activity and the type of company were associated with higher levels of optimal experience in adolescents, beyond the influence of individual psychological states.

Individual factors: The role of personal characteristics in optimal experience

Research has identified proximal and distal individual factors associated with variations in optimal experience. Different studies have put in evidence the influence of proximal factors such as the internal dimensions of momentary subjective experience (i.e., cognition, emotion, and motivation). For instance, researchers have found that momentary cognitive states of experience such as focused attention, the balance of high challenges and high skills and the perceived autonomy in the activity (Schmidt et al., 2007), and the sense of control in the activity (Choe, Kang, Seo, & Yang, 2015) were associated with flow in adolescents.

Other researchers have focused on the role of emotions in optimal experience. Although flow experience is usually reported as a pleasant state, it has a cognitive core (Delle Fave & Massimini, 2005). In fact, and according to flow theory (Csikszentmihalyi, 1990), the several dimensions that characterize flow experience do not include emotions. Albeit not being one of its characteristics, positive affect is, in general, an important correlate of optimal experience (e.g. Esteban-Millat, Martínez-López, Huertas-García, Meseguer, & Rodríguez-Ardura, 2014; Rogatko, 2009). Some studies have shown that positive affect can also predict students' flow experience in school and leisure activities (Freire & Tavares, 2016; Kopačević et al., 2012). These same studies have also demonstrated that negative affect predicted a decrease in students' optimal experience. In a previous work under this doctoral research, presented in Chapter II, we examined the influence of both positive and negative affect (Tavares et al., 2019). We found that momentary positive affect predicted a positive variation in adolescents' optimal experience. Also, adolescents with a higher week average of negative affect reported lower levels of momentary optimal experience. Neuroimaging research is in line with these findings by showing activation of brain

regions linked to positive affectivity (de Manzano et al., 2013) and decrease in activation of brain regions (amygdala) responsible for negative affect (Ulrich, Keller, & Grön, 2016) when in a flow state.

Moving to more distal factors of optimal experience, sociodemographic characteristics like gender and age emerged as possible influences for explaining differences in optimal experience. However, the findings are inconsistent, with some studies showing that girls experienced more flow than boys (Schmidt et al., 2007), others demonstrating that boys reported more flow than girls when using the internet (Stavropoulos, Alexandraki, & Motti-Stefanidi, 2013), and others showing no correlation between gender and optimal experience (Riva et al., 2017). Regarding age, Leibovich, Maglio, and Giménez (2013) have found that younger adolescents were more likely to experience flow. However, other researchers have found that age is positively correlated with some dimensions of optimal experience and negatively correlated with others (Riva et al., 2017).

Literature has also demonstrated that other distal personal factors, such as individual dispositions or traits, can explain some variation in adolescents' optimal experience. Autotelic personality, which is the propensity to experience flow and to engage actively in an activity for its own sake, seems to justify individual differences in flow experience (Csikszentmihalyi, 1990). Autotelic individuals seem to have specific qualities or meta-skills (e.g. curiosity and interest in life, greater capacity to focus attention at the moment, persistence, capacity of matching challenges with skills, and low self-centeredness) that make them more prone to find flow (Nakamura & Csikszentmihalyi, 2002). Research has demonstrated that autotelic individuals were more intrinsically motivated and more actively engaged with their daily lives in comparison with non-autotelic individuals (Asakawa, 2004), with similar results for autotelic adolescents (Adlai-Gail, 1994). Researchers have also found that the Big Five personality traits are important personal factors for attaining optimal experience, being conceived of as boundary conditions since they drive individuals to experience flow when they encounter optimal tasks conditions (Baumann, 2012). Specifically, researchers have found that Openness to Experience trait predicted the occurrence of flow (Bassi et al., 2014) and that Extraversion trait was higher in adolescents who experienced higher levels of flow than in those who evidenced lower levels of flow (Leibovich et al., 2013). Schmidt et al. (2007) have also found that some other trait-related variables such as self-esteem, optimism, and self-efficacy were associated with higher momentary levels of flow in adolescents. These are promising findings regarding the role of individual factors in optimal experience, regardless of whether they are stable individual characteristics (traits) or momentary expressions of those characteristics (states). However,

further research is needed on the predictive role of other individual factors and the differential effects of their trait and state manifestations in optimal experience, especially in adolescence.

1.3 Cognitive resources for enhancing optimal experience: The role of self-regulation abilities

From its inception, flow theory (Csikszentmihalyi, 1975, 1990) postulated that possessing self-regulation abilities is crucial for entering a state of flow. Specifically, attention could be considered the primary cognitive resource to control what enters in consciousness and to experience flow. The capacity to focus on a specific task and to resist external or internal distractions allows the person to enjoy and to be fully engaged in everyday experiences. Besides, the ability to regulate one's emotions could also support the engagement in this absorbing state by preventing the interference of negative emotions on concentration, and consequently on the flow experience (Csikszentmihalyi, 1997). Therefore, adolescents' self-control seems to be crucial for helping them to regulate their thoughts and emotions, maintaining their attentional focus on a task and avoiding impulses or distractors (Kuhnle, Hofer, & Kilian, 2012). Indeed, general self-control (as the capacity to regulate attention, emotion, and behavior) is a predictor of flow in adolescence (Kuhnle et al., 2012). As adolescence is a developmental period characterized by intense and fluctuating emotionality, it seems pertinent to consider self-regulation abilities as essential skills or dispositions for adolescents successfully respond to daily challenges (Steinberg, 2005). Developmental research has shown that attentional control and emotion regulation are the main components of self-regulation and that these abilities tend to develop between early childhood and middle childhood, showing a more stable course when entering in adolescence (Rafaelli, Crockett, & Shen, 2005).

Attentional control

Attentional control (AC) refers to the individual capacity to voluntarily focus and shift one's attention to attaining a specific goal (Derryberry & Reed, 2002). More than paying attention to a task, AC is the ability to attend to relevant stimuli in the face of irrelevant stimuli which requires a voluntary and effortful action (Merlo, Shaughnessy, & Weiss, 2018). This process implies the activation of dorsal and ventral networks in the brain responsible for top-down regulation (Corbetta & Shulman, 2002). Some authors demonstrated an increase in executive attention and physiological indicators of mental effort when in a flow state (Peifer, Schächinger, Engeser, & Antoni, 2014; Ulrich et al., 2016).

Attentional control has a vital role in regulating emotion and behavior. Research showed that children with higher levels of AC regulate better their internal experience of emotions, resulting in less externalizing behavior (Eisenberg, Fabes, Guthrie, & Reiser, 2000). However, the ability to control one's attention is still immature during childhood and early adolescence but rapidly develops during middle adolescence (Anderson, Anderson, Northam, Jacobs, & Catroppa, 2001). With the progression of neural maturation in interaction with the environment, adolescents become more capable of exerting a flexible cognitive control (Luna, Padmanabhan, & Hearn, 2011). These changes bring new possibilities for their socioemotional development and their capacity to respond to more complex demands and challenges. However, there are still immaturities in this ongoing process at this age period, which put adolescents at risk for the onset of psychopathology. Literature showed that low levels of AC are related to the development and maintenance of some psychological disorders in children and adolescents. Specifically, its association with anxiety, depression, aggression, and attention-deficit hyperactivity disorder (Muris, de Jong, & Engelen, 2004; Muris et al., 2008; Muris, Meesters, & Rompelberg, 2007). Researchers also demonstrated that high levels of AC could have a protective role in adolescents' psychopathology. For example, AC can moderate the impact of negative effect in adolescents' depressive symptoms (Vasey et al., 2013) and reduce the effect of reactive temperament in internalization (Sportel, Nauta, de Hullu, de Jong, & Hartman, 2011).

Beyond the association of AC with adolescents' maladaptive functioning, research has also started to show some promising results concerning its role regarding positive individual functioning. The few existent studies in this topic linked AC (as a component of effortful control) to better academic performance, social competence, and social adjustment (Checa, Rodríguez-Bailón, & Rueda, 2008; Zorza, Marino, de Lemus, & Mesas, 2013).

Optimal experience is a central topic in the field of positive development and positive human functioning. However, there is still little empirical research relating optimal experience with the construct of AC. Most of the existent studies have put in evidence the central role of general attentional processes for the occurrence of flow experience. Massimini, Csikszentmihalyi, and Delle Fave (1988) have demonstrated that concentration is a fundamental factor for entering in a flow experience, especially for college students. Abuhamdeh and Csikszentmihalyi (2012) have found that the momentary level of attention devoted to the activity was a mediator between the balance of challenges/skills and enjoyment (which is one dimension of optimal experience). Marty-Dugas and Smilek (2019) have demonstrated that individuals who experienced flow more often had more focused attention and fewer attention errors. Other

researchers who studied e-learning environments have shown that focused attention predicted university students' levels of flow (Esteban-Millat et al., 2014; Shin, 2006).

Although the theoretical flow model postulated that the control of attention is an important skill required for entering into a flow state (Csikszentmihalyi, 1990), we found fewer studies that have approached the relationship of optimal experience with the specific construct of AC. In an experimental study, Harris, Vine, and Wilson (2017) have investigated the role of AC (measured with an index of visual attention) in the flow states of adult basketball players. They have found initial evidence that optimal visual attention may enhance flow experience. Indeed, studies about psychological interventions with athletes have demonstrated that practicing the regulation of attention (as part of a mindfulness training or a more general psychological skills intervention) was related to increases in the flow state (Cohen, Tenenbaum, & English, 2006; Swann, Keegan, Piggott, & Crust, 2012). Cermakova et al. (2010) investigated how trait AC and dispositional flow influenced undergraduate students' approach to study when preparing for the academic examination. They have found that higher levels of AC were associated with an increase in students' levels of flow experience when performing study-related activities. Another study has shown that mindfulness (which included a component of AC) and cognitive flexibility predicted college students' propensity for experiencing flow (Moore, 2013).

In sum, if we consider the construct of AC and its relationship with optimal experience in adolescence, we found that empirical research is still scarce or nonexistent (Tavares & Freire, 2016). All of the studies mentioned above were done with young adults or adult samples. Even if not focusing on adolescence, these studies present some evidence on the positive association we might expect between AC and optimal experience in adolescents.

Emotion Regulation

Emotion regulation (ER) is the process by which the individual up- or down-regulate the magnitude or duration of his/her emotional response according to an existent goal (Gross, 2013). ER is widely recognized as a crucial construct in adolescent development literature (Riediger & Klipker, 2014). The capacity for regulating one's emotions increases across adolescence and becomes more differentiated as a function of biological and environmental factors (Zeman, Cassano, Perry-Parrish, & Stegall, 2006). The development of executive and cognitive functions in this age period allows the use of more sophisticated and flexible ER strategies (Todd, Cunningham, Anderson, & Thompson, 2012). This renewed ability makes the adolescent more capable of responding to the increased complexity of daily

situations (Larson, 2011). In a continually changing world, the capacity to regulate efficiently one's emotions is a crucial resource for adolescents' psychosocial adjustment (Gullone, Hughes, King, & Tonge, 2010). An extensive body of research has found that ER is related to internalized and externalized psychopathology in childhood and adolescence. Specifically, researchers have found a link with depressive symptoms, anxiety, problem behavior, and eating disorders (Compas et al., 2017; McLaughlin, Hatzenbuehler, Mennin, & Nolen-Hoeksema, 2011; Silk, Steinberg, & Morris, 2003). Another line of research has found evidence that supports the protective effect of ER on child and adolescent well-being in a variety of contexts and diverse samples in terms of psychological and behavioral outcomes (Daniel, Abdel-Baki, & Hall, 2020; Morrish et al., 2018).

In literature, we can find different theoretical models for conceptualizing ER. Gross's process model of emotion regulation (1998) has proven to be a useful and adequate framework to investigate the role of different ER strategies in psychological functioning. The author defined several groups of ER strategies, depending on what moment they are used in the emotion generative process. Cognitive reappraisal (CR) and expressive suppression (ES) are two examples of those strategies that have been extensively studied in psychological literature. CR implies a cognitive change and consists of changing the way one is thinking about a situation to prevent the generation of a specific emotion. In turn, ES activates a behavioral response by suppressing the expression of the emotion that has been already generated, and consequently, does not prevent the individual from experiencing the emotion. Thus, CR is considered an antecedent-focused strategy because it is used before the emotional response has been generated while ES is a response-focused strategy as it is elicited after the emotional response is generated (Gross, 1998). In general, research has demonstrated that CR strategy has healthier effects on psychosocial functioning and well-being than ES strategy (e.g. Butler et al., 2003; Haga, Kraft, & Corby, 2009; John & Gross, 2004). Evidence review has demonstrated that CR was negatively associated with anxiety and depressive symptoms in adolescents whereas ES showed a positive association with anxiety and depression (Sai, Luo, Ward, & Sang, 2016; Schäfer, Naumann, Holmes, Tuschen-Caffier, & Samson, 2017). Gómez-Ortiz, Roldán, Ortega-Ruiz, and García-López (2018) reinforced part of these findings by showing that adolescents with higher social anxiety evidenced a greater use of the ES strategy when compared with adolescents with lower social anxiety. However, no differences were found for CR strategy. Other studies have found that the use of CR is positively associated with self-esteem, life satisfaction, psychological well-being, and happiness, and the ES is negatively associated with those same variables (Freire & Tavares,

2011; Freire & Teixeira, 2018; Teixeira, Silva, Tavares, & Freire, 2015; Verzeletti et al., 2016; Wang, Li, Hu, Dong, & Tao, 2017).

Although these findings indicate that, in general, CR is more adaptive than ES, Gross (1998) made no prior assumptions about if ER strategies are 'good' or 'bad' in his process model of emotion regulation, considering that the adequacy of emotion regulation processes will depend on contexts. Previous research on ER in daily life has demonstrated that ER processes are dynamic and context-dependent (Brockman, Ciarrochi, Parker, & Kashdan, 2017; Silva et al., 2018). Thus, it seems pertinent to investigate these ER processes in a contextualized scenario such as adolescents' daily lives and under an ecological approach, as we did in the present study.

Despite the extensive amount of research in ER, few studies have investigated its relationship with flow or optimal experience. Beyond theoretical discussions relating ER and optimal experience (Tavares & Freire, 2016), we can find some research relating ER with similar constructs that share a common ground with optimal experience. For example, in their review, Morrish et al. (2018) have demonstrated that ER strategies may foster positive engagement in activities by regulating negative emotions or increasing positive affect. Other studies in sports and education have found that ER skills are crucial for attaining optimal performance states in competitive sports (Jackson, Thomas, Marsh, & Smethurst, 2001). Practitioners have even included them in sport training programs for enhancing optimal performance of athletes (Robazza, Pellizzari, & Hanin, 2004). The few existent studies that investigated the relationship between ER and optimal experience in adolescence presented some preliminary findings of the effect of ER strategies in flow disposition in school and leisure (Freire & Tavares, 2016). Using multiple hierarchical regression analyses, the authors have found that CR predicted higher dispositional flow in leisure activities (but not in school activities) when controlling for the effect of positive and negative affect. The present study intends to fill this gap in the literature by testing the influence of ER strategies (cognitive reappraisal and expressive suppression) in adolescents' optimal experience, considering their interaction with daily contexts.

In the present study, we sought to examine if adolescents' self-regulation abilities to control attention and to regulate emotions influence adolescents' daily optimal experience, beyond the effect of momentary positive and negative affect.

1.4 Trait and state influences: The use of the experience sampling method

The influence of attentional control and emotion regulation in optimal experience can be studied, allowing for the differentiation of trait and state components. This approach of integrating stable (trait) predispositions and momentary (state) expressions have been used in personality psychology to predict behavior more effectively (Sosnowska, Kuppens, De Fruyt, & Hofmans, 2020). By integrating different levels of analysis (i.e., traits and states), researchers became able to detect between-person differences and within-person variability (i.e., the extent to which person's behaviors, emotions, and cognitions fluctuate across contexts and time) (Beckmann, Wood, & Minbashian, 2010). Adopting this integrated approach in research becomes even more relevant as evidence suggests that between-person associations and within-person associations can differ not only in magnitude but also in direction (Tennen, Affleck, Armeli, & Carney, 2000). Statistics reinforce this idea by showing that any relationship at the between-person level can coexist with any relationship at the within-person level of analysis (Nezlek, 2001).

In the literature review, we have found that most research has assessed attentional control (e.g. (Melendez, Bechor, Rey, Pettit, & Silverman, 2017) and emotion regulation strategies (e.g. Freire & Tavares, 2011; Gullone & Taffe, 2012) from a trait perspective, mostly using retrospective questionnaires. Fewer studies have employed a state perspective assessing self-reported momentary states of attentional control and emotion regulation across everyday life (e.g. Silk et al., 2003) or assessing these same constructs with objective indicators of neural functioning and performance in experimental tasks (e.g. Cohen Kadosh, Heathcote, & Lau, 2014; McRae et al., 2012). Regarding emotion regulation, studies that applied a trait and state perspective simultaneously are almost inexistent, except for one study of Silva et al. (2018) that have investigated the predictive role of adolescents' trait and state emotion regulation on affect. These authors have found that state expressive suppression strategy predicted an increase in adolescents' negative affect and a decrease in positive affect while trait expressive suppression did not. Moreover, results in opposite directions were found for the same sample of adolescents: state cognitive reappraisal predicted an increase in negative affect while trait cognitive reappraisal predicted a decrease in negative affect. The existence of these discrepancies reinforces the importance of distinguishing within- and between-person processes when studying emotional regulation (Nezlek & Kuppens, 2008).

In attentional control literature, also few studies have investigated trait and state attentional control simultaneously. Within an experimental stress condition, two studies have investigated the impairment of cognitive performance anxiety on state attentional control and working memory performance, with a

possible moderation of trait attentional control (Angelidis, Solis, Lautenbach, van der Does, & Putman, 2019; Putman, Verkuil, Arias-Garcia, Pantazi, & Van Schie, 2014). Another experimental study has examined the effects of working memory capacity and wearing a white lab coat during an insight-problem solving task (Van Stockum & DeCaro, 2014). The authors have searched for a possible interaction between state and trait attentional control to impact the performance on the task.

For applying this integrated trait-state approach, some methods have demonstrated to be more suitable than traditional cross-sectional designs. They are referred to as ecological momentary assessments or daily life methods and capture the daily fluctuations of the different dimensions of human functioning (Mehl & Connor, 2012; Shiffman, Stone, & Hufford, 2008). These methods allow the gathering of intensive longitudinal data which is an appropriate solution for understanding variations in psychological constructs from trait and state perspectives. Daily life methods can capture the daily subjective experience, showing in real-time (or close) the behaviors and activities adolescents perform along the day, and their momentary perceptions, thoughts, feelings, and motivations about those activities (Schwarz, 2012). The Experience Sampling Method (ESM; Hektner et al., 2007) is a daily life method that captures momentary and repeated samples of participants' daily subjective experience through self-report. It is a real-time and ecological method that assesses the experience as it occurs and within real-life contexts. ESM allows researchers to obtain multiple assessments for each individual across a short period (usually one week), thus being considered an intensive longitudinal method (Bolger & Laurenceau, 2013). Literature has shown that ESM has good reliability and high internal and ecological validity (e.g. Hektner et al., 2007; Larson, Moneta, Richards, & Wilson, 2002).

Following this approach, we aim to disentangle the trait and state influences of attentional control and emotion regulation in adolescents' optimal experience to understand their distinct and unique contributions. We intend to do this using both real-time (i.e., the Experience Sampling Method) and retrospective measures, collecting state and trait data, respectively. By combining between-person (trait) and within-person (state) perspectives, we can go beyond merely describing differences in optimal experience between adolescents to concluding about within-individual variation across time and real-life conditions (Reis, 2012).

1.5 The present study

The reviewed literature suggests that, in general, self-regulation capacities (i.e., attentional control and emotion regulation) may have a significant influence in optimal experience (Cermakova et al., 2010; Freire & Tavares, 2016; Jackson et al., 2001; Kuhnle et al., 2012; Moore, 2013; Morrish et al., 2018). The purpose of the present study is to examine the predictor role of attentional control (AC), and cognitive reappraisal (CR) and expressive suppression (ES) emotion regulation strategies on adolescents' daily optimal experience. We intend to test the effects of these predictors when measured as traits and states. Also, we intend to control for the effect of other correlates such as positive and negative affect states and contexts (activities, companies), since previous studies showed their significant contribution on optimal experience (Freire & Tavares, 2016; Kopačević et al., 2012; Schmidt et al., 2007). Finally, we sought to explore if the influence of these predictors is stable over the school year.

First, we aim to examine whether the momentary capacity of controlling one's attention (state) and momentary use of CR and ES (states) are associated with within-variation in optimal experience, both at the concurrent and lagged level of analysis, beyond the influence of positive and negative affect states. Based on the reviewed literature, we expect state AC to be positively associated with adolescents' optimal experience at the concurrent level. We also expect to find a positive effect of CR strategy and a negative effect of ES strategy in optimal experience, also at the concurrent level. Accordingly, we defined the following hypotheses:

Hypothesis 1: On occasions when adolescents experienced higher levels of momentary AC (state), they will have higher levels of optimal experience (concurrent relationship).

Hypothesis 2: On occasions when adolescents reported using higher levels of momentary CR (state), they will have higher levels of optimal experience (concurrent relationship).

Hypothesis 3: On occasions when adolescents reported using higher levels of momentary ES (state), they will have lower levels of optimal experience (concurrent relationship).

At the lagged level, we intend to explore the relationships between predictors (state AC, state CR, and state ES) assessed at the previous moment (t - 1) and optimal experience assessed at the next moment (t), examining if the patterns found in the concurrent relationships between these constructs replicate when we consider their lagged relationships. Therefore, we assert no specific hypothesis concerning these lagged relationships.

Second, we aim to test whether different activities (i.e., school activity, leisure, maintenance, and socialization) and different companies (i.e., alone, family, and friends) would have a direct effect in optimal

experience and would moderate the above relationships. Based on previous literature regarding the influence of contexts in optimal experience (e.g. Bassi & Delle Fave, 2004; Freire & Tavares, 2016; Freire et al., 2016; Mesurado, 2009), we expect that:

Hypothesis 4: Leisure will exhibit a higher impact on optimal experience than school activities and other activities.

Hypothesis 5: Being with family and friends would have a more beneficial effect in optimal experience when compared with being alone.

Given the lack of studies regarding the interaction between these contexts and AC or ER strategies in predicting optimal experience, we assert no specific hypothesis for the moderation effects, assuming instead an exploratory intend.

Third, we aim to examine whether trait AC and trait ER strategies, measured as one-time scores of global self-report scales, are associated with within-variation in optimal experience, beyond their state influences. The inclusion of traits and states of the same constructs in the same model will allow us to disentangle the influence of AC and ER strategies at the person-level and the moment-level. Thus, we will confirm if the effect found at the state level is also found at the trait level, showing (or not) between-person differences and within-person variability in the reported findings (Beckmann et al., 2010). Based on previous research, we expect to find a positive association between trait AC and adolescents' optimal experience. For emotion regulation, and regarding the differential consequences of the two ER strategies on psychological functioning demonstrated in the literature, we expect that CR and ES will also influence optimal experience but in opposite directions.

For these same constructs (attentional control, cognitive reappraisal, and expressive suppression), we also computed their aggregate scores (i.e., the person-mean of the repeated assessments collected across the week). Using aggregate scores allows researchers to characterize the person's "typical" state across situations (Shiffman et al., 2008). The advantage of conceptualizing traits as aggregated scores relies on the fact that these estimates of person's characteristics are expected to be more reliable (because they are based on several assessed moments in time and not one-single assessed moment) and more valid (because avoid the recall bias associated with retrospective measures and have increased ecological validity) (Shiffman et al., 2008). We expect that these aggregate variables would follow the same predictions formulated for one-time trait scores.

Following this, we defined the following hypotheses for both traits and aggregates:

Hypothesis 6: High levels of trait (or aggregate) AC will be associated with higher levels of optimal experience.

Hypothesis 7: High levels of trait (or aggregate) CR strategy will be associated with higher levels of optimal experience.

Hypothesis 8: High levels of trait (or aggregate) ES strategy will be associated with lower levels of optimal experience.

Besides, we aim to explore whether AC, CR, and ES, measured as traits or as aggregates, would moderate the relationships between their state manifestations (state AC, state CR, and state ES) and optimal experience.

Finally, we want to explore whether the direct and indirect influences of all these predictors (attentional control, emotion regulation strategies, positive and negative affect, and contexts) in their different manifestations (traits, states, and aggregates) differ depending on the time of the school year in which they occur. For this, the present study collected data over two-time points separated by a 6-month interval: at the beginning of the school year (Wave 1) and the end of the school year (Wave 2). Each wave involved the completion of the same global self-report (retrospective) questionnaires and one week of experience sampling (ESM).

2. Method

2.1 Experience sampling method

We used the Experience Sampling Method (ESM; Hektner et al., 2007) to collect data of adolescents' daily lives through self-reports answered in real-time. During the ESM period, each participant carried an electronic device (Psychobeeper; Machado, Gomes, & Freire, 2009) that was programmed to randomly signal eight times a day, between 8:00 a.m. and 10:00 p.m., for seven consecutive days (one week). At each signal/beep, participants were asked to report on a paper booklet about contextual features (i.e., the activity being performed and the company they were with at that moment) and internal dimensions (cognition and affect) of their momentary experience, answering to open-ended questions or Likert scales. To avoid distortions due to retrospective recall, only the responses completed within 20 minutes after the beep were considered valid (real-time) assessments (Csikszentmihalyi & Larson, 1987). We excluded participants with less than 15 valid assessments to ensure external validity (Hektner et al., 2007). The compliance was good as indicated by a mean signal

response rate of 63% in Wave 1 and 55% in Wave 2, which is consistent with the results reported in ESM research (Christensen, Barrett, Bliss-moreau, Lebo, & Kaschub, 2003; Hektner et al., 2007).

2.2 Participants

A priori power analyses with G*Power (Faul, Erdfelder, Buchner, & Lang, 2009) revealed that the required sample size was 100 to obtain enough power to detect small to medium effect sizes (d = .15, α = .05). We decided to oversample by 15% to compensate for possible dropout throughout the study. Therefore, 114 participants took part in the first wave of the present study. These 114 participants completed the global self-report measures, demographic information, and one-week of experience sampling (ESM) at the beginning of the school year (Wave 1). Four participants had low compliance with the ESM protocol (i.e., completed less than 15 valid assessments) (Csikszentmihalyi & Larson, 1987) and were, therefore, excluded from further analyses. This procedure resulted in a final sample of 110 participants in Wave 1. From those, 92 participated again six months later, completing the same measures at Wave 2, which corresponded to 16% of attrition across waves. At the second wave, 9 participants were excluded from further analyses for not having at least 15 valid experience sampling reports, which resulted in a final sample of 83 participants in Wave 2. Overall, the participants completed a total of 6466 reports, being 3901 completed in Wave 1 and 2565 completed in Wave 2. Since some reports had missing data in one or more variables, they were excluded from analysis using listwise deletion, which resulted in 5886 final observations for the same number of participants.

Participants were 110 adolescents (72% female) ranged in age from 14 to 19 years old at baseline (Wave 1, M = 16.11, SD = 0.97). Thirty percent of the participants were in the 10th grade (n=33), 41% were in the 11th grade (n = 45), and 29% were in the 12th grade (n = 32). Almost all participants had a Portuguese nationality (99%). Most participants reported having an average academic performance (70%), with 24% reporting an above average and 6% a below-average academic performance. The sample was relatively homogeneous concerning the perceived socioeconomic status, with 93% of participants reporting an average standard of living and 7% stating an above-average standard of living. Participants mostly lived with their parents and siblings (60%) or with their parents (23%). The other participants lived with a single parent (5%), a single parent and siblings (5%), a single parent and other family members (3%), and extended family or significant others (4%).

2.3 Procedure

Participants were recruited from two secondary schools of Braga, an urban city located in the Northern region of Portugal. After the approval of the school directors, a trained researcher presented the study to students in classrooms, giving them a handout with the aims of the study, the procedures, and the informed consents for them and their parents. Participants were informed about the confidentiality and anonymity of their data, and that their participation was voluntary. The students who volunteered to participate returned their and their parents' written consents. A briefing session was scheduled with each one of the volunteers. In this session, the researcher asked participants to complete global self-report measures, provided detailed information about the study and ESM procedure, and delivered the respective material and equipment. After the sampling week, participants took part in a debriefing session for returning the material and equipment and for completing a debriefing questionnaire. At the end of the school year (Wave 2), the participants were contacted to complete the same global self-report measures and one-week sampling (ESM) again. After the two waves, participants received a certificate of participation. The study was conducted after the approval of the University Ethical Committee.

2.4 Measures

In the present study, we used global self-report measures (i.e., retrospective questionnaires) to assess the constructs at the trait level and a real-time measure (ESM) to assess the constructs at the state level.

Retrospective measures

Trait attentional control. The Attentional Control Scale (ACS; Derryberry & Reed, 2002) is a 20-item self-report scale that measures the individual capacity of controlling attention, more specifically the ability to focus attention and switch attention between tasks. ACS comprises two subscales: attentional focusing and attentional shifting. A total score and subscale scores can be computed by summing across relevant items. In the present study, we used a 10-item short-form Portuguese version of the scale (ACS-SF; Tavares, Freire, & Teixeira, 2019)[5]. Items are scored on a 4-point Likert scale (1 = *almost never* to 4 =

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[5] The psychometric properties of the ACS-SF were explored in two pilot studies under this doctoral project, in which we tested the construct validity and reliability of the scale. In a first study, we examined the 20-item version in a sample of 240 adolescents, aged between 15 and 21 years old. A two-factor model has demonstrated a better adjustment than a one-factor model, in line with previous research (e.g. Judah, Grant, Mills, & Lechner, 2014; Verstraeten, Vasey, Claes, & Bijttebier, 2010), however with some indices revealing a poor fit to the data. A confirmatory factor analysis (CFA) have suggested the

always). Items 1, 2, 3, 4, 5, 6, 8, 9 and 10 are reversed (e.g. "I have a hard time concentrating on a difficult task when there is noise around"; "It takes me some time to get really involved in a task"). For the purpose of the present study, we only used the ACS-SF total score (without item 7). Higher scores reflect higher levels of attentional control. ACS-SF revealed a good internal consistency, with a Cronbach's alpha of 0.78 in Wave 1 and 0.81 in Wave 2, which is comparable to the reduced 12-item ACS ($\alpha = 0.83$) of Judah et al. (2014).

Trait emotion regulation strategies. The Emotion Regulation Questionnaire for Children and Adolescents (ERQ-CA; Gullone & Taffe, 2012; Portuguese version of Teixeira et al., 2015) is a 10-item self-report scale that assesses the use of two emotion regulation strategies: cognitive reappraisal (CR) and expressive suppression (ES). The items are rated in a 5-point Likert scale (1 = *strongly disagree* to 5 = *strongly agree*). There are no reverse items. Six items compose the CR subscale (e.g. "When I want to feel happier, I think about something different") and four items the ES subscale (e.g. "I keep my feelings to myself"). Subscale scores can be computed by summing the items of each subscale, ranging from 6 to 30 (CR) and from 4 to 20 (ES). Higher scores mean greater use of the correspondent strategy. In the present study, we found a Cronbach's alpha of 0.72 for both the CR and ES subscales. Similar reliability indices were found in previous studies, ranging from 0.70 and 0.83 for CR and 0.65 and 0.75 for ES (Freire & Teixeira, 2018; Gullone & Taffe, 2012; Teixeira et al., 2015).

Real-time measure (ESM)

Some state constructs were measured using a single-item, which is a standard procedure in ESM research to avoid that participants are overburdened by long reporting forms (Hektner et al., 2007). Other state constructs were measured as composite variables that combined several rating scale items, which

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elimination of the items 4, 5, 9, 13, 14, 15, 17, 18, 19, and 20 since their factor loadings were less than .40, the commonly accepted threshold for retaining items in factor analysis (Gorsuch, 1983). Thus, we ran a CFA in the remaining ten items of the scale. This 10-item reduced ACS has demonstrated a good fit to the data, $\chi2(33) = 37.145$, $p = .284$, $\chi2/df = 1.125$, *CFI* = .991, *RMSEA* = .023, *GFI* = .997, *AGFI* = .988, comparable to the findings of Judah et al. (2014) who also tested a reduced 12-item version. In a second study, we tested this 10-item ACS short-form (ACS-SF) with 366 adolescents, aged between 14 and 19 years-old. The model tested, with a constraint specifying that measurement errors of item 1 and item 4 were correlated, revealed a good adjustment to the data $\chi2(33) = 81.949$, $p = .000$, $\chi2/df = 2.483$, *CFI* = .934, *RMSEA* = .067, *TLI* = .910, but with item 7 exhibiting a low factor loading (< .40). Therefore, we tested the same model without item 7. This final two-factor model was the one that showed a better fit to the data for all the analyzed indices, $\chi2(25) = 64.988$, $p = .000$, $\chi2/df = 2.600$, *CFI* = .944, *RMSEA* = .069, *TLI* = .919. Concerning reliability analysis, the results for the total sample (N = 336), without item 7, showed an acceptable internal consistency, with a Cronbach's Alpha of 0.77 for the total scale, 0.78 for the focusing subscale, and 0.61 for the shifting subscale.

is also a typical procedure in ESM research when researchers assess multidimensional constructs (Hektner et al., 2007).

State attentional control. We measured state AC with the single-item "Regarding the main activity you were doing when the beep sounded, was it difficult to concentrate?". This item was adapted from the trait questionnaire used in this study for assessing trait AC (Portuguese short-version of the ACS of Derryberry & Reed, 2002) and was reworded to adjust to a momentary assessment. The item was scored on a 7-point Likert scale (1 = *not at all* to 7 = *very much*). The item was reversed so that higher scores represented higher state AC levels at the reported moment. To test the reliability of the measure, we aggregated each participant's responses from the first and the second half of the sampling weeks and computed the correlation between the two halves, which is a method commonly employed in ESM measurements (Hektner et al., 2007). We have obtained acceptable reliability of .62 for state AC measure.

State emotion regulation strategies. We used two single-items to measure ER strategies at each signaled moment. The items were adapted from the trait measure used in this study (ERQ-CA; Gullone & Taffe, 2012; Portuguese version of Teixeira et al., 2015) and from previous research that has used similar single-items to assess these same ER strategies (e.g. Brans, Koval, Verduyn, Lim, & Kuppens, 2013). For assessing state cognitive reappraisal (CR) we used the item "I was trying to change the way I was thinking about what caused my feelings" and for assessing state expressive suppression (ES) we used the item "I was trying not to show my feelings". Both items were preceded by the sentence "What were you doing about your feelings when you were beeped" to help participants focus on the signalled moment when rating the items. The items were answered on a 7-point Likert scale (1 = *not at all* to 7 = *very much*). Higher scores corresponded to higher use of the respective strategy at the assessed moment. In the present study, the correlation between the aggregated scores of the first and second halves of the weeks was .87 for cognitive reappraisal and .84 for expressive suppression, showing good reliability for both ER measures.

State positive and negative affect. Participants were asked to rate on a 7-point Likert scale (1 = *not at all* to 7 = *very much*) a list of positive and negative emotions at each moment they were signaled. A positive affect (PA) scale was created by averaging the participants' responses of the eight items "happy", "strong", "joyful", "active", "contented", "free", "cheerful", and "satisfied with myself". The negative affect (NA) scale was created by calculating the mean of the six items "apathetic", "alone", "angry", "bored", "sad", and "irritated". Higher scores indicated higher PA or NA at the assessed moment. Prior ESM research has used similar composite variables for measuring positive and negative affect in

adolescents, evidencing good reliability (e.g. Csikszentmihalyi, Rathunde, & Whalen, 1993). In the current study, positive and negative affect have also demonstrated good reliability, with a Cronbach's alpha of 0.91 for PA's aggregated score and a Cronbach's alpha of 0.78 for NA's aggregated score.

State optimal experience. We used a composite variable to measure the construct of optimal experience. We computed the mean of five ESM items: concentration ("Regarding the main activity you were doing, were you concentrated?); involvement ("Did you feel involved in the activity?); control ("Did you feel like you were in control?"); enjoyment ("Were you enjoying what you were doing?"); and time perception ("When you were beeped, the time was passing..."). All items were scored in a 7-point Likert scale that ranged from 1 (*not at all*) to 7 (*very much*) for the first four items, and from 1 (*slow*) to 7 (*fast*) for the item time perception. Higher composite scores were indicators of higher intensity of optimal experience. Other researchers have used similar composite variables for measuring the state of optimal experience (e.g. Chen, Wigand, & Nilan, 1999; Csikszentmihalyi & Nakamura, 2010; Hektner et al., 2007). In the present study, the construct of state optimal experience revealed a good internal consistency, with the aggregated scores having a Cronbach's alpha of 0.81.

Contextual variables: activity and company. Participants had answered open-ended questions in the ESM protocol reporting the activity ("When you were beeped, what was the main thing you were doing?") and the company ("When you were beeped, who were you with?"). Participants' responses were coded into several predefined broad categories by two well-trained researchers. Intercoder disagreements were resolved by review and discussion with a senior coder researcher. The level of agreement (Cohen's kappa) on 10% of the data for two independent coders was 88% (Wave 1) and 94% (Wave 2) for activity, and 95% (Wave 1) and 94% (Wave 2) for company, indicating excellent interrater reliability for both variables at both waves. As a result of this coding process, four categories were created for the activity variable (1 = school; 2 = leisure; 3 = maintenance; 4 = socializing) and three were created for the company variable (1 = alone; 2 = family, 3 = friends).

Covariates. Demographic variables such as gender (0 = female; 1 = male) and school year (0 = 10th grade; 1 = 11th grade; 2 = 12th grade) were collected through a demographic questionnaire and were included in the analyses as covariates.

2.5 Data analysis

We performed hierarchical multilevel modelling (Raudenbusch & Bryk, 2002) since the data obtained through ESM have a nested nature (multiple observations nested within waves, and by its turn,

nested within individuals). We used the R package nlme (Pinheiro, Bates, DebRoy, Sarkar, & R Development Core Team, 2017) for estimating the multilevel models.

We ran some preliminary analyses to check for the existence of sufficient within-person variability on the outcome optimal experience for ensuring the appropriateness of conducting multilevel modelling. For this, we estimated a three-level null model: moment-level (Level 1), wave-level (Level 2), and person-level (Level 3), since we had repeated measures within waves (Wave 1 and Wave 2) and within persons. However, the results showed that, in this three-level model, most of the total variance observed in the moment-level ICC (total variance = 1.71102) was explained by the moment-level (72.08%) and the person-level (27.92%), while the wave-level explained a small portion of the variance (<1%). We decided to eliminate the wave-level since it explained an insufficient variability on the outcome variable. Therefore, we estimated a new two-level null model that included a moment-level (Level 1) and a person-level (Level 2).

For estimating the following multilevel models, we joined the data assessed at Wave 1 (one week) and Wave 2 (one week), which resulted in a dataset with 110 participants and 5886 assessed moments across two weeks. All continuous predictors at Level 1 were group-mean centered (i.e., at each individual's mean). Group-mean centering removes between-person variances when testing within-person relationships among the Level 1 variables, being the recommended approach when testing cross-level interaction effects (Aguinis, Gottfredson, & Culpepper, 2013). Level 2 predictors were grand-mean centered (i.e., at the sample's overall mean).

First, we estimated a multilevel model for examining the concurrent relationships between Level 1 predictors (attentional control, cognitive reappraisal, expressive suppression, positive affect, and negative affect states) and Level 1 outcome (optimal experience). We tested whether within variation in optimal experience was a function of variation of attentional control (AC), cognitive reappraisal (CR), and expressive suppression (ES) states when controlling for the influence of positive affect (PA) and negative affect (NA) states. We also investigated whether Level 1 predictors prospectively predicted optimal experience, allowing us to test the direction of these relationships (lagged model). Therefore, in another model, we tested whether lagged AC, CR, ES, PA, and NA states (at sampling moment t-1) predicted changes in optimal experience at the next sampling moment (t) when controlling for lagged optimal experience (t-1).

Then, we estimated a multilevel model that tested the moderator role of daily contexts. Specifically, we examined whether the type of activity (school activity, leisure, maintenance, and socialization) and the

type of company (alone, family, and friends) moderated the concurrent relationships between Level 1 predictors (AC, CR, ES, PA, and NA states) and optimal experience.

Next, we evaluated the influence of person-level variables (Level 2 predictors) such as sociodemographic (gender and school year) and psychological trait variables (trait AC, trait CR, and trait ES) in optimal experience. First, we estimated a random intercept and fixed slope model that allowed us to test cross-level direct effects of these Level 2 predictors, controlling for the single-level effects of Level 1 predictors (AC, CR, ES, PA, and NA states) and assuming that the relationships between Level 1 predictors and optimal experience are identical between persons (fixed slopes). This model examined whether these person variables were factors that explained the differences in optimal experience across adolescents (in the intercepts). Second, we estimated a random intercept and random slope model for testing the same multilevel model but now allowing variation of these relationships between persons (random slopes). The existence of between-person variation in these relationships (slopes) justifies the search for possible moderators that could explain these between-person differences (Aguinis et al., 2013). Therefore, in a third step, we examined whether these person-level variables (gender, school year, trait AC, trait CR, and trait ES) moderated the relationships between Level 1 predictors and optimal experience. For this, we estimated a random slope model again but adding a cross-level interaction effect of Level 2 predictors in optimal experience.

Finally, we estimated three more multilevel models, in which we replaced the trait predictors (Level 2) by the aggregate person-mean variables (Level 2) of the same constructs. Specifically, we examined whether AC, CR, and ES measured as aggregates (i.e., the person-mean of the repeated assessed states across two weeks of experience sampling) would also influence optimal experience. Therefore, we first estimated a random intercept model with fixed slopes and secondly a random intercept model with random slopes for testing single-level effects of Level 1 predictors (AC, CR, ES, PA, and NA states) and cross-level direct effects of Level 2 predictors (aggregate AC, CR, and ES) in optimal experience. This time, we did not include gender and school year. Third, we also examined whether these aggregate variables moderated the relationships between Level 1 predictors and optimal experience through the estimation of a cross-level interaction model.

3. Results

3.1 Descriptives

We ran descriptives for all variables at the person-level (Level 2). The means and standard deviations are presented in Table 1. In the total sample, participants reported moderate levels of trait AC, trait CR, trait ES, aggregate CR, aggregate ES, aggregate PA, and aggregate OE. Participants also reported high levels of aggregate AC and low levels of aggregate NA.

TABLE 6

Means (standard deviations) among the study variables, for the total sample, gender, school year, and waves.

| Variables | Scale range | Data range | Total sample N=110 M (SD) | Gender | | School year | | | Waves | |
				Female N=79 M (SD)	Male N=31 M (SD)	10th N=33 M (SD)	11th N=45 M (SD)	12th N=32 M (SD)	Wave 1 N= 83 M (SD)	Wave 2 N= 83 M (SD)
Trait AC	1 - 4	1.67-3.78	2.93 (0.43)	2.95 (0.43)	2.87 (0.42)	2.93 (0.44)	2.96 (0.38)	2.88 (0.48)	2.92 (0.46)	2.94 (0.47)
Trait CR	1 - 5	2.50-4.67	3.62 (0.42)	3.60 (0.45)	3.66 (0.34)	3.69 (0.42)	3.62 (0.42)	3.53 (0.42)	3.75 (0.48)	3.51 (0.53)
Trait ES	1 - 5	1.25-4.75	3.03 (0.73)	3.04 (0.72)	3.00 (0.76)	3.01 (0.66)	3.02 (0.75)	3.06 (0.76)	3.18 (0.79)	3.01 (0.76)
Aggregate AC	1 - 7	3.67-6.93	5.74 (0.77)	5.78 (0.69)	5.62 (0.95)	5.88 (0.81)	5.68 (0.81)	5.67 (0.68)	5.82 (0.76)	5.65 (0.88)
Aggregate CR	1 - 5	1.00-3.48	2.20 (0.71)	2.20 (0.74)	2.19 (0.63)	2.11 (0.75)	2.32 (0.68)	2.11 (0.71)	2.19 (0.75)	2.23 (0.80)
Aggregate ES	1 - 5	1.00-4.99	2.22 (0.78)	2.23 (0.80)	2.27 (0.74)	2.15 (0.79)	2.31 (0.72)	2.26 (0.86)	2.22 (0.83)	2.29 (0.83)
Aggregate PA	1 - 7	1.38-6.22	4.08 (0.87)	4.00 (0.81)	4.27 (0.99)	4.12 (1.04)	4.04 (0.86)	4.07 (0.70)	4.03 (0.97)	4.08 (0.95)
Aggregate NA	1 - 7	1.04-4.15	1.89 (0.61)	1.85 (0.56)	1.98 (0.72)	1.68 (0.47)	1.96 (0.66)	1.99 (0.63)	1.85 (0.66)	1.92 (0.68)
Aggregate OE	1 - 7	2.74-6.36	4.74 (0.67)	4.73 (0.64)	4.75 (0.74)	4.69 (0.63)	4.64 (0.72)	4.92 (0.61)	4.75 (0.70)	4.73 (0.80)

Note. Means and standard deviations are all at the person level (one score per person). The trait variables represent the participants' score obtained in a global self-report questionnaire. The aggregate variables represent the mean of participants' responses across the two weeks of the two waves (for total sample, gender groups, and school year groups) or one week (for Wave 1 and Wave 2) obtained through the Experience Sampling Method. AC = attentional control; CR = cognitive reappraisal; ES = expressive suppression; PA = positive affect; NA = negative affect; OE = optimal experience.

3.2 Group differences and correlations

We examined group differences of each study variable by gender and school year using independent t-test and analysis of variance, respectively. For the sake of brevity, we only present the significant results in the text.

We found no gender and school year mean differences in all the variables at the specified $p < .05$ level.

We also examined group differences by waves (Wave 1 and Wave 2) using paired sampled t-test. We have found a significant decrease in the mean level of trait CR at the end of the school year (Wave 2) ($M = 3.51$, $SD = 0.53$) compared to the beginning of the school year (Wave 1) ($M = 3.75$, $SD = 0.48$), t (82) = -3.1929, $p < .01$, $d = -0.35$, 95% CI [-0.39;-0.09]. There was also a significant decrease in the mean level of trait ES in Wave 2 ($M = 3.01$, $SD = 0.76$) compared to Wave 1 ($M = 3.18$, $SD = 0.79$), t (82) = -2.2783, $p < .05$, $d = -0.25$, 95% CI [-0.308;-0.021]. We also found significant mean differences between waves in aggregate AC. The mean level of aggregate AC decreased significantly in Wave 2 ($M = 5.65$, $SD = 0.88$) when compared with Wave 1 ($M = 5.82$, $SD = 0.76$), t (82) = -2.6447, $p < .01$, $d = -0.29$, 95% CI [-0.316, -0.045]. There were no mean group differences by waves in optimal experience and in the other variables.

The results of person-level correlations are presented in Table 2. Optimal experience showed a positive association with aggregate AC and aggregate PA, and a negative association with trait ES strategy. This means that adolescents who had more attentional control and positive affect on average across daily moments also had more optimal experience. Also, that those who had a higher general disposition of using ES strategy had less optimal experience.

Concerning the correlations between the trait variables, the results showed that trait AC was positively correlated with trait CR and negatively with trait ES. Adolescents who reported a higher general tendency to control their attention also use more, in general, the CR strategy and less the ES strategy. The results also showed that the strategies were negatively correlated with each other (i.e. trait CR vs trait ES).

We also found some correlations between the aggregate variables. Aggregate AC showed a negative correlation with aggregate NA and aggregate CR, meaning that adolescents who reported on average more attentional control in the assessed days also had less negative affect and used less the CR strategy for regulating their emotions in average across that time. Besides, aggregate NA showed a positive correlation with both strategies (aggregate CR and aggregate ES), which indicates that adolescents who reported more negative affect on average across the week used more these ER strategies than adolescents who reported less negative affect. Moreover, results showed a strong correlation between the aggregate strategies CR and ES. Adolescents who used more cognitive reappraisal on average across the week used more expressive suppression too.

Concerning the correlations between traits and aggregates, we found a positive correlation between trait AC and aggregate AC, while ER strategies revealed no association between their trait and their aggregate state level. Trait AC also correlated positively with aggregate PA and negatively with aggregate NA. Finally, trait CR showed no correlation with the aggregated variables, while trait ES exhibited a negative correlation with aggregate PA. The adolescents who had a general tendency to use more expressive suppression had less positive affect on average across the week.

TABLE 7

Intraclass correlations and Pearson's correlations at the person-level

Variables	ICC	1	2	3	4	5	6	7	8	9
1. Trait AC	0.85	-								
2. Trait CR	0.59	0.19*	-							
3. Trait ES	0.84	-0.20*	-0.23*	-						
4. Aggregate AC	0.20	0.33**	-0.06	0.03	-					
5. Aggregate CR	0.45	-0.06	-0.03	0.05	-0.20*	-				
6. Aggregate ES	0.47	-0.04	-0.05	0.15	-0.17	0.81***	-			
7. Aggregate PA	0.48	0.23*	0.21	-0.38***	0.15	-0.03	-0.02	-		
8. Aggregate NA	0.38	-0.25**	-0.11	0.06	-0.58***	0.30**	0.25**	-0.23*	-	
9. Aggregate OE	0.25	0.15	0.11	-0.18*	0.26**	-0.12	0.02	0.57***	-0.16	-

Note. ICC is the intraclass correlation which represents the proportion of between-person variability. The trait variables represent the participants' score obtained in a retrospective questionnaire. The aggregate variables represent the mean of participants' responses across the weeks of the two waves (one week on Wave 1; one week on Wave 2) obtained through the Experience Sampling Method. AC = attentional control; CR = cognitive reappraisal; ES = expressive suppression; PA = positive affect; NA = negative affect; OE = optimal experience.
*p < .05. ** p < .01. *** p < .001.

3.3 Preliminary analyses: Intraclass correlation and unconditional model

As intraclass correlation (ICC) estimates indicate (Table 2), the major proportion of variability in the trait variables was attributed to between-person differences: 85% for trait AC, 59% for trait CR, and 84% for trait ES. On the contrary, for some of the aggregated variables, between-person differences explained a minor proportion of the variability: 20% for aggregate AC, 38% for aggregate NA, and 25% for aggregate OE. This means that, for these variables, most of the total variability was attributed to the moment or within-person variability. For the remaining variables, almost half of the proportion was attributed to between-person differences: 45% for aggregate CR, 47% for aggregate ES, and 48% for aggregate PA.

To ensure the appropriateness of conducting multilevel modelling for our study outcome variable, we examined the amount of variance present in moment-level optimal experience. We predicted the moment-level optimal experience ICC with a two-level null model, with moments and persons modelled at Levels 1 and 2, respectively. The ICC from the null model was higher than .05, demonstrating sufficient

variability of optimal experience for running multilevel analyses (Peugh, 2010). Most of the total variance observed in the moment-level ICC (total variance = 1.69), was explained by the moment-level (75.23%), while a smaller portion of the variance was explained by the person-level (24.77%).

3.4 Multilevel modeling for predicting optimal experience: Concurrent and lagged relationships at the moment-level (Level 1)

We estimated a first random intercept model to test if within-variation in optimal experience was a function of state AC, state CR, and state ES when controlling state PA and state NA. The results showed that state AC (B = 0.21, p < .001, 95% CI [0.187, 0.224]) was associated with a significant increase in optimal experience, beyond the effect of state PA (B = 0.37, p < .001, 95% CI [0.338, 0.405]) and state NA (B = - 0.07, p < .001, 95% CI [- 0.112, - 0.032]), confirming hypothesis 1 (Table 3, Model 1). No effect was found concerning the influence of the ER strategies (cognitive reappraisal and expressive suppression) in optimal experience, thus not confirming hypotheses 2 and 3.

We computed a second random intercept model to explore if Level 1 predictors (state AC, state CR, state ES, state PA, and state NA) at the sampling moment t-1 predicted any variation of optimal experience in sampling moment t when controlling for the level of optimal experience at t-1. The results showed that only lagged state AC (B = 0.03, p = .013, 95% CI [0.006, 0.050]) and lagged state PA (B = 0.06, p = .003, 95% CI [0.020, 0.100]) predicted optimal experience, although with a small effect. High levels of state AC and state PA at the sampling moment t-1 were associated with high levels of optimal experience at moment t, even when controlling for previous levels of optimal experience (Table 3, Model 2). Again, we found no effect of ER strategies in optimal experience.

3.5 Multilevel modeling for predicting optimal experience: Moderation of contexts at the moment-level (Level 1)

We examined whether daily contexts interacted with Level 1 predictors to predict optimal experience. For this, we added the type of activity (school activity, leisure, maintenance, and socialization) and the type of company (alone, family, and friends) to the random intercept model of concurrent relationships between Level 1 predictors and optimal experience. The results showed that there were significant main effects of the type of activity and company (Table 3, Model 3). Specifically, performing a

leisure activity was associated with an increase in optimal experience when compared with performing a school activity (B = 0.29, p < .001, 95% CI [0.209, 0.364]), confirming hypothesis 4. Performing a maintenance activity was associated with a decrease in optimal experience in comparison with school activity (B = - 0.13, p < .001, 95% CI [- 0.205, - 0.052]). Contrary to our prediction in hypothesis 5, being with family (B = - 0.16, p < .001, 95% CI [- 0.232, - 0.084]) or being with friends (B = - 0.35, p < .001, 95% CI [- 0.415, - 0.278]) decreased the levels of optimal experience when compared with being alone. In this model, the effects of state AC, state PA, and state NA remained significant while state CR became a significant predictor with a negative effect in optimal experience (B = - 0.12, p = .023, 95% CI [- 0.215, - 0.016]).

The results also showed some significant interaction effects (Table, 3 Model 3). The type of activity did interact with state AC in predicting optimal experience. Particularly, when performing a leisure activity (B = - 0.08, p = .003, 95% CI [- 0.133, - 0.028]) in comparison with performing a school activity, the relationship between state AC and optimal experience had become slightly attenuated and the relationship between state PA and optimal experience had become stronger (B = 0.10, p = .031, 95% CI [0.009, 0.189]). When doing a maintenance activity, the relationship between state NA and optimal experience had become also stronger (B = 0.16, p < .001, 95% CI [0.076, 0.239]), in comparison with performing a school activity. The company did interact with state AC and state PA in predicting optimal experience. Specifically, when adolescents were with friends (in comparison with being alone), the relationship between state AC and optimal experience had become slightly reinforced (B = 0.06, p = .005, 95% CI [0.020, 0.109]). Also, when with family or friends, the relationship between state PA and optimal experience had become stronger (for family, B = 0.18, p < .001, 95% CI [0.097, 0.271]; for friends, B = 0.18, p < .001, 95% CI [0.096, 0.256]), as compared with being alone. We have found no interaction effect between contexts (activity or company) and ER strategies (cognitive reappraisal and expressive suppression), except for the interaction between friends and state CR (B = 0.14, p = .010, 95% CI [0.033, 0.241]). When with friends, the relationship between state CR strategy and optimal experience improved, when compared with being alone.

3.6 Multilevel modeling for predicting optimal experience: Adding sociodemographic and trait variables at the person-level (Level 2)

We examined the influence of person-level predictors (Level 2) such as sociodemographic and trait variables in optimal experience. First, we estimated a multilevel model to test single-level effects of Level 1 predictors (state AC, state CR, state ES, state PA, and state NA) and cross-level direct effects of Level 2 predictors (gender, school year, trait AC, trait CR, and trait ES) in optimal experience, based on the assumption that the relationships between predictors and outcome were equal between persons (fixed slopes). In a second model, we tested the same single-level and cross-level direct effects but now allowing variation of these relationships between persons (random slopes). Based on FIML, likelihood ratio test showed that the model with random slopes fitted the data better than the model with fixed slopes (i.e., deviance of 8,321.823-8,524.279 = 404.9108, df = 10, p <.0001). Thus, we only report the results for the random intercept and random slope model (Table 4, Model 4). The results showed that the only person-level variable significantly associated with optimal experience was trait AC (B = 0.15, p = .032, 95% CI [0.013, 0.288]). Adolescents that reported higher levels of trait AC also reported higher levels of momentary optimal experience, confirming Hypothesis 6. No main effects were found for trait CR and trait ES, thus not confirming hypotheses 7 and 8. No main effect was found for gender and school year also. State AC, state PA, and state NA remained significantly associated with optimal experience in this model, but now state ES presented also a significant although small main effect (B = - 0.06, p = .004, 95% CI [- 0.109, - 0.020]). For the sake of brevity, we only report in Table 4 the results of the random effects for the Level 2 variance (intercept) and Level 1 residual variance, instead of reporting the full model (with slope variance and covariance coefficients for each predictor). This applies to Model 4 and subsequent models.

Then, we tested whether Level 2 person-variables could explain this variability on slopes. We examined the moderator role of Level 2 predictors on the relationships between Level 1 predictors and optimal experience. We estimated a cross-level interaction model based on the previous random slope model. The results showed that when adding the interactions with Level 2 predictors to the model, state ES had become a non-significant predictor in comparison with the previous model (Table 4, Model 5). State AC, state PA, and state NA remained significantly associated with optimal experience. Concerning the person-level predictors, trait AC predicted a marginally significant increase in optimal experience (B = 0.14, p = .045, 95% CI [0.004, 0.279]) while ER strategies (trait CR and trait ES) and sociodemographic variables (gender and school year) presented no effect.

The results also revealed some significant, although weak interaction effects (Table 4, Model 5). Being in the 11th grade compared with being on the 10th grade reinforced the relationship between state AC and optimal experience (B = 0.12, p = .011, 95% CI [0.028, 0.215]). Although trait ER strategies did not show a significant main effect, they interacted with state AC although evidencing a small effect. As trait CR increased, the relationship between state AC and optimal experience had become slightly attenuated (B = - 0.06, p = .003, 95% CI [-0.101, -0.020]). On the contrary, with the increase of trait ES the relationship between state AC and optimal experience had become slightly reinforced (B = 0.05, p = .014, 95% CI [0.010, 0.086]). Moreover, trait ES has also interacted significantly with state NA by slightly reinforcing the relationship between this predictor and optimal experience (B = 0.08, p = .03, 95% CI [0.008, 0.156]).

TABLE 8

Concurrent and Lagged Relationships Between Level 1 Predictors and Optimal Experience, and the Moderation of Contexts (Activity and Company)

Predictors	Model 1 (concurrent) B (SE)	Model 2 (lagged) B (SE)	Model 3 (contexts) B (SE)
Fixed effects			
Intercept	4.74*** (.06)	4.73*** (.07)	4.90*** (.07)
Level 1 (moment)			
State AC	.21*** (.01)		.17*** (.02)
State CR	-.00 (.02)		-.12* (.05)
State ES	-.04 (.02)		.04 (.05)
State PA	.37*** (.02)		.24*** (.04)
State NA	-.07*** (.02)		-.14*** (.04)
Level 1 (t- 1)			
State AC $_{t-1}$		.03* (.01)	
State CR $_{t-1}$		-.02 (.02)	
State ES $_{t-1}$		.00 (.02)	
State PA $_{t-1}$		.06** (.02)	
State NA $_{t-1}$		.04 (.02)	
State OE $_{t-1}$		.15*** (.02)	
Level 1 (contexts)			
Activity leisure			.29*** (.04)
X state AC			-.08** (.03)
X state CR			.09 (.06)
X state ES			-.09 (.06)

X state PA			.10* (.05)
X state NA			.02 (.04)
Activity maintenance			-.13** (.04)
X state AC			.00 (.03)
X state CR			.02 (.06)
X state ES			-.08 (.06)
X state PA			-.07 (.05)
X state NA			.16*** (.04)
Activity socializing			.04 (.05)
X state AC			-.08 (.04)
X state CR			.04 (.08)
X state ES			-.11 (.08)
X state PA			.08 (.06)
X state NA			.02 (.06)
Company family			-.16*** (.04)
X state AC			-.03 (.03)
X state CR			.09 (.05)
X state ES			.01 (.05)
X state PA			.18*** (.04)
X state NA			-.03 (.04)
Company friends			-.35*** (.03)
X state AC			.06** (.02)
X state CR			.14* (.05)
X state ES			-.02 (.05)
X state PA			.18*** (.04)
X state NA			-.03 (.04)
Random effects	B	B	B
Level 2 variance (intercept)	0.424543	0.438459	0.407193
Level 1 residual variance	1.003960	1.265939	0.934454
-2log likelihood	17058.51	17700.3	16609.21***
Number of parameters	8	9	38
Pseudo R^2	0.15	0.10	0.21

Note. Unstandardized estimates (B) and standard errors (SE). For the activity variable, school activity was the category of reference, while for company, being alone was the reference. AC = attentional control; CR = cognitive reappraisal; ES = expressive suppression; PA = positive affect; NA = negative affect; OE = optimal experience. By using the likelihood ratio test, we compared Model 1 and Model 3 with their -2loglikelihhod values, i.e. 17058.51-16609.21 = 898.6, df = 30, p <.001, which means that the fit of the model increased with the addition of the contextual variables. Pseudo R^2 statistics corresponds to the amount of variance explained by each model.

*p < .05; **p < .01; ***p < .001

3.7 Multilevel modeling for predicting optimal experience: Replacing traits by aggregate predictors at the person-level (Level 2)

We replaced the Level 2 trait predictors in the previous models above by Level 2 aggregate predictors (i.e., the person-mean of the multiple state assessments across the two weeks sampled). We did not include gender and school year as they had evidenced no significant main effects in the previous models. Therefore, we first estimated a random intercept model with fixed slopes and second, a random intercept model with random slopes. As before, based on FIML, likelihood ratio test showed that the model with random slopes fitted the data better than the model with fixed slopes (i.e., deviance of 8320.497-8522.568 = 404.1427, df = 20, p <.001). Thus, we only report the results for the random intercept and random slope model which tested the single-level effects of Level 1 predictors (state AC, state CR, state ES, state PA, and state NA) and cross-level direct effects of Level 2 predictors (aggregate AC, aggregate CR, and aggregate ES) in optimal experience. In line with our predictions, the results showed significant main effects for Level 1 predictors, except for state CR (Table 4, Model 6). State AC, state PA, state NA, and state ES were significantly associated with optimal experience, as in the previous model with trait predictors, with state AC (B = 0.20, p < .001, 95% CI [0.154, 0.236]) and state PA (B = 0.38, p < .001, 95% CI [0.323, 0.429]) still exhibiting the strongest effect. The results have also shown significant main effects for all aggregate Level 2 predictors, contrary to the previous model with traits which has shown only a significant effect for trait AC (Table 4, Model 6). Aggregate AC (B = 0.24, p = .003, 95% CI [0.080, 0.390]) and aggregate ES (B = 0.28, p = .027, 95% CI [0.033, 0.533]) were positively associated with optimal experience while aggregate CR (B = - 0.30, p = .036, 95% CI [-0.572, -0.019]) was negatively associated with it.

Finally, we computed a cross-level interaction model to test whether the aggregate Level 2 predictors could also moderate the relationships between Level 1 predictors and optimal experience. The results have shown that the main effects of Level 1 and Level 2 predictors remained significant when adding the interactions to the model (Table 4, Model 7). Concerning the interaction effects, no moderation was found across all the variables (all p > .05).

TABLE 9

Multilevel Models of Optimal Experience Predicted by Level 1 and Level 2 Predictors

	Traits		Aggregates	
	Model 4	Model 5	Model 6	Model 7
Predictors	B (SE)	B (SE)	B (SE)	B (SE)
Fixed effects				
Intercept	4.71*** (.11)	4.68*** (.12)	4.76*** (.06)	4.76*** (.06)
Level 2 (individual)				
Gender (= male)	.16 (.13)	.06 (.14)		
School year (= 11th grade)	-.18 (.14)	-.06 (.15)		
School year (= 12th grade)	.18 (.15)	.22 (.16)		
Trait AC	.15* (.07)	.14* (.07)		
Trait CR	-.05 (.04)	-.04 (.04)		
Trait ES	.02 (.04)	.04 (.04)		
Aggregate AC			.24** (.08)	.23** (.08)
Aggregate CR			-.30* (.14)	-.32* (.15)
Aggregate ES			.28* (.13)	.29* (.13)
Level 1 (moment)				
State AC	.20*** (.02)	.15*** (.04)	.20*** (.02)	.20*** (.02)
State CR	.03 (.03)	-.03 (.06)	.04 (.03)	.03 (.03)
State ES	-.06** (.02)	-.02 (.05)	-.07** (.02)	-.07** (.02)
State PA	.38*** (.03)	.38*** (.05)	.38*** (.03)	.37*** (.03)
State NA	-.10** (.03)	-.17* (.07)	-.11** (.03)	-.11** (.03)
Cross-level interactions				
Gender × state AC		-.09 (.05)		
× state CR		.03 (.06)		
× state ES		.01 (.05)		
× state PA		.08 (.06)		
× state NA		-.04 (.08)		
11th grade × state AC		.12* (.05)		
× state CR		.13 (.08)		
× state ES		-.10 (.06)		
× state PA		-.06 (.07)		
× state NA		.15 (.08)		
12th grade × state AC		.07 (.05)		
× state CR		.03 (.08)		
× state ES		-.04 (.06)		
× state PA		.00 (.07)		
× state NA		.02 (.09)		
Trait AC × state AC		-.03 (.04)		

	B	B	B	B
× state CR		.10 (.06)		
× state ES		-.09 (.05)		
× state PA		.03 (.06)		
× state NA		.07 (.07)		
Trait CR × state AC		-.06** (.02)		
× state CR		-.04 (.05)		
× state ES		.02 (.03)		
× state PA		-.03 (.04)		
× state NA		-.06 (.05)		
Trait ES × state AC		.05* (.02)		
× state CR		-.04 (.03)		
× state ES		-.00 (.02)		
× state PA		-.04 (.03)		
× state NA		.08* (.04)		
Aggregate AC × state AC				.02 (.03)
× state CR				.00 (.04)
× state ES				-.01 (.04)
× state PA				.01 (.04)
× state NA				-.02 (.05)
Aggregate CR × state AC				.01 (.05)
× state CR				.08 (.07)
× state ES				-.05 (.05)
× state PA				-.01 (.07)
× state NA				-.00 (.08)
Aggregate ES × state AC				-.05 (.05)
× state CR				-.01 (.05)
× state ES				.06 (.04)
× state PA				-.00 (.06)
× state NA				-.00 (.07)
Random effects	B	B	B	B
Level 2 residual variance (intercept)	0.409708	0.409320	0.372932	0.372364
Level 1 residual variance	0.875237	0.870942	0.876503	0.872344
-2*loglikelihood	16643.62	16585.87**	16640.99	16633.49[ns]
Number of parameters	34	64	31	46
Pseudo R^2	0.164	0.178	0.184	0.187

Note. Unstandardized estimates (B) and standard errors (SE). For gender, female was the category of reference and for school year, the 10th grade was the reference. AC = attentional control; CR = cognitive reappraisal; ES = expressive suppression; PA = positive affect; NA = negative affect. By using the likelihood ratio test, we compared Models 4 and 5, and Models 6 and 7 with their -2loglikelihhod values. In the first comparison (Models 4 and 5), the fit of the model increased with the addition of the cross-interaction effects, i.e. 16643.62-16585.87 = 115.5, df = 30, p <.01. No significant difference was found in the second comparison (Models 6 and 7). Pseudo R^2 statistics corresponds to the amount of variance explained by each model. In all models, the intercept and the slopes were free to vary.
*p < .05; **p < .01; ***p < .001

4. Discussion

The findings of the current study confirmed most of the proposed hypotheses, evidencing the influence of the state, trait, and aggregate attentional control, aggregate emotion regulation strategies, and the type of activity and company in adolescents' optimal experience. Nevertheless, some of the obtained results were not in the expected direction. Next, we discuss these main findings, but first, we briefly reflect on the variability and stability of optimal experience evidenced in this sample.

The highest proportion of variance of optimal experience was at the within-person level, showing that optimal experience varied more across multiple assessments within adolescents than between adolescents. This finding suggests that a significant proportion of the variability of adolescents' optimal experience is attributable to situational/state factors than to stable individual differences. The use of an integrated approach in the present research that combined trait and state assessments allowed for the role of dispositional and situational factors to be more fully addressed and, consequently, enabled the emergence of new patterns of relationships that otherwise had remained hidden (Beckmann et al., 2010).

If we consider a more extensive period, adolescent's optimal experience was relatively stable over almost a one-year school period, with no differences found between the person week average at Wave 1 and Wave 2. This result suggests that most adolescents started and finished the school year with similar average levels of optimal experience. By crossing the within-variability expressed in a short interval (week) with the relative stability evidenced in a larger period (6 months), the results showed that adolescents experience a considerable fluctuation of optimal states across a week of their everyday life. However, this fluctuation seems to be stable across a broader period. Situational factors could explain the within-variability found while dispositional factors should be responsible for the stability demonstrated by the construct over the year. Moreover, this pattern of optimal experience occurrence for each adolescent seems to be independent of the school year and gender, in line with previous research (Hektner & Csikszentmihalyi, 1996).

4.1 Predicting adolescents' optimal experience: Influence of the contexts

The findings confirmed that contexts have a considerable influence on adolescents' optimal experience, as literature has demonstrated before (Schmidt et al., 2007). In this research, the type of activity and the type of company has a unique contribution to the variation of optimal experience reported by adolescents, beyond the effect of state individual factors. Leisure showed a more positive effect on adolescents' optimal experience than school activities, which is in line with previous research (Freire &

Tavares, 2016), while maintenance activities (e.g. personal care, household chores) seem to be the worst experience. As we discussed earlier, the characteristics of the type of activities may justify these differences. Leisure allows adolescents to freely choose their own goals and promotes the engagement in progressively more complex challenges while providing structure and opportunities for action in a different way of what occurs in schools (Perkins & Nakamura, 2011). Although maintenance tasks have clear goals and immediate feedback, they are usually low challenging and embedded in a routine of obligation and are associated with lower adolescents' engagement (Offer, 2013).

On the contrary, the type of company did not reveal the expected effect. It is interesting to note that when being alone adolescents reported experiencing a more intense optimal state than when being with family or with friends. A flow state can be experienced in a diverse array of situations, including when adolescents are without any company. However, since previous studies have shown that being with family and friends is more associated with flow experience (Delle Fave et al., 2002), we must reflect on this finding. This reflection raises the question of what are adolescents doing when they are alone that could justify these higher levels of optimal experience in these situations. Our analyses did not cross "activity" with "company" variables to investigate this in detail. Nonetheless, we can discuss if the portion of time being alone could be spent on recreational activities such as videogames and listen to music, which is *per se* associated with optimal experience. Moreover, it could be that when adolescents reported not being alone, they were indeed interacting with someone through a digital connection. Literature has shown that nowadays teenagers spend a lot of their free time playing online with friends (David-Ferdon & Hertz, 2007) or socializing on chats and social media (Magaldi, Appel, & Berler, 2020). Future research should be aware of this possibility when investigating adolescents' daily life to differentiate physical distance from digital presence. Our findings are in line with the ecological perspective by showing that adolescents' optimal experience is the result of the interaction person-environment-time (Bronfenbrenner & Morris, 2006). Here, the dimension of time acquires greater relevance if we consider that the influence of contexts can change over the years, as new adolescents' habits and behaviors emerge in cultures (Bassi & Delle Fave, 2004). Researchers should consider the new forms of social presence and social interaction that are emerging among teenagers nowadays when investigating optimal states of functioning in this age period.

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4.2 The role of attentional control in adolescents' optimal experience: State and trait influences and interaction with contexts

Concerning the findings of state influence, we demonstrated that in occasions where adolescents exhibit a higher mastery in controlling their attention, they attain a more intense state of optimal functioning. More importantly, this effect exists beyond the significant influence of positive and negative affect states. Lagged analyses confirmed the direction of this effect by showing that lagged attentional control increases the optimal experience of the next moment, although with a small magnitude. This suggests how important it is for adolescents to have the capacity of focusing on the task and switching attention easily from one task to another, which can facilitate the emergence of higher levels of flow at the moment and with a short-lasting effect in the next moment. This idea is particularly important nowadays teenagers are digitally connected most of the time and exposed to a massive amount of information through social media, making the need to be focused a greater challenge (Firth et al., 2019). More and more adolescents report difficulties in focusing their attention, especially in contexts where the demands to be focused are higher such as in school activities (Badri, Nuaimi, Guang, & Rashedi, 2017). This idea is reinforced when we consider the interaction of state attentional control with adolescents' daily contexts. When performing school activities, the relationship between state attentional control and optimal experience became strengthened. This finding suggests that the influence of momentary attentional control could be more relevant in activities in which achievement is markedly present such as school activities, in contrast with leisure and social ones. A similar finding was found in a study that related trait attentional control and dispositional flow with approaches to studying (Cermakova et al., 2010). The authors concluded that the ability to control attention is particularly useful in achieving flow in school-related activities, such as studying for the academic examination, because of the specificity of the tasks that involve selecting information and restructuring goals within a scenario of limited cognitive resources and time. Besides, having a good attentional control capacity in the presence of friends seems to be more helpful for achieving more intense optimal experience than using this cognitive resource in the presence of family or when alone. Overall, these findings suggest that the influence of momentary attentional control in adolescents' optimal experience is consistently positive and, at the same time, context-sensitive.

Another important finding concerns the additive influence of attentional control when measured as a trait characteristic. Adolescents that exhibit a general tendency to control better or regulate their attention report a more intense optimal experience in their daily lives. This effect is present beyond the effect of attentional control at the state level. Moreover, when we measured this trait characteristic with

the aggregated scores as well, the findings demonstrated that the effect was also significant and in the same direction: adolescents with a higher week average of attentional control showed higher levels of optimal experience. This result may be indicative of the importance of attentional control as an individual dispositional characteristic in determining the intensity of optimal experience. Already Keller and Landhäußer (2012) have pointed out that personal characteristics are crucial when determining the intensity of flow experiences, in contrast with situational factors that would represent the boundary conditions that enable individuals to enter in a state of flow. Albeit, in our research, situational conditions are also important determinants of optimal experience's intensity, as we discussed earlier.

Overall, these findings confirm the initial supposition of Csikszentmihaly (1990) about the vital role of attentional control skill to attain flow experience. In sum, we found that the positive influence of attentional control is consistent through different levels of analysis. Attentional control seems a relevant construct to be incorporated in flow theory and research, conceptualized both as a trait and as a state, although more studies are needed to confirm this initial evidence. This central finding may have some implications for practitioners by indicating that interventions targeting attentional control capacity in both dimensions of individual functioning (as a general tendency or as a momentary skill) may be useful for promoting an optimal state of functioning in adolescents.

4.3 The influence of emotion regulation strategies in adolescents' optimal experience: State and trait influences and interaction with contexts

In this research, we found a considerable variability within-adolescents concerning ER strategies at the aggregate level (i.e., adolescents differed widely in the use of ER strategies across the different moments of the week). This variation means that a significant part of the use of cognitive reappraisal and expressive suppression is circumstantial and context-dependent (Brockman et al., 2017). In this sense, adolescents may flexibly choose the strategy that they perceive as more adequate for responding to the demands of a particular situation (Brans et al., 2013; Sheppes & Levin, 2013) or that best serves their hedonic and instrumental goals (Tamir & Gross, 2011).

Despite this within-variability, a pattern relating state cognitive reappraisal with optimal experience emerged in the concurrent model with context interactions: employing more cognitive reappraisal strategy at a particular moment predicted a decrease in optimal experience (although small). This finding was not in the expected direction according to literature, which has demonstrated that cognitive reappraisal

strategy has, in general, a positive effect in various aspects of psychological functioning (Freire & Teixeira, 2018; Schäfer et., 2017) and optimal states (Freire & Tavares, 2016). One possible explanation may come from the relationship of these variables with negative affect, which is a construct that has been negatively linked with flow experience (Tavares et al., 2019). Previous research has shown that state cognitive reappraisal is associated with higher levels of state negative affect in adolescents at the concurrent level (Silva et al., 2018). Also, in the present study, the aggregate reappraisal strategy was associated with higher levels of aggregate negative affect. This strategy seems to be failing to respond to its purpose of decreasing unpleasant emotions, at least, on an immediate basis in the same sampling moment (Silva et al., 2018). Therefore, reappraisal may not prevent the deleterious effect of negative affect in adolescents' optimal experience (Tavares et al., 2019), and thus, may be indirectly linked with less optimal experience through negative affect. Future research should investigate a possible mediator role of negative affect between the use of cognitive reappraisal strategy and optimal experience.

Another possible explanation is related to the cognitive efficiency that characterizes optimal experience (Csikszentmihalyi, 1990). As we discussed earlier, regulating emotions in a non-automatic (or consciously) way requires a great deal of cognitive effort and psychic energy (Baumeister, Bratslavsky, Muraven, & Tice, 1998). Cognitive reappraisal implies changing a situation's meaning to alter one's emotional response to the situation (Gross, 2014). Making this conscious effort of cognitive change may interfere with the necessary intense and uninterrupted focus present in optimal experience, particularly if the two psychological processes are being held at the same moment (Moore, 2013). Interestingly, this cognitive depletion seems to be more pronounced when being with friends than when being alone or with family. Reappraising the situation meaning in social interaction with peers seems to interfere more with the achievement of a state of optimal functioning. Unveiling the underlying mechanisms responsible for this finding will add a valuable contribution towards targeted interventions with adolescents.

Moreover, our findings indicate that the effect of the momentary use of ER strategies in optimal experience is not linear and may change according to situational features of experience. For instance, we found that being with friends strengthens the (negative) effect of cognitive reappraisal in optimal experience in comparison with being alone. This is a relevant finding within the scope of interventions because it suggests that adolescents can be taught to flexibly use their emotion regulation repertoire in response to contextual clues or specific features of the situations, to improve the quality of their subjective daily experience. Nonetheless, these relationships deserve more investigation from researchers to unveil the specificities of contexts that make the use of one or other strategy more effective for this purpose.

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Advances in future research should bring some clarity on this issue addressing the questions of when, how, and for whom ER strategies produce short and long-term positive or negative effects in optimal experience.

In this research, we also found that ER strategies measured as aggregates did predict adolescents' optimal experience, while the same constructs at the trait level revealed no effects. As we discussed earlier, using a multimethod approach with different measurements (i.e., global self-reports vs real-time) can unveil different results in the relationships between the same constructs (Tennen et al., 2000). Therefore, this finding indicates that it is relevant to distinguish from the habitual and the situational use of ER strategies (John & Eng, 2014). Indeed, in the present study, the situational use of ER strategies (aggregates) across the week predicted variation in adolescents' optimal experience. However, it did so in an unexpected direction: whereas aggregate cognitive reappraisal predicted a decrease in optimal experience, aggregate expressive suppression was associated with an increase. This is an intriguing finding that seems to question the proposition of cognitive reappraisal as an adaptive strategy and expressive suppression as a maladaptive one (Gross, 1998) since it revealed effects in the opposite direction. Emotion regulation processes are complex and dichotomizing ER strategies may not be the most suitable approach to explain individual differences at this level (Dixon-Gordon, Aldao, & De Los Reyes, 2014). Until researchers further investigate these findings, it is premature to conclude that reappraising emotions has a negative effect on adolescents' optimal experience and suppression has a beneficial effect. Besides, it is unclear how long these effects may last. Nonetheless, these findings warrant some explanation.

An interesting possibility is related to the effectiveness of ER strategies that are being employed by adolescents in their daily lives (John & Eng, 2014). Is possible that adolescents may be more or less competent in selecting and applying ER strategies, thus having more or less ability to regulate their emotional repertoire (Gross, 2014). As adolescence is a developmental period characterized by the intensity of emotions and high daily emotional fluctuation (Larson et al., 2002), this issue of effectiveness becomes even more relevant. The finding that aggregate suppression strategy predicted an increase in optimal experience is in line with past research suggesting that suppression may have beneficial effects, at least in the short-term (Chapman, Rosenthal, & Leung, 2009; Dixon-Gordon et al., 2014). For instance, some researchers suggest that suppression strategy might be more effective in regulating emotions with clear expressive components such as anger than other emotions less expressive like loneliness (Larsen, 2000), showing that the type of emotions that are being regulated is essential. Others found that students

who flexibly suppressed their expression of emotions following situational circumstances demonstrated better adjustment (Bonanno, Papa, Lalande, Westphal, & Coifman, 2004). The finding of the negative influence of aggregate reappraisal strategy in optimal experience is also unexpected, although it matches the finding found at the state level, which was previously discussed. The issue of the effectiveness of ER strategies also seems to apply to this finding.

Another possibility for ineffective use of ER strategies is related to the interference hypothesis, which postulates that maladaptive strategies can interfere with the proper use of adaptive strategies in individuals who are prone to use both of them, by narrowing the attentional capacity to focus on contextual clues (Aldao & Nolen-Hoeksema, 2012). Indeed, in the present study, the average use of cognitive reappraisal across the week was highly correlated with the average use of expressive suppression. These means that adolescents who used more one strategy also used more the other one (when measured as aggregated states), demonstrating that these ER strategies are highly dependent on each other at the aggregate level. Using more suppression across the week may have prevented adolescents from accessing and properly deploying reappraisal strategy, thus justifying the unexpected adverse effect of reappraisal strategy in optimal experience.

In short, the use of cognitive reappraisal strategy predicted a decrease in optimal experience at both state and aggregate levels while the use of emotion suppression strategy predicted an increase, but only at the aggregate level. It seems that the effects of ER strategies in optimal experience are more likely to occur when considering their use at each moment of the day or in average across the week than the general tendency of using them in life. More than changing the adolescent general use of ER strategies, interventions should focus on the spontaneous and momentary use of these strategies in order to improve their efficacy in the promotion of momentary optimal states in this age.

5. Limitations and future directions

Several study limitations warrant consideration. One limitation was that this study did not test causality, as it was based on association and regression analyses. Indeed, most of the research in optimal experience is based on association rather an explanation. Still, the use of an intensive longitudinal design (i.e., repeated assessments across the week) allowed us to run lagged analyses to test the hypothesized direction between variables at the momentary level. These bursts of intensive repeated assessments were repeated longitudinally over a more widely spaced temporal interval, namely in two waves across the school year, which increased the robustness of the findings. However, including only two assessment

points prevented us from testing the relationships prospectively across waves (as it represented only one time-point for the lagged analyses), which is a significant limitation. Also, the size of the sample at the person-level had not enough power to conduct structural equation modelling, which could also have tested the prospective relationships between the variables across the two waves. Despite these limitations, we were able to present some preliminary evidence about the less-known influence of self-regulation abilities on optimal experience. Future research should be directed towards also developing causal explanations that may increase our knowledge on the influence of attentional control and emotion regulation in adolescents' optimal experience.

The findings on attentional control referred to a global index of this construct. However, previous studies have demonstrated the differential role that its two components (i.e., focusing and shifting) have in psychological functioning, being focusing a unique predictor of trait anxiety and shifting a unique predictor of trait depression (Judah et al., 2014). The specific impact of these two dimensions in adolescents' optimal experience should be investigated in future studies.

In this research, we focused on the two ER strategies that are most commonly studied as two contrasting examples of antecedent and response-focused strategies (Gross, 1998). Researchers should further include other ER strategies and test how they interrelate to enhance optimal experience. Some authors started to focus on an ER repertoire system and its link with well-being (De France & Hollenstein, 2017). Investigating the use of multiple strategies by adolescents instead of focusing on the use of single strategies may help identify individual profiles that can be more or less related with optimal states of functioning or with autotelic personality. Moreover, we did not investigate the interactions between affect and ER strategies, although we include positive and negative affect as important correlates in the models. Knowing what kind of regulation is being made (i.e. increasing positive emotions vs decreasing negative emotions) by adolescents at the different moments of their daily life could bring some clarity to the complex array of relationships in this subject (e.g. Silva et al., 2018). For instance, some authors have found that the type of emotion and its interaction with emotion intensity predicted different patterns of spontaneous use of ER strategies in undergraduate students (Dixon-Gordon et al., 2014).

Overall, our findings stemmed from previously defined hypotheses that predicted a specific direction among the variables under study, with optimal experience defined as the outcome. Although we examined the lagged relationships between the predictors and the outcome, the confirmation of the direction of the effects warrants additional investigation. In particular, for the predictive effect of emotion regulation strategies in adolescents' optimal experience since our findings were non-significant in the

lagged model. Besides, future research should investigate the predictive relationships in the opposite direction to rule out the possibility of an inverse relationship, in which having more or less optimal experience in daily life may impact the daily use of attentional control, cognitive reappraisal, and expressive suppression.

6. Conclusion

Optimal experience is a psychological state linked to several positive outcomes in adolescents' development. Although the considerable contribution of past research in showing the influence of dispositional and situational factors for achieving this desirable state of functioning, there is still a large space for expanding models and theories on flow experience. The present study is an attempt to bring to debate the influence of self-regulation abilities in adolescents' optimal experience, by showing the unique contribution of attentional control capacity and the use of specific emotion regulation strategies, such as cognitive reappraisal and expressive suppression. To the best of our knowledge, this study indicates for the first time that two broad markers of mental health, attentional control and emotion regulation, are relevant predictors of optimal experience in adolescents. As expected, attentional control demonstrated a consistent positive influence in optimal experience concurrently, whether it was conceptualized as a general disposition or a momentary state, and prospectively (lagged effect). This influence was moderated by leisure activities and being with friends. In contrast, emotion regulation strategies revealed an unexpected influence on adolescents' optimal experience. Cognitive reappraisal demonstrated a negative effect in optimal experience across the dispositional and situational levels, while expressive suppression exhibited a positive effect at the dispositional level. This intriguing finding seems to question the state-of-the-art on reappraisal as an adaptive strategy and suppression as a maladaptive strategy. It is in line with recent empirical findings showing that the effects of regulation processes should depend on the strategy used efficiently according to contextual demands. The confirmation of the influence of the contexts reinforces the relevance of embracing an ecological perspective when researching adolescents' optimal experience in daily life.

7. References

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CONCLUSION

The present dissertation intended to provide new insights for the existent conceptual frameworks and empirical work in the research field of optimal experience in adolescence. Particularly, it aimed to increase the knowledge about what factors can improve adolescents' optimal experience in daily life. In line with this, the central aim of this dissertation was to investigate how self-regulation abilities would influence the intensity of adolescents' optimal experience in their daily lives, accounting for the simultaneous direct and indirect effect of proximal contexts. Researchers have identified several individual characteristics as significant predictors of optimal experience (Bassi, Steca, Monzani, Greco, & Delle Fave, 2014; Riva et al., 2017; Schmidt, Shernoff, & Csikszentmihalyi, 2007). However, few studies have focused on the individual capacity of controlling attentional processes and regulating daily emotions as relevant pathways to achieve a more intense optimal state of psychological functioning (Cermakova, Moneta, & Spada, 2010; Freire & Tavares, 2016; Harris, Vine, & Wilson, 2017). This dissertation makes a clear and important contribution in this regard by demonstrating that attentional control and emotion regulation capacities can significantly influence adolescents' optimal experience. Moreover, it shows how two important mental health indicators – attentional control and emotion regulation - widely investigated in their relationship with psychopathology, can also be related to and have an important role in human positive functioning.

Main findings and future studies

The most robust finding we found was related to attentional control. Indeed, this psychological construct has shown a consistent positive influence in adolescents' optimal experience across the different moments of daily life. This effect was found at both trait, aggregate, and state levels of analysis. In sum, adolescents who reported more capacity of controlling their attention in general (trait) and in average across the week (aggregate) have also more intense momentary optimal experience. Moreover, in moments when adolescents are more in control of their attentional state, demonstrating more ability of focusing and switching it, the levels of optimal experience were also higher. These findings corroborate the initial assumptions proposed by Csikszentmihalyi (1990) that considered the capacity of controlling attention a crucial skill for selecting what enters into our consciousness and, consequently, improving the quality of our subjective experience. The fact that we found the same effect of attentional control at different levels of analysis, which is the result of the application of a multimethod approach (retrospective

and real-time measures), gives us far greater confidence than any single method's findings would warrant (Brewer & Hunter, 2006). Also interesting was the moderating role of the contexts found in these relationships. In fact, the positive influence of momentary attentional control in optimal experience was boosted when adolescents were performing a school activity than when they were participating in leisure or social activities. Thus, although the existence of a main and stable effect of attentional control in optimal experience, there seems to exist some variability of this effect across the different contexts of adolescents' daily lives.

In this dissertation, we also sought to understand how the emotion regulation strategies used by adolescents contributed to the between and within-person differences in optimal experience. The use of cognitive reappraisal and expressive suppression strategies has been widely investigated in psychology (Compas et al., 2017; Morrish, Rickard, Chin, & Vella-Brodrick, 2018), but no study has tested their direct effect on adolescents' daily optimal experience. In the present dissertation, we have demonstrated that they can influence adolescents' daily optimal experience depending on whether we conceptualize and measure them as general tendencies or as momentary states. The general use of cognitive reappraisal and expressive suppression strategies (measured as traits with global self-reports) had revealed no impact on the intensity of daily optimal experience in our study. However, when we consider their average use across the different moments of the assessed week (aggregate), which for some authors represents also a dispositional or trait characteristic (Buss, 1989), they became significant predictors of optimal experience. Adolescents who used, on average, more cognitive reappraisal strategy across the week reported a decrease in optimal experience while adolescents who used, on average, more expressive suppression have reported an increase in their levels of optimal experience. Additionally, a significant effect emerged when we have assessed the situational use of these same strategies: the momentary use of cognitive reappraisal decreased optimal experience.

There are two important conclusions that we can draw from these findings on the emotion regulation influence. The first is methodological, while the second is conceptual. Concerning the first, this dissertation reinforces the idea that the use of a multimethod approach in psychological research allows the emergence of possible distinct results in the relationships between the same constructs (Tennen, Affleck, Armeli, & Carney, 2000). The type of measure used (i.e., retrospective versus real-time measures) filters in a certain way what we are analyzing, as it provides a specific kind of information. Hence, the importance of selecting and applying the type of measure that best suits the research aims. It always depends on what kind of psychological processes we want to access: retrospective global perceptions

and constructed meanings, or micro-level processes, that is, the content of and patterns surrounding experiences as they unfold close to real-time in daily life (Conner & Lehman, 2012). However, divergent results are also important as they signal the need to analyze a research problem further and to be cautious in interpreting the significance of any one set of data (Brewer & Hunter, 2006). Besides, it allows the researcher to approach the complexity of the phenomenon under study by helping to understand the inter-individual differences/similarities in intra-individual variability/stability (Hamaker, Nesselroade, & Molenaar, 2007).

The second point refers to the conceptual aspect as it puts in evidence the type and direction of the effect of these two emotion regulation strategies. Interestingly, cognitive reappraisal revealed a negative influence on adolescents' optimal experience while expressive suppression revealed a positive one, which contradicts prior evidence. We had presented several possible explanations for these findings in our study, but, above all, these results suggest that the adaptive or maladaptive consequences of using a certain type of emotion regulation strategy are not straightforward. Instead, they are situational-based as they account for the specificities of the situation and of the goals of the emotion regulation process (Tamir & Gross, 2011). This suggests that the use of emotion regulation strategies in daily life may be context-dependent and its understanding must be balanced with the contexts in which they are applied (Gross, 2013).

Although the focus of this dissertation was on self-regulation predictors, other important and related psychological variables were investigated as possible correlates in the prediction of optimal experience. The purpose was to disentangle overlapping influences when predicting adolescents' optimal experience in daily life. Not doing so could result in rash and misleading conclusions about the relevance of our main variables of interest (i.e. attentional control and emotion regulation). Therefore, we investigated the role of other emotional and cognitive individual factors such as affect and effortless attention.

Regarding the affective dimension, this dissertation has shown the predictive power of emotions to explain variations in adolescents' optimal experience. To the best of our knowledge, our investigation was the first to test the influence of momentary positive and negative affect in daily optimal experience in a sample of adolescents and within a multilevel framework of analysis that considered both the person and the moment. As we mentioned earlier, previous attempts have been made, but only at the trait level (Freire & Tavares, 2016; Kopačević, Rogulja, & Tomić, 2012). Our findings indicated that more positive affect predicts more intense optimal experiences. More importantly, we have presented an innovative finding by demonstrating that negative affect can impair adolescents' daily optimal experience. These

results further reinforce the relevance of studying how adolescents regulate their pleasant and unpleasant emotions since they can significantly influence optimal experience in this age period. In addition, these results pinpoint the need of including affect in the explanatory models of optimal experience, as we have done. In this line, our findings have demonstrated that positive and negative affect still have a unique and significant effect in adolescents' optimal experience when we included cognitive reappraisal and expressive suppression strategies in the models. Thus, researchers in the field should not disregard the power of positive and negative emotions for the attainment of a state of optimal functioning in adolescence. Future research should address several unanswered questions concerning the unique role of positive and negative emotions and the effectiveness of emotion regulation strategies in promoting or impairing adolescents' daily optimal experience.

Along the present dissertation, we have also focused our lens into another cognitive factor related with the attentional processes implicated in optimal experience. We have shown that effortless attention is a central component to achieve more intense states of optimal experience, either alone or as a support to prompt the effect of other variables, such as positive and negative affect and the challenge-skill perception. In contrast with the construct of attentional control, in which there is a dimension of conscious effort or voluntary control of the attentional processes (Derryberry & Reed, 2002), effortless attention represents a state of high concentration with no effort perceived (Dormashev, 2010). The fact that these two attention-related constructs have shown a significant influence in adolescents' optimal experience illustrates the complexity of attentional processes and the importance of separating its different manifestations or ramifications when analysing its influence in daily optimal experience. More research is needed to investigate how these two constructs relate when predicting adolescents' optimal experience and if there is a precedent effect over one another. For example, to test whether adolescents with a better control of their attentional resources would achieve more easily a state of effortless attention that, in turn, would lead to higher levels of optimal experience.

Overall, the current dissertation has contributed to unveil the predictive influence of self-regulation individual capacities in adolescents' daily optimal experience under an ecological and interactionist perspective of psychological functioning. In fact, we replicated previous research about the direct effects of adolescents' daily contexts in optimal experience, but also brought additional knowledge on how these same contexts (activities and companies) may interact with the individual capacities. These findings support the idea that both the adolescent and the related situational characteristics should be a key focus of future psychological research since they can explain differently the state of optimal experience across

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adolescents' everyday moments. Moreover, researchers should identify the patterns of longitudinal stability and change in the person-situation fit for enhancing optimal experience. This will help to define specific periods for interventions designed to promote adaptive self-regulation processes for the attainment of optimal experiences at early, middle, and late adolescence.

Implications for practice

The present dissertation provides insights to practitioners who aim to promote optimal experiences in adolescents' daily lives. The findings reinforce the idea that interventions with adolescents should account for both the person and the contextual dimensions when seeking to increase daily optimal experience. Regarding the person and its internal dimensions, practitioners should encourage adolescents to manage their self-regulation abilities and their emotions. Particularly, they should help adolescents to learn how to control their attention, moving from an initial effortful attention to a progressively state of perceived effortless attention, both necessary states to reach more intense optimal experiences. Practitioners should also intervene in the management of emotions. On the one hand, adolescents should learn on the specific impact of positive and negative affect in optimal experience. On the other hand, adolescents should attempt to increase their general and momentary positive affect and to deal with general negative affectivity that may prevent the experience of flow. One way to achieve this may be using emotional regulation strategies. However, more than proposing rigid guidelines to teenagers on what emotion regulation strategies to use in everyday situation, they should increase adolescents' understanding on the meaning and utility of each strategy, showing them how they can effectively use reappraisal and suppression, according to contextual needs and demands (e.g. when performing a school activity or being with friends).

Concerning the external or contextual dimensions of experience, interventions with adolescents should also promote the involvement in relevant social contexts that are by nature more prone to elicit optimal experience such as leisure activities. Alternatively, they could manipulate intentionally the environments, by designing a structure or creating a dynamic in the activities that challenges the adolescent in an optimal level, elicits positive affect, and reduces or eliminates possible attentional distractors. Besides this, practitioners should be aware of the interplay between internal and external resources, by knowing that the effect of some internal psychological states (challenge-skill perception, positive affect, effortless attention) or self-regulation abilities (attentional control, reappraisal) may be strengthened or weakened by specific external dimensions such as school or leisure activities and being

with family, with friends or alone. By doing so, practitioners may optimize the interaction between the internal and external resources available for adolescents, creating more opportunities to attain optimal experience in their daily life.

Taken together, the findings of the present dissertation will provide practitioners and policy makers with evidence-based knowledge for designing and implementing individual and social interventions targeted towards the enhancement of adolescents' capacities and the intentional use of external and internal resources for fostering optimal patterns of psychological functioning in adolescence.

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APPENDIX

Subcomissão de Ética para as Ciências Sociais e Humanas

Identificação do documento: SECSH 028/2015

Título do projeto: *A influência do controlo atencional e da regulação emocional na Experiência Ótima da vida diária de adolescentes: um estudo longitudinal*

Investigador(a) responsável: Teresa Margarida Moreira Freire Barbas Albuquerque, Escola de Psicologia, Universidade do Minho - Supervisora e orientadora científica

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Subunidade orgânica: Escola de Psicologia, Universidade do Minho

PARECER

A Subcomissão de Ética para as Ciências Sociais e Humanas (SECSH) analisou o processo relativo ao projeto intitulado *"A influência do controlo atencional e da regulação emocional na Experiência Ótima da vida diária de adolescentes: um estudo longitudinal"*.

Os documentos apresentados revelam que o projeto obedece aos requisitos exigidos para as boas práticas na investigação com humanos, em conformidade com as normas nacionais e internacionais que regulam a investigação em Ciências Sociais e Humanas.

Face ao exposto, a SECSH nada tem a opor à realização do projeto.

Braga, 29 de setembro de 2015.

O Presidente

Paulo Manuel Pinto Pereira Almeida Machado