

Flow experience, attentional control, and emotion regulation: contributions for a positive development in adolescents

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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.*

Experiência de flow, controlo atencional e regulação emocional: contributos para o desenvolvimento positivo de adolescentes: A investigação tem demonstrado que as experiências ótimas promovem o desenvolvimento positivo. Sendo a adolescência marcada pela experimentação e definição de interesses, é também um período crucial para a ocorrência de experiências ótimas na vida diária, concretamente, a experiência de Flow. Os adolescentes estão mais propensos a procurar desafios e desenvolver novas competências nos vários contextos, emergindo assim a possibilidade de experienciarem Flow e desenvolverem vidas bem-sucedidas. O presente artigo apresenta uma revisão dos principais resultados da investigação acerca dos fatores individuais e contextuais associados à experiência de Flow e do impacto desta na vida dos adolescentes. Especificamente, o artigo discute as possíveis relações entre o Controlo Atencional, a Regulação Emocional e a experiência de Flow, e a importância destes para o desenvolvimento positivo dos adolescentes. Adotando uma perspetiva social e ecológica, o artigo apresenta conclusões e sugere novas linhas de investigação futura acerca dos preditores da experiência de Flow.

Palavras-chave: *Experiência de Flow; Controlo Atencional; Regulação Emocional; Adolescentes; Desenvolvimento Positivo.*

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, &

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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.

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).

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, & González-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).

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).

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, & Rempelberg, 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.

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.

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). 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).

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).

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.

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.

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