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Chapter 4

**ABOUT THE FUELS OF SELF-REGULATION:
TIME PERSPECTIVE AND DESIRE FOR CONTROL
IN ADOLESCENTS SUBSTANCE USE**

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ABSTRACT

In this chapter, we focus on the role of time perspective (TP) and desire for Control (DC) in self-regulation theory (SRT). Whereas self-control is the muscle of self-regulatory processes, time and control, as distal factors in self-regulation, may be considered as the fuels of this activity. We present results from a study investigating how SRT and TP frameworks can be related empirically, and to evaluate the role played by DC in the context of an extended model of the theory of planned behavior (TPB). The study was designed to explore the intervention of Desire for Control (DC) in the relation of TP to substance use, and to evaluate the contribution of these constructs to the TPB model and SRT. Participants were randomly recruited in high schools (N=690) and the study was prospective in design with an assessment of behaviors one week later. Findings showed the moderating role of DC in the relation of TP to substance use, suggesting the impact of those constructs on cannabis use behaviors, through their impact on proximal predictors. Findings of this research program offer some perspectives to integrate further TP research in the framework of self-regulation, and have some practical implications for promotion-or prevention-focused intervention related to substance use behaviors. They also open perspectives for a more “social” view on self-regulation.

SELF-REGULATION AND SELF-CONTROL

In the last decade, Self-regulation theory (SRT) became one of the most influential and promising theoretical framework to deeper our understanding of how and why people engage in health damaging behaviors, or escape from those behaviors (De Ridder & De Wit, 2006; Hagger, 2010). Grounded in motivation theories, SRT is a deeply dynamical model depicting conscious and nonconscious processes by which people regulate their thoughts, emotions, attention or behaviors and extended research has shown its implications for addictions or substance consumption. A key factor in SRT is the way individuals differ in their basic styles of self-control, which appeared as a crucial predictor of self-regulation capacity (Baumeister, Vohs & Tice, 2007). Self-control relate to the process through which people manage their dispositional tendencies and control their thoughts, feelings, impulses and task performance in order to be consistent with their goals and standards of behaviors, and is a basic element of the capacity to self-regulate (cf. Baumeister, Gailliot, DeWall & Oaten, 2006; Rasmussen, Wrosch, Scheier & Carver, 2006). As various studies evidenced, people with high abilities to self-control are less vulnerable to impulsivity and delay more gratification than people with low self-control (DeRidder & DeWitt, 2006). Therefore, people with low capacities to regulate appeared as more susceptible to engage in substance use, to sustain their consumption et to have difficulties in quitting (Wills, Sandy & Yaeger, 2002 ; Wills & Stoolmiller, 2002 ; Wills, AINETTE, Stoolmiller, Gibbons & Shinar, 2008). Beyond its main effect on substance use (Brody & Ge, 2001; Wills, Walker, Mendoza & AINETTE, 2006), self-control repeatedly appeared as a buffering agent in the relation of risk factors to substance use behaviors (Wills & al., 2008; Wills, Pokhrel, Morehouse & Fenster, 2011). In these studies, having good (or high) self-control appears to be negatively related to substance use, and to reduce the impact of risk factors on substance use. This buffering effect of self-control on the impact of risk factors to substance use has been extensively acknowledged for different populations, using a variety of methods (see Wills & al., 2008 for a review).

BEYOND THE MUSCLE, THE FUELS OF SELF-REGULATION CAPACITY

Its central functional role in self-regulation processes lead some authors to depict self-control as a “muscle” that allow and sustain self-regulation activity, susceptible to become tired after exertion, and to be increased via exercise (Muraven & Baumeister, 2000; Baumeister & al., 2006). In a recent study, Fieulaine & Martinez (2010) claimed for consideration of another control construct, distinct from self-control, but that can act as a main motivational factor in self-regulation, namely the construct of desire for control (Burger & Cooper, 1979). Desire for control (DC) or motivation to control is a specific and significant construct amongst the various concepts envisaged in the framework of “control” (Skinner, 1996). Specifically, it corresponds to the desire or motivation to maintain control, make one's own decisions, and be in charge of one's activities (Burger & Cooper, 1979). Although need for control is generally taken for granted in psychology, it can manifest itself at various levels or strengths. DC is distinct from other measures related to perceptions or beliefs about control, given that it examines the degree to which control is attractive, desirable and valuable, while other measures generally assess the level to which, and how, control is

attained or perceived (cf. Skinner, 1996). Thus, one can attain high control in a given situation, but may wish to relinquish this control over others. Conversely, one may actually desire high control, but perceive his/her effective control as low. DC is presumed to be a source of motivation for control (Burger & Cooper, 1979), varying from situation to situation but resulting in a general and measurable level, and was evidenced as an important dispositional factor within various phenomena, such as achievement, psychological adaptation, stress, or health (Burger, 1992; Gebhardt & Brosschot, 2002). Following Fieulaine & Martinez (2010), “if self-control resembles a muscle in self-regulation processes, then desire for control could function as the oxygen or the fuel of muscular activity” (pp. 799-800), and should be considered as a motivational basis for self-control capacity in self-regulation processes. When considering the energetic role of self-control in self-regulation, one may pay more attention to the motivational basis of self-control, and therefore to its desirability for individuals. Power or strength of self-control, and resources enhancement or depletion in self-regulatory processes could find an antecedent, at least for a part, in the level of motivation or desire for control.

TIME PERSPECTIVE AND SELF-CONTROL

To investigate further how DC can intervene in self-regulation Fieulaine & Martinez (2010) tested its role as a buffering agent in the relation of a dispositional risk factor to substance use and evidenced that desire for control can buffer the link between time perspective (TP) and substance use. There are several strong theoretical reasons why TP deserve particular attention when considering self-regulatory processes and self-control. First, self-control, and self-regulatory capacity in general, are deeply temporally based (Hall & Fong, 2007) and shaped (Wills, Sandy & Yaeger, 2001; Joireman, Balliet, Sprott, Spangenberg & Schultz, 2008). Balancing short term and long term consequences of decisions and behaviors can adequately be considered as the core definition of self-control. Second, among the psychological factors that relate to health behaviors, time perspective has received growing attention and has been identified as one of the most important by numerous studies, based on various approaches and methods, sometimes involving large representative samples (Guthrie, Butler & Ward, 2009; Adams & White, 2009; Crockett, Weinman, Hankins & Marteau, 2009). Third, several studies suggested that TP and self-control are not only intercorrelated, but also interact in their impact on behaviors (Joireman & al., 2008; Barber & al., 2009).

The hypothesis underlying the incorporation of time in this field of research is that health behaviors fundamentally involve temporal dilemmas, creating conflicts between immediate benefits and future costs (in the case of risk-taking behaviors), or between immediate costs and future benefits (in the case of health protective ones). Time preference and time orientation thus appeared as personal variables likely to influence, more or less directly, the decision-making process. While time preference corresponds specifically to the differential value attached to outcomes in relation to temporal location for a particular behavior or event (Fuchs, 1982; Chapman & Coups, 1999; Chapman, Brewer, Coups, Brownlee, Leventhal & Leventhal, 2001; Chapman, 2001), temporal orientation corresponds to the attention paid to the past, present, and future time frames across a broader range of situations (Cottle, 1968;

Zaleski, 1994; Finke, 2005). Both have been extensively acknowledged in relation to preventive and risky health behaviors, and from these studies it emerges that future time preference and orientation, (as opposed to present preference and orientation), is associated with less risky and with more preventive behaviors, and this for a variety of health behaviors (e.g. Agnew & Loving, 1998; Björgvinsson & Wilde, 1996; Strathman, Gleicher, Boninger & Edwards, 1994; Chapman & Coups, 1999; Orbell & Kyriakaki, 2008).

In the last decade, a field of research has emerged based specifically on the broader concept of time perspective (TP), originally proposed by Lewin (1942), and recently reactivated by the work of Zimbardo and colleagues (Gonzales & Zimbardo, 1985; Zimbardo & Boyd, 1999; Zimbardo & Boyd, 2008). This construct corresponds to “*the often nonconscious process whereby the continual flow of personal and social experiences are decomposed or allocated into selected temporal categories or frames that help give order, coherence, and meaning to those events*” (Keough, Zimbardo & Boyd, 1999). It describes how one’s experiences, feelings, perceptions, or behaviors can be influenced by one’s orientation and attitude towards the past, present and future, and appeared to be a strong psychosocial predictor of many behaviors, particularly in the field of health (Boyd & Zimbardo, 2005; Henson, Carey, Carey & Maisto, 2005; Crockett & al. 2009; Guthrie & al., 2009). From the perspective of Zimbardo & Boyd’s theory of time, which postulates that TP consists of five factors based on orientation and attitudes towards timeframes (Zimbardo & Boyd, 1999), several studies have shown that present orientation, in a hedonistic and sensation-seeking attitude (Present-hedonistic time perspective – PHTP), and future orientation, in a planning and goal-oriented attitude (Future time perspective – FTP), are the most predictive TP dimensions in health behaviors, and in substance use (Keough & al., 1999; Wills & al., 2001; Apostolidis, Fieulaine, Simonin & Rolland, 2006). While individuals focused on FTP are more likely to engage in health protective behaviors and to avoid risky ones, individuals predominantly possessing a PHTP are more likely to adopt risky behaviors.

Nevertheless, there was claims to deeper our understanding of the two aspects of why or how and when or for whom this relation occurs (Wills & al., 2001; Apostolidis & al., 2006; Apostolidis, Fieulaine & Soulé, 2006; Fieulaine & Martinez, 2010). The first was investigated in relation with different potential mediating variables, whereas testing for moderators or buffering factors explored the second. In relation with self-control, whereas Wills & al. (2001) suggested that TP produce good self-control that in turn impacts exposure to risk factors for substance use, Joireman & al. (2008) and Barber, Munz, Bagnall & Grawitch (2009) relied on the hypothesis of a buffering effect of self-control in the link between TP and problem behaviors (temporal discounting and academic achievement). In a recent study in a general sample, Fieulaine & Martinez (2010) argued for a buffering hypothesis, considering that both TP and DC are distal dispositional constructs, without strong theoretical basis for the hypothesis of a causal order between them. Moreover, in line with a large body of research on the buffering effect of self-control on the impact of risks factors, they investigated how DC can intervene when considering TP as a risk factor of substance use. Despite risk factors are most frequently related to a background of adverse living circumstances, there is reason to consider TP as a risk factor given the consistent findings on its socioeconomically patterning (Agarwal, Tripathi & Srivastava, 1983; Fieulaine, Apostolidis & Olivetto, 2006; Adams & White, 2009; Guthrie & al., 2009), and on its predictive role in substance use (Keough & al., 1999; Wills & al., 2001; Apostolidis & al., 2006; Fieulaine & Martinez, 2010). This buffering hypothesis was also in line with prior studies showing the relation of

TP to control components (Ego control; cf. Zimbardo & Boyd, 1999; Health LOC, Sundaramurthy, Bush, Neuwelt & Ward, 2003; Perceived control, Wills & al., 2001; Self-control, Barber & al., 2009), or suggesting that the relation between TP and substance use can be moderated by other constructs (Apostolidis, Fieulaine, Simonin & Rolland, 2006), self-control among others (Barber & al., 2009; Joireman & al., 2008). In a previous study, results strongly suggest the existence of such a buffering effect, showing that Present hedonistic and future time perspective are significantly related to a composite score of substance use only for those who are high in desiring control (Fieulaine & Martinez, 2010). Therefore, PHTP seems to be at risk and FTP appeared as a protective factor only when linked to a high desire for control. These results lead to question the role desire for control may play in the impact of TP as a dispositional risk factor for substance use. To focus on sensation seeking and pleasure in the present, with low concern for future consequences is related to highest substance use only for those who simultaneously are motivated for controlling their life and situation. In the same way, being focused on future issues in a planning and conscientious attitude is linked to lower substance use only when simultaneously related to a high desire to control one's life. More important in a self-regulation perspective, motivation to control has no main effect on substance use but acts only as a buffering agent, enhancing or reducing the impact of TP on substance use. Hence, if DC has to be considered as a fuel in self-regulation processes, this is through its activating or inhibiting role on the impact of a dispositional factor such as time perspective. Therefore, these distal predictors of behavioral edification seem to find their energetic role as a mixture of fuels for the proximal muscular activity of self-regulation.

LIMITATIONS AND DIRECTIONS FOR RESEARCH

While this body of research provides strong theoretical and empirical bases for future studies, it remains limited from various reasons. First, self-regulatory constructs need to be related to well-established prediction models of health behaviours, to evaluate the degree to which broad constructs such as TP and DC can increase the predictive power of these models, or, more interesting in our view, provide new insights on their principal limitations. For instance, the theory of planned behavior (TPB) is one of the most widely used models to predict and change behaviors, particularly in the field of health, but its main limitation is due to the lack of clear and predictable relation between intentions and behaviors (Godin & Kok, 1996; Armitage & Conner, 2001; Sheeran, Conner & Norman, 2001; Webb & Sheeran, 2006). This intentions-behavior gap can fruitfully be investigated using the framework of self-regulation (Conner & Armitage, 1998; Orbell, 2003; Hall & Fong, 2007) and by considering the role of dispositional constructs such as TP or control (Rhodes, Courneya & Jones, 2005; Kovac & Rise, 2007; Armitage, Conner, Loach & Willetts, 1999; Griva, Anagnostopoulos & Madoglou, 2010). A second limitation is the lack of prospective or longitudinal studies to overcome weakness of cross-sectional studies design, particularly on causal statements and measures of behaviours related to TPB components (Armitage & Conner, 2001) or to TP construct (Apostolidis & al. 2006; Adams, 2009). A third limitation is the definition of populations or behaviours under study. While general population samples and composite indicators of health behaviours are useful for providing results in

representative sample and for relatively common behaviors, there is the need to complete these studies with more focused designs, precise populations and specific behaviors.

In summary, there was several lack of research we tried to overcome with the study we present in this chapter: Does DC intervene as a buffering agent in the relation of TP to substance use? Can the previous findings be replicated in a study on cannabis use in an adolescent sample? How the main and interaction effects of TP and DC on cannabis use can be observed using a prospective study design? What is the contribution of these variables to an existing model, namely the theory of planned behavior? These few questions are those deserving attention for future research, and present findings are an invitation to pursue these research avenues, and surely not their definitive answers.

METHOD AND PARTICIPANTS

The present study was designed as prospective, with TPB variables assessed at Time 1, in addition with measures of DC, TP, and cannabis perceptions, and behavior was assessed one week later (Time 2). Participants were high school students, recruited in all classes of two high schools located in an metropolitan area in center France. Those high schools are dedicated to general and professional education, and students originate from diversified socioeconomic levels. Data were obtained through a self-report questionnaire administrated to students during normal class hours by trained research staff. The study was presented as “a survey on opinion and lifestyles”, and it was stressed that participation was anonymous and on a voluntary basis. Anonymity was stressed by keeping professors away in the classroom, and by inviting participants to depose their filled questionnaire in an opaque ballot box. Participants were asked to provide a code number one the first page of the questionnaire, and to cautiously note it somewhere to be sure to remind it if necessary. Study introduction and data collection was performed by researchers and by trained assistants. 690 students participated at Time 1 (M age=16,7, SD=1,42), 54% were women and 46% were men. At Time 2 (1 week later), 664 filled the questionnaire assessing behavior (M age=16,7; SD=1,41), a response rate of 96,3%. Of these, 53% were women and 47% were men.

MEASURES

Participants completed a self-report questionnaire that included at Time 1 TPB, TP and DC measures together with assessment of substance perceptions, use, and demographics. At time 2, only behaviors were assessed, with several demographics in order to check for the reliability of numerical codes. Scales structures were verified with factor analyses (principal components method with Varimax rotation) followed by internal consistency analyses (Cronbach's alpha). Scales were coded such that higher scores represent positive positioning towards cannabis use for TPB measures, and more of the named attributes for other measures.

TPB Measures

The targeted behavior for TPB was “*to consume cannabis next week*”, and this behavior was directly assessed at Time 2. The proximal determinants of intention and behavior (attitude, subjective norm, perceived behavioral control) were assessed by multi-items measures, following the guidelines proposed by Ajzen (2002). Attitude was assessed using four bipolar items, ranging from 1 (*harmful, pleasant, boring, good*) to 7 (*beneficial, unpleasant, enjoying, bad*). Subjective norm was measured through 4 items each on a 7-point Likert scale ranging from 1 to 7, reflecting descriptive (*most people who are important to me will use cannabis next week, most people whose opinions are important for me will use cannabis next week*) and injunctive (*most people who are important to me think I should/should not use cannabis next week; most people whose opinions are important for me approve/disapprove my using of cannabis*) norms. Perceived behavioral control beliefs were assessed using 4 items, referring to perceived control (*Using cannabis next week depends only on my willing; If I want, I can easily use cannabis next week*) and efficacy (*For me, to use cannabis next week is easy/difficult; For me, using cannabis next week is possible/impossible*), using a 7-point Likert scale (from 1-*not at all* to 7-*very much*). Lastly, intention was assessed with three items (*I plan to; I intent to; I want to – consume cannabis next week*) measured on a 7-point Likert scale ranging from 1 (*not at all*) to 7 (*very much*).

Time Perspective

Time perspective construct was assessed using the Zimbardo Time Perspective Inventory (Zimbardo & Boyd, 1999), in its shorten form (Fieulaine, Apostolidis & Zimbardo, in press). ZTPI measures TP through an inventory of temporally marked propositions concerning the beliefs, values and preferences that individuals associate with their experiences. This 15-item scale contains 5 subscales: "Past-Positive" (PP: nostalgic, positive construction of the past); "Past-Negative" (PN: aversive attitude towards the past); "Present-Fatalistic" (PF: hopeless, nihilistic attitude towards life); "Present -Hedonistic" (PH: orientation towards enjoyment and pleasure in the present) and "Future" (F: planning for and achievement of future goals). Each subscale is composed of three items, assessed on a 5-point Likert scale according to how characteristic each statement is considered to be by the respondent (ranging from 1 [*very uncharacteristic*] to 5 [*very characteristic*]). In previous studies, “Present hedonistic” (PH) and “Future” (F) subscales appeared as the two most predictive TP dimensions for substance use (Keough, Zimbardo & Boyd, 1999; Apostolidis, Fieulaine, Simonin & Rolland, 2006; Fieulaine & Martinez, 2010). Yet, we decided to introduce past subscales, to explore how past TP can impact TPB measures and cannabis use behaviors, following the claim made by Hall & Fong (2007) for the attention past deserve in self-regulatory processes.

Desire for Control

Desire for Control was measured using the scale proposed by Burger & Cooper (1979, Desire for Control Scale – DCS), and recently validated in French (Fieulaine & Martinez, 2010). DCS measures general desire for control over life events in several domains, such as

making one's own decisions, taking preventive action to control upcoming situations, controlling others, or avoiding situations in which others have control (cf. Burger & Cooper, 1979). This scale is a 20-item self-report questionnaire, in which participants indicate their degree of agreement with each statement on a seven-point Likert scale (from 1: *strong disagreement* to 7: *strong agreement*). Factor analysis of the scale in different samples has yielded unstable results (see Burger & Cooper, 1979; Burger, 1992; Gebhardt & Brosschot, 2002; Abdullatif & Hamadah, 2005), and DCS is mostly used as an unidimensional measure of motivation to control, despite subfactors were observed in the original study (General Desire for control, Decisiveness, Preparation-prevention, Avoidance of dependence) but have been only partially replicated in subsequent studies (Gebhardt & Brosschot, 2002, Fieulaine & Martinez, 2010). General DC as measured by the whole scale has been found to have high internal and test-retest reliabilities; its construct and predictive validities have been rigorously and frequently demonstrated (Burger, 1992; McCutcheon, 2000; Gebhardt & Brosschot, 2002); and it has also demonstrated discriminant validity with measures of social desirability and locus of control (Burger, 1992; Gebhardt & Brosschot, 2002).

Behavior

Cannabis use was self-reported at both waves of the study. Past behavior at Time 1 was measured as lifetime, last 12 months and last month use; Level of use measure was based on the patterns used in surveys conducted by the French Monitoring Centre for Drugs and Addiction (OFDT; cf. Beck & Legleye, 2003) with a response format containing 5 levels of consumption; experimental (*to have smoked cannabis but not during the last 12 months*), occasional (*to have smoked cannabis less than 10 times during the last 12 months*), repeated (*to have smoked cannabis less than 10 times during the last 30 days*), regular (*to have smoked cannabis more than 10 times during the last 30 days*) and daily (*to have smoked cannabis at least once per day*). Proximity and accessibility of substance were measured using two items (having received cannabis offers and having cannabis users as friends). Similar measures were used at Time 2, with a focus on behaviors for the preceding week (offer, use, number of use, level of use).

ANALYSIS

Hierarchical multiple linear regression models were used to explore the role of TP and DC in relation with the TPB model of prediction for subsequent cannabis use. Considering the more distal to the more proximal predictors of behaviors, we tested for a mediation of proximal predictors of intention in the relation of TP and DC to intentions at Time 1, and then tested intention as the more proximal predictor of T2 behavior. Indirect effects were tested following Baron & Kenny (1986) approach for testing mediating effects, and significance of these effects were assessed using the Sobel test (Sobel, 1982). Buffering effect of DC on the relation of TP to cannabis use was tested using hierarchical regression analysis (Holmbeck, 1997; Cohen & Cohen, 1983). Regression models therefore included concurrent main effects terms for DC and TP and the cross product of the two variables. Interaction effect was

established if the interaction terms revealed significant regression coefficients and if the increase in variance explained by the model (ΔR^2) after entering the interaction term in the regression equation is significant. Effects were then interpreted graphically via simple slope analysis, that is to say, by examining regression lines representing relationships between the predictor (time perspective) and the outcome variable (substance use) for representative groups created by dichotomizing the moderator variable (DC: +1 and -1 standard deviation above and below the mean; Cohen, Cohen, West & Aiken, 2003).

RESULTS

Descriptive Statistics and Measures Reliabilities

Sample characteristics are recapitulated in table 1. Participants reported lowest level of experimental use compared to those reported in national surveys performed on similar population (N=43 7999; 17 years old, 50,3 men; 49,7 women - 42% ever consumed) but higher rates for other levels of use (42% experimental, 24,7% occasional, 7,3 % regular, 3,2% intensive; Legleye, Spilka, LeNezet & Laffiteau, 2006).

Table 1. Sample Characteristics

Variable	Total	Men	Women
N	690	322	358
Age (m, SD)	16,7 (1,42)	16,7 (1,53)	16,6 (1,30)
Offer (N, %)			
No	169 (24,5)	59 (18,8)	110 (31,3)
Yes	497 (72)	254 (81,15)	241 (68,6)
Ever consumed (N, %)			
No	437 (63,3)	196 (61,4)	241 (68,1)
Yes	238 (34,5)	123 (38,5)	113 (31,9)
Consumption level (N, %)			
Experimental	64 (24)	27 (20,1)	37 (28,4)
<i>Occasional</i>	97 (36,4)	43 (32,1)	52 (40)
<i>Repeated</i>	54 (20,3)	28 (20,9)	26 (20)
<i>Regular</i>	24 (9)	19 (14,2)	5 (3,8)
<i>Intensive</i>	27 (10,1)	17 (12,7)	10 (7,7)
Time 2			
N	664	307	355
Response rate	96,3%	95,3%	99,1%
Offer (N, %)			
No	521 (78,5)	219 (71,3)	301 (84,8)
Yes	143 (21,5)	88 (28,7)	54 (15,2)
Consumption (N, %)			
No	556 (83,7)	239 (77,8)	315 (88,7)
Yes	108 (16,3)	68 (22,2)	40 (11,3)

Reliabilities for TPB measures appeared acceptable in the sample (subjective norms: $N=4$, $\alpha=.77$; Control beliefs: $N=4$, $\alpha=.70$; Attitude: $N=4$, $\alpha=.86$; Intention: $N=3$, $\alpha=.94$). ZTPI subscales reliabilities appeared low in the sample, but acceptable (PN: $\alpha=.66$; PH: $\alpha=.63$; F: $\alpha=.60$; PP: $\alpha=.60$), except for PF ($\alpha=.41$), this subscale was subsequently excluded from the analyses. General desire for control scale reliability appeared satisfactory ($N=19$; $\alpha=.65$).

Intercorrelations between Measures

Intercorrelations between measures were computed and made appear significant links between TP and TCP components. Relations are in line with previous research, showing a relation between PH TP and positive attitude, norms and control related to cannabis use. DC appeared modestly but significantly positively correlated to PHTP, FTP and PPTD. No relation appeared between DC and TPB measures.

Table 2. Intercorrelations between measures

	PH	F	PP	PF	DC	NORM	CONTR	INTEN	ATT
ZTPI-PN	,167^{***}	-,055	-,001	,191^{***}	,032	,024	,085[*]	,041	,035
ZTPI-PH		-,081[*]	,206^{***}	,159^{***}	,181^{***}	,187^{***}	,289^{***}	,187^{***}	,222^{***}
ZTPI-F			,116^{**}	-,232^{***}	,176^{***}	-,131^{***}	-,222^{***}	-,237^{***}	-,223^{***}
ZTPI-PP				-,146^{***}	,10 ^{**}	-,023	-,049	-,100^{**}	-,105^{**}
DC						-,037	,078	,008	-,037
TCP-norm							,459^{***}	,471^{***}	,504^{***}
TCP-control								,579^{***}	,600^{***}
TCP-intention									,667^{***}

Distal and Proximal Predictors of Cannabis Use

In a first step of analyses, we explored how TP and DC constructs can predict the proximal predictors of intention (attitude, subjective norms and perceived behavioral control). In our model, given the constructs under study, it is hypothesized that TP and DC cannot be more or equally proximal determinants of intention or behaviors than attitudes, control and norms, but can instead participate at an upper level of prediction. Therefore, distal constructs are hypothesized as predicting intention through their impact on proximal TPB measures (i.e. a mediating effect). Hence, we first examined the relation of distal constructs to proximal TBP measures, by using a simultaneous multiple linear regression controlled for age and sex, with distal constructs as predictors and TPB measures as criterion. Results recapitulated in

table 2 revealed that several TP subscales are significantly related to proximal predictors of cannabis use intention. Hence, in line with previous studies, PHTP appeared as positively related to attitudes, subjective norm and perceived control favoring cannabis use, whereas FTP is negatively related to these constructs. Results also revealed a significant negative relation of PPTP to proximal predictors of cannabis use intention.

Table 3. Predictors of TPB components

	Attitude		Subjective Norm		Perceived Control	
	β	t	β	t	β	t
Gender	-,03	-1,00	-,00	-,12	-,06	-1,83t
Age	,14	3,85***	,07	1,89*	,13	3,60***
PNTP	-,01	-,24	-,01	-,29	,03	,89
PHTP	,23	6,11***	,19	4,98***	,27	7,19***
FTP	-,17	-4,74***	-,10	-2,67**	-,19	-5,39***
PPTP	-,11	-3,07**	-,04	-1,08	-,07	-1,98*
DCS	-,04	-1,16	-,05	-1,33	,05	1,47
R ²	.12***		.05***		.15***	

In a second step, hierarchical multiple linear regression were performed, by entering progressively all variables, from the most distal to the most proximal. In this model, TP and DC are assumed to share the same distal level, whereas substance perception is assumed to be a meso-level construct, and TPB measures are considered as the most proximal predictors. Regression equations were used to predict cannabis use intentions (linear multiple regression) and behaviors (binomial logistic multiple regression). Results (see Table 4) showed that FTP and PHTP are significant predictors of cannabis use intentions and subsequent behavior, whereas DC appeared to have no impact on intention or on behaviors. Step 2 and step 3 of the analyses revealed that the TP relation to cannabis use is mediated by proximal TPB measures of attitudes, perceived control and subjective norm. Sobel tests for indirect effects were significant in all cases (for PHTP : $z_{norm}=3.36^{***}$, $z_{attitude}=5.46^{***}$; $z_{control}=5.14^{***}$ and for FTP : $z_{norm}=2.29^*$; $z_{attitude}=4.35^{***}$; $z_{control}=4.28^{***}$).

Hence, if PHTP is positively related to cannabis use intention or behavior, it is trough its impact on attitudes, subjective norms and perceived control related to this behavior. For FTP, it must be noted that it remains a significant predictor of intention after having entered the TPB variables. Therefore, FTP has a direct impact on intention, which in turn mediate its relation to behavior. These results confirmed the predictive role played by time perspective in adolescent cannabis use as a distal dispositional construct leading to greater positive views on cannabis use, and to higher subsequent intentions and behaviors.

The Buffering Effect of Desire for Control

As in previous studies (Fieulaine & Martinez, 2010), Desire for Control appeared as having no direct effect on behaviour, and the present study extend this result by showing no effect on TPB measure. It remains to examine if we can observe in this sample the same buffering effect of DC as evidenced previously. In this aim, we entered in regression equations the

interaction term TP X DC, created by multiplying scores after having centered the variables in order to reduce multicollinearity. To assess for an interaction effect, we examined the significance of the regression coefficient associated with the interaction term, and the significance of the increase in explained variance brought by the introduction of the interaction term.

Table 4. Synthesis of hierarchical multiple regressions

Step 1	Cannabis use intention		Cannabis use behavior	
	β	t	OR	95% CI
Gender	-,08	-2,31*	,50	.32-.77***
Age	,10	2,67**	1.17	1.01-1.35*
PNTP	,00	,13	.91	.74-1.12
PHTP	,18	4,83***	1.83	1.40-2.38***
FTP	-,21	-5,58***	.63	.48-.82***
PPTP	-,10	-2,70**	.81	.63-1.03
DC	,01	,35	1.19	.81-1.78
R ²	.11***		.13***	
Step 2				
Gender	-,04	-1,71	,43	,24-.74**
Age	-,00	-,06	,95	.78-1,15
PNTP	,00	,14	.89	.68-1.17
PHTP	-,00	-,01	1.15	.85-1.56
FTP	-,07	-2,46**	.89	.64-1.24
PPTP	-,03	-1,23	.95	.69-1.31
DC	,03	1,13	1.06	.66-1.72
TPB-Norm	,14	4,57***	1.20	.97-1.48
TPB-Control	,25	7,15***	1,78	1.41-2.25***
TPB-Attitude	,40	11,56***	1.94	1.58-2.37***
R ² (ΔR^2)	.51*** (.40***)		.53*** (.40***)	
Step 3 (Time 2)				
Gender			,46	,25-.84**
Age	--	--	,98	.80-1.21
PNTP	--	--	,84	.63-1.12
PHTP	--	--	1.21	.88-1.66
FTP	--	--	1.05	.73-1.50
PPTP	--	--	.96	.67-1.36
DC	--	--	.94	.56-1.59
TPB-Norm	--	--	1,02	.80-1.31
TPB-Control	--	--	1.36	1.06-1.75**
TPB-Attitude	--	--	1.53	1,21-1.93***
TPB-Intention	--	--	1,86	1.51-2.30***
R ² (ΔR^2)	--	--	.58*** (.05**)	

Note: Gender was coded as 1:Men, 2:Women; Behavior was coded as 1: having consumed cannabis last week, 0: having not consumed cannabis last week.

Results showed a significant effect of PH X DC interaction on control beliefs ($\beta=.09$, $t=2.62$, $p<.01$; $\Delta R^2=.02$, $p<.05$) and on intention ($\beta=.10$, $t=2.80$, $p<.01$; $\Delta R^2=.02$, $p<.05$); and a tendencial effect of F X DC interaction on intention ($\beta=.06$, $t=1.89$, $p=.05$; $\Delta R^2=.02$, $p<.05$). No significant effect appeared on subsequent behaviors. Complementary analyses showed that TPXDC interaction effects on intention remain significant even after having controlled for TPB measures. Hence, TP X DC interaction is a direct predictor of intention, even if the increase in explained variance is relatively low. Graphical interpretation of the interaction effects through simple slopes (see Figure 1) made appear that the positive relation PH maintain with intention was enhanced when individuals score higher on the DC dimension (.69 vs. .27 for low DC), and that the negative relation of FTP to intention was enhanced when individuals score higher on DC (-.66 vs. -.31 for low DC).

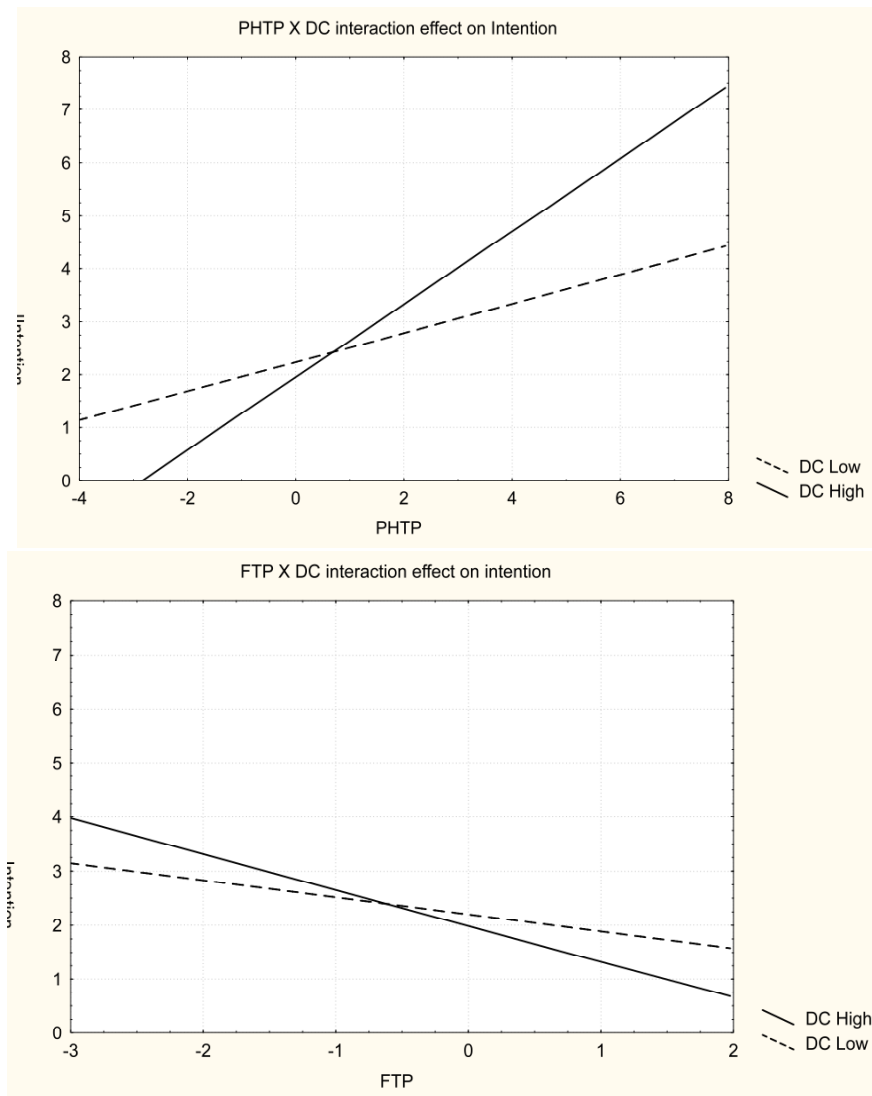


Figure 1. Interaction between TP and DC on cannabis use intentions.

Results are therefore in line with previous ones establishing the buffering effect of desire for control on the relationship between TP and substance use, giving further evidence of this effect in an adolescent sample and in regard with cannabis use.

CONCLUSION AND DIRECTIONS FOR FUTURE RESEARCH

In this chapter, we aimed at presenting new insights into the intervention of time and control in adolescents substance use. The results of this study are in line with previous ones and provide further support to the predictive role played by time perspective in substance use. Moreover, our study is the first, as far as we know, to establish the role of TP using a prospective design, with a large sample and for a specific behavior clearly defined in terms of its target, action, context, and time elements. Using such a design, the predictive role of PHTP and FTP find in our study strong evidence, and therefore challenge the main limitation often opposed to statements on the attention TP deserve in predicting and changing health behaviors. This is particularly true for present findings given they provide a clear view on the pathways through which TP impacts health behaviors. Using the theory of planned behavior model, TP appeared as a distal predictor of behavioral intention, mediated by proximal attitudes, behavioral control and subjective norms. In turn, behavioral intention was observed as the most predictive construct of subsequent behavior. These findings highlight the need to incorporate TP in existing model, not mainly in order to enhance their predictive power (TP contribution in this regard is relatively low), but to deeper our understanding of the antecedent of proximal behavioral edification. When considering interventions, identifying distal predictors of health behaviors allow for interventions designed for a variety of behaviours, and provide support for interventions aiming at changing broad dispositions to enhance health promotion practices.

Within the framework of self-regulation, results highlighted the ambiguous role desire for control may play in cannabis use. In line with our moderating hypothesis, desire for control appeared as having a buffering effect on the relation between TP and substance use. Hence, the well-established predictive role of future and present-hedonistic TP in substance use appears to be conditioned by the level of desire for control. Thus, if TP is a risk (for PH) and a protective (for F) factor in substance use, it is under the dependence of another psychological construct. In our study, the construct considered is not more proximal than TP. In relation to personal experiences, values and living conditions, TP and DC interact and thus establish what may be considered as social-psychological vulnerability profiles for cannabis use. High PHTP and high DC on the one hand, and low FTP and high DC on the other, appear as the most vulnerable profiles for substance use. It is important to note here that TP and DC are not highly intercorrelated, and furthermore do not represent overlapping factors. Thus, observed vulnerable profiles are not improbable, and one can't assume that TP is automatically linked to the less acknowledged construct of desire for control. Present findings highlight the importance of TP and DC constructs as distal predictors of cannabis use, and the role their interaction may play in establishing vulnerability profiles for substance use. High desire for control thus support the protective role of future orientation, but simultaneously reinforce the risk factor present hedonistic orientation represents. Self-control, as broadly defined, may bring to confusion between time and control, and lead to counterproductive

interventions. Hence, there is a strong need to further our understanding of the role psychological time and control play in self-regulation processes and particularly in substance use. Time and control often appeared as the core concepts in self-regulation (Carver & Scheier, 2002; Hall & Fong, 2007) but few studies investigated these issues using the actual developments in research on these constructs. Conversely, there is a need to integrate self-regulation models in research on time or control, and to propose integrative approach, of time particularly, based not only on temporal dimensions, but also on recent models that incorporate time components. Temporal self-regulation (Hall & Fong, 2007), implementation intentions (Gollwitzer, 1999), construal levels (Trope & Liberman, 2010) have in common to place time and control at the heart of self-regulation processes.

One final and pressing issue may provide research avenues for future studies. If we emphasize how far distal constructs such as time perspective or desire for control deserve attention in self-regulation theory, this is in part because we seek to favor the establishment of a more “social” view on self-regulation, by incorporating social contexts, or their social-psychological proxys, in extended models of self-regulation or other models with time concerns. Two main issues, in our view under considered in self-regulation research, can easily illustrate the limitations of self-regulation theory if it remains disconnected to social surroundings. Both rely on the postulate that self-regulation capacity is socially grounded and shaped, and on the precautionary principle according to which we should reduce the risk of confusion between descriptive and normative findings, by reversing the traditional causal emphasis by placing the cause in the environment, at least as a working hypothesis. First, leaving conditions and socio-economic status lead to develop contrasting psychological dispositions. Whereas secured environment and resources allow the development of future orientation and planning competencies, social insecurity and deprivation lead to develop temporal coping strategies, by focusing on present or past, avoiding planning and psychologically leaving the future (Fieulaine, Apostolidis & Olivetto, 2006). Therefore, to understand more fully how self-regulation processes function in various contexts, there is a strong need to develop research on the intervention of environmental and socioeconomic factors. Second, from a social-psychological point of view, the normative component of self-regulation capacity deserves much more attention than actually. Well known for a long time is the social desirability of control and self-determination (Jellison & Green, 1981), but such a norm was also recently evidenced for future orientation and planning attitudes (Martinez & Fieulaine, 2011; Guignard, Apostolidis & Demarque, 2011). Hence, a strong limitation of actual research on self-regulation is that we don’t know if it is not the social environment that is the principal cause of the impact of self-regulation capacities. If one assumes that self-regulation competencies are socially approved and that impulsivity and low self-control are not, then self-regulatory capacities are functional because of a norm favoring such kind of behaviors, attitudes, or self-presentation strategies. This is this kind of social causality we observed regarding future time perspective and academic achievement. In a self-presentation approach, we demonstrated that future orientation is not only rewarded by positive evaluations, but also lead to provide more help and academic support to a student presented as normative, namely as being future oriented (Martinez & Fieulaine, 2011). In the case of self-regulation processes, such an exploration of its normative components is lacking.

To open avenues for future research and interventions, we would like to end by a broader view on present findings and on the state of research on self-regulation. There are many reasons why self-regulation is still a fruitful and promising frame of work to understand and

change health-damaging behaviors. But we are also convinced that the social roots of self-regulation deserve more attention, for several reasons. First, as for time perspective and desire for control, many of the dispositional constructs under study in social psychology are merely situational, but in the sense of Bourdieu's *habitus* (Bourdieu, 1998). Living conditions and social norms find their psychological counterpart through the objectification of social structure at the level of individual subjectivity. Hence, the *habitus* is, by definition, isomorphic with the structural conditions in which it emerged. The observed interaction between time perspective and desire for control, by defining vulnerability profiles, are not only informative for intra-personal processes, but also for the social contexts people live in. This is crucial for our understanding and for practical interventions. Challenging health-damaging behaviors need to explore how social inequalities lead to health inequalities. Self-regulation, and other related models, can be invaluable in this aim, by discovering social-psychological pathways through which socioeconomic status impacts health outcomes (Lachman & Weaver, 1998; Bailis & al. 2001; Fieulaine, Apostolidis & Olivetto, 2006; Adams & White, 2009; Guthrie & al., 2009). Another challenge is to build effective health communications. Present findings bring to support the inclusion of a double framing process in interventions or communications designed to prevent substance use. If temporal framing is well-known as a crucial determinant in health prevention (Orbell & Kyriakaki, 2008; Hall & Fong, 2007), it is necessary to consider also the possibility of simultaneous control framing, in order to make the former effective. Usually separated in health communications and interventions, time perspective and control could be more efficiently used as interactive factors in vulnerability-reduction or competence enhancement programs.

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