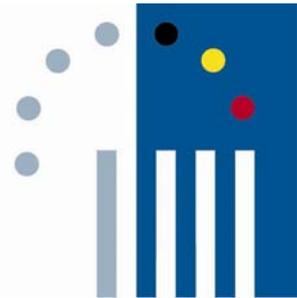


**BELGIAN SCIENCE POLICY**



**Longitudinal study of the effects of cannabis use on mental and physical health (ELECAN)**

SUMMARY

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## INTRODUCTION AND METHODOLOGICAL CONSIDERATIONS

The main objective of this research was to evaluate longitudinally the effects of regular cannabis consumption on various parameters reflecting aspects of physical and mental health. In recent years, the prevalence of cannabis use has reached very high levels in global and European respects. According to the 2006 report by the European Monitoring Centre for Drugs and Drug Addiction on the status of the drugs phenomenon in Europe (OEDT, 2006), cannabis is currently the most produced and most frequently consumed illegal substance in the world. Moreover, at European level, most EU countries have seen an increase in cannabis use since the 1990s. In fact, almost one European in five aged between 15 and 64 has already used cannabis at least once in his or her lifetime. In addition, it seems that the number of persons seeking treatment for their cannabis consumption has increased in most countries. In this context, cannabis is currently a public health problem. It now seems vital that we have access to specific information in order to be able to respond to this phenomenon in an effective manner.

Although cannabis is the most frequently consumed illicit drug in Europe, national consumption varies widely from one country to another (OEDT, 2006). These figures vary from 2% to 31% depending on the country. It would therefore seem that each country has specific characteristics and it is within this context that this research is situated. In fact, it would seem necessary to clarify these specific national characteristics. It seems vital to shed some light on the “cannabis phenomenon” as it is observed in Belgium. The present research has in fact attempted to specify the effects of regular cannabis use on the health of Belgian consumers. Moreover, clarification of these cannabis effects seems to be an essential prerequisite for the development of effective strategies, at both political and clinical levels. In fact, it is important for political decision-makers to adopt certain legislative positions and to be able to organise parallel strategies in order to control the “cannabis phenomenon” effectively in Belgium. In addition, in clinical practice, consumers and those close to them very often do not have more than incomplete or even inaccurate information about the effects of regular cannabis use. It is therefore essential not only to have information available, but for this information to be useful and in line with the reality of the Belgian consumer.

This research puts forward two main hypotheses concerning the effects of regular cannabis use on physical and mental health. The first hypothesis supposes that it would be possible to identify, for certain aspects of mental and physical health, differences between regular consumers of cannabis and control subjects who consume either alcohol or a combination of alcohol and tobacco. The second hypothesis supposes that it would be possible to see, given the longitudinal monitoring of cannabis consumers, changes in certain variables reflecting the same, increased or decreased use of cannabis.

With the aim of studying the effects of cannabis use on physical and mental health, this research was based on a specific methodology. The present research evaluated the physical and mental health of three distinct samples of subjects. The first sample consists of 59 regular consumers of cannabis (at least twice per week) displaying no other diagnostics of dependence or abuse according to the DSM-IV (American Psychiatric Association, 1994). The second sample comprises 15 subjects who are regular consumers of alcohol, with no diagnostics of dependence or drug abuse according to the DSM-IV (American Psychiatric

Association, 1994). The third sample comprises 15 subjects who are regular consumers of alcohol and tobacco and do not display, apart from addiction to tobacco, any diagnostics of dependence or abuse of other drugs according to the DSM-IV (American Psychiatric Association, 1994).

Subjects were recruited through advertisements in Dutch and in French. These advertisements were placed in various locations in Brussels and Walloon Brabant, particularly universities, colleges and sports centres. To qualify for inclusion in the study, subjects who consume cannabis had to demonstrate regular cannabis use of at least twice per week. Subjects using other drugs (amphetamines, methadone, cocaine, opiates) and those displaying a diagnostic of abuse or dependence on alcohol according to the DSM-IV were excluded.

Evaluation of all the subjects took the form of a medical check-up, carried out in one afternoon within the psychiatric and medical psychology department of the Brugmann Hospital in Brussels. Subjects who used cannabis were evaluated on two occasions, with a four-month interval. The control subjects were only evaluated once.

Three sectors were evaluated during the medical check-up: a physical sector, a psychosocial and addictions sector and a cognitive sector. Evaluation of the physical sector was based on urine toxicology in order to identify the presence and concentration in the urine of amphetamines, methadone, cocaine, opiates and cannabinoids. A blood test was also performed in order to evaluate haematological, biochemical and endocrine parameters. The cognitive evaluation involved three types of cognitive evoked potentials in order to detect any anomalies in attentional (P300), decisional (Negative Contingent Variation) and information processing (Somaesthetic Evoked Potentials) processes. Adaptation of the phasic attention test resulting from a battery of attention evaluation tests (Zimmermann and Fimm, 2002) was also included.

Evaluation of the psychosocial and addictions sector comprised a set of questionnaires. The Addiction Severity Index (McLellan et al., 1980), the Adolescent Drug Abuse Diagnosis (Friedman and Utada, 1989) and an adaptation of the Marijuana Screening Inventory (Alexander and Leung, 2004) allowed us to analyse drug consumption as well as its repercussions. The Temperament and Character Inventory (Cloninger et al., 1991) was used to evaluate seven personality dimensions: novelty seeking, harm avoidance, reward dependence, persistence, self-directedness, cooperativeness and self-transcendence. The State-Trait Anxiety Inventory (Spielberger, 1983) was used to estimate the state of anxiety (STAI-A) and the anxiety trait (STAI-B). The Pittsburgh Sleep Quality Index (Buysse et al., 1989) was intended to measure sleep quality. The events questionnaire by Amiel-Lebigre (1984) was used to determine life events. The intensity of depressive symptoms was measured using the Abbreviated Beck Depression Inventory (1974). The Fagerström Test of Nicotine Dependence (Heatherton et al., 1991) helped measure tobacco dependence. The Symptom Check-List (Derogatis, 1977) was used to obtain a global psychopathological gravity score as well as the scores for seven factors: somatisation, obsessional symptoms, interpersonal sensitivity, depression, anxiety, hostility, phobias, paranoid traits, psychotic traits and miscellaneous symptoms. The Ways of Coping Check-List (Lazarus and Folkman, 1984) was used to evaluate two types of coping strategy: problem-centred coping and emotion-centred coping.

## RESULTS

### 1. Description of the population

The group of subjects who are consumers of cannabis is made up of 40 men with an average age of 24 and 19 women with an average age of 22. Within this sample, 16 subjects are Dutch-speaking and 43 are French-speaking. Of these subjects, 53 are single and 13 say that they live alone. Forty-one are students, 15 are working and 3 are not working. As far as alcohol consumption is concerned, the subjects had drunk alcohol on an average of 6 days out of the 30 days preceding the evaluation and felt the effects of alcohol intoxication on an average of 4 days out of the previous 30. In terms of cigarette consumption, 31 of the sample of 59 subjects are tobacco users and demonstrate weak to very weak dependence on nicotine, according to the Fagerström Test of Nicotine Dependence.

In terms of the consumption profile of cannabis users, 58 subjects consume cannabis in weed form in joints. Of the 59 subjects in the sample, 37 use cannabis when they are in a group rather than alone. They first used cannabis on average at the age of 16 and their consumption became regular at the age of 18. The subjects who use cannabis consume on average 3 joints per day and spend 100 euros per month on their consumption. The average concentration of cannabinoids present in their urine is 1156 ng/ml.

The control group of subjects who are consumers of alcohol is made up of 7 men whose average age is 26 and 8 women whose average age is 31. Within this sample, 3 subjects are Dutch-speaking and 12 are French-speaking. Of these subjects, 12 are single and 3 say that they live alone. Ten subjects are working, 4 are students and 1 is not working. As far as alcohol consumption is concerned, the subjects drank alcohol on an average of 7 days out of the 30 days preceding the evaluation and felt the effects of alcohol intoxication on an average of 1 day out of the previous 30 days.

The control group of subjects who are consumers of alcohol and tobacco is made up of 6 men with an average age of 32 and 9 women whose average age is 27. Within this sample, 2 subjects are Dutch-speaking and 13 are French-speaking. Of these subjects, 13 are single and 3 say that they live alone. Five subjects are students, 8 are working and 2 are not working. As far as alcohol consumption is concerned, the subjects drank alcohol on an average of 7 days out of the 30 days preceding the evaluation and felt the effects of alcohol intoxication on an average of 2 days out of the previous 30 days. As far as cigarette consumption is concerned, the subjects demonstrate a weak to very weak dependence on nicotine according to the Fagerström Test of Nicotine Dependence.

## 2. Inter-group comparisons

In terms of comparisons between the group of cannabis consumers and the two groups of control subjects (alcohol group and alcohol/tobacco group), the statistical analyses revealed significant differences for different variables. One significant difference among the three groups was highlighted by the *problem-centred coping method* ( $p = 0.040$ ). The analyses also revealed a significant difference among the three groups of subjects for the *self-transcendence dimension*, i.e. spiritual maturity ( $p = 0.010$ ) on the Temperament and Character Inventory. In fact, the group of subjects who are cannabis consumers shows a self-transcendence score that is significantly higher than that of the control group of consumers of alcohol and tobacco ( $p = 0.047$ ). Regarding blood biology, the analyses revealed significant differences among the three groups in terms of the number of anomalies in the *sedimentation rate* ( $p = 0.010$ ) and *renal function* ( $p = 0.007$ ). In fact, the control group of alcohol consumers displays a significantly higher number of anomalies than the two other groups for sedimentation rate and renal function.

## 3. Cannabis intra-group comparisons

In terms of comparisons between the two check-ups for the group of cannabis consumers, 43 out of the 59 subjects in the initial sample were tested in the second check-up, given the experimental mortality. Among these 43 subjects, who were retested during the second check-up, 5 subjects had ceased their cannabis consumption. Moreover, a decrease in the concentration of urinary cannabinoids was also observed between the first check-up (1155 ng/ml) and the second (779 ng/ml).

The analyses revealed a significant improvement in the scores for the *somatisation dimension* ( $p = 0.008$ ), *obsessional symptoms* ( $p = 0.001$ ) and *anxiety* ( $p = 0.006$ ) on the Symptom Check-List during the second check-up for the group of cannabis consumers. The analyses also showed a significant reduction in the score for the *anxiety trait* ( $p = 0.005$ ) on the State-Trait Anxiety Inventory. During the second check-up for the group of cannabis consumers, a significant improvement was also observed in the *auditory response times with the dominant hand* ( $p = 0.004$ ) and *non-dominant hand* ( $p = 0.001$ ). Analyses of blood biology reveal a significant reduction in the number of anomalies for *proteins* ( $p = 0.001$ ) in the second check-up.

## 4. Additional analyses

A series of additional statistical analyses was performed in order to evaluate the relative influence of different variables: the age of the subjects, their gender, period of cannabis consumption and the quantity of cannabis consumed. In order to do this, we have identified categories of subjects within these variables. For the age variable, three groups of subjects were created: those under 20, those between 20 and 30 and those aged over 30. For the gender variable, the subjects were divided into two groups: male and female. For the period of

cannabis consumption, three subject groups were formed: consumption for more than 5 years, consumption for between 5 and 10 years and consumption for more than 10 years. Finally, for the consumption quantity variable, we took as our basis the quantity of cannabinoids observed in the first urinary test and then identified three subject groups: below 900 ng/ml, between 900 and 1500 ng/ml and over 1500 ng/ml.

#### 4.1. Inter-group comparisons

The statistical analyses revealed an *age effect* for the emotion-centred mode of coping ( $p = 0.032$ ) and the self-directedness dimension ( $p = 0.020$ ) on the Temperament and Character Inventory. Moreover, the analyses revealed an interaction between the group and age for sleep quality ( $p = 0.050$ ) on the Pittsburgh Sleep Quality Index, for the miscellaneous symptoms dimension ( $p = 0.031$ ) on the Symptom Check-List as well as for the visual response times with the non-dominant hand ( $p = 0.032$ ).

The analyses showed a *gender effect* for the psychotic traits dimension ( $p = 0.048$ ) on the Symptom Check-List. In addition, the analyses revealed an interaction between the group and gender for the problem-centred mode of coping ( $p = 0.027$ ). An *effect of the period of cannabis consumption* was revealed for the self-transcendence dimension ( $p = 0.049$ ) on the Temperament and Character Inventory as well as for life events ( $p = 0.049$ ). An *effect of the quantity of cannabis consumption* was found for life events ( $p = 0.005$ ).

#### 4.2. Cannabis intra-group comparisons

The statistical analyses did not reveal any *age effects* for any of the variables in comparisons between the first and the second check-ups for the group of cannabis consumers. Regarding the *gender effect*, the analyses showed an interaction between the time of the check-up (first versus second check-up) and gender (female versus male) for the response time with the non-dominant hand ( $p = 0.029$ ).

Regarding the *effect of the period of cannabis consumption*, the analyses revealed the existence of an interaction between the time of the check-up (first versus second check-up) and the period of cannabis consumption for the miscellaneous symptoms dimension on the Symptom Check-List ( $p = 0.049$ ). Regarding the *effect of the quantity of consumption* of cannabis, the analyses showed an interaction between the time of the check-up (first versus second check-up) and the quantity of cannabis consumed for the dimensions of somatisation ( $p = 0.009$ ) and interpersonal sensitivity ( $p = 0.029$ ) on the Symptom Check-List.

## CONCLUSIONS

The subjects in the cannabis group have a higher consumption/alcohol intoxication ratio than the two control groups. This higher ratio indicates the tendency of cannabis consumers to display a higher frequency of episodes of alcohol intoxication. This phenomenon would be likely to have subsequent consequences in terms of abusive consumption/dependence on alcohol. It would now be worthwhile studying this phenomenon in a systematic manner in order to determine the global impact (social, economic and medical) of this phenomenon at national level. In this context, the use of a method combining a qualitative dimension with life expectancy would be advisable. The DALY (Disability Adjusted Life Years) measures the global burden of an illness by merging, on the one hand, the years of *potential life* lost following premature death as a result of the illness and, on the other hand, the years of *productive life* lost as a result of the disability resulting from the illness (World Health Organization, 1999). This type of approach is recommended for evaluating the real impact of cannabis consumption (road accidents, suicide rate, industrial disability, etc.). Within the field of mental health, the DALY made it possible specifically to demonstrate that psychiatric and neurological disorders were among the major problems adding to the world morbidity burden (World Health Organization, 1999). It would therefore be prudent to consider the real weight of cannabis and its direct and indirect consequences on the national morbidity burden. This approach would also allow consideration of the number of years of disability avoided by the implementation of effective strategies for dealing with the issue.

Some values allow for differentiation between regular consumers of cannabis and the other subjects in the study. At this level, we find the self-transcendence dimension of the Temperament and Character Inventory. The literature indicates that this variable is an indicator of the subsequent gravity of consumption. This effect could be not confined to the consumption of cannabis and consequently indicate that the subjects who consume cannabis are at risk of developing the complications associated with other drugs. This effect would therefore confirm the medium-term and long-term risks associated with regular consumption of cannabis. The use of this variable within the context of the evaluation of cannabis consumers could provide pertinent indications regarding the relative risk of presenting a morbid evolution.

The simple check-up performed on subjects who are regular consumers of cannabis could have had an effect on their average consumption. In fact, while some of them gave up their consumption after the first check-up, the remainder of the sample evaluated in the second check-up had significantly reduced their average consumption. This result would indicate that an isolated act (such as a medical check-up) with no therapeutic goal (e.g. stopping consumption) would be likely to raise awareness, as demonstrated by a reduction or even cessation of consumption. The effect of this isolated act, which is moreover well described in the literature, should be considered systematically within the context of updates on consumers of cannabis. However, the combination of these isolated, non-therapeutic acts and monitoring towards access to specialist therapeutic programmes does require study.

The reduction in observed consumption in the second check-up among consumers of cannabis

is reflected in different variables (somatisation, obsessional symptoms, anxiety, etc.). It would therefore be possible to achieve a very rapid improvement in the general health of cannabis consumers. This latter element would indicate the possibility of limiting and rapidly controlling any consequences associated with the consumption of cannabis and preventing this consumption from placing an excessive burden on public health.

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