Title: Family-Related Stress versus External Stressors: Differential Impacts on Alcohol and Illicit Drug Use in Young Men.

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Abstract

Intense stress increases substance use (SU). However, little is known about the extent to which distinctive forms of stress should be weighted with regard to their effects on SU. This study aimed to determine whether family-related stress factors (FSF) influenced substance use (SU) in a different way than external stress factors (ESF). Data was drawn from a Swiss cohort study on SU risk factors (C-SURF), involving 5,308 young adult men. Twelve-month use of alcohol and of illicit substances was assessed. FSF and ESF for the time period preceding SU were measured. FSF and ESF were both significantly associated with SU. FSF had a greater impact on the use of most substances than did ESF. The FSF with the strongest association with SU was lack of parental monitoring. Regarding ESF, the cumulative number of stressful external events had a higher impact on SU than previous physical or sexual assault by a stranger. In contrast, physical or sexual assault by a family member was not found to be associated with subsequent SU. These findings have important implications for SU prevention programmes focusing on male teenagers, as it is difficult to screen and intervene for subtle forms of maltreatment in families.

Keywords: substance use disorders; parental monitoring; neglect; stress; risky family setting; trauma; sexual assault; physical assault

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Introduction

It is widely known that stress influences the use and misuse of psychoactive substances (substance use = SU). The occurrence of stressful life events during childhood and adolescence especially was shown to be highly correlated with the development of a substance use disorder (SUD) in later years [1,2]. Many studies, using various neurobiological investigation techniques, have illustrated the persistent effects of early-life stress on the body and brain, such as on the hypothalamic-pituitary-adrenal-axis and the stress regulation system [3], epigenetic gene expression [4], and cognition, memory function and learning [5-7].

Thus, chronic exposure to stress is a factor that contributes to the development of a maladaptive reactivity towards daily life stressors, and in which SU becomes a part of the individual's overall strategy for coping with stress [8,9].

Furthermore, genetic studies have shown that familial predisposition also contributes to the development of stress-related sequelae of functioning [10] and SUD [11,12]. However, according to current models of adaptive learning, individuals only develop problematic SU if they are in contact with the substance and if there are particular reasons, typically due to stressful incidents, that motivate them to use it [13,14].

Whereas the importance of single or repeated traumatic incidents, or chronic exposure to a hostile environment during childhood, are well-established stress factors that facilitate SU and subsequently SUD, little is known about their comparative weighting or influence. In addition, little is known about the relationship between the type of stressor and the particular substance which an individual might choose to cope with it. According to the self-medication hypothesis of addiction, individuals tend to use substances, in order to better cope with perceived difficulties, according to their temperament, personality type or psychiatric comorbidity [15,16]. Even though the empirical and clinical validity of the self-medication hypothesis is subject to some debate [17,18] , there is a broad consensus that SUDs are the result of the interplay between many factors, such as substance availability, the individual's predisposition and the presence of stressors.

Concerning the question whether specific stressful experiences have specific effects on the development of psychopathological traits in adolescents, it was found that there is little evidence for such a specificity assumption [19]. However, with regard to the differential influence of various forms of child maltreatment, it was shown that nonsexual forms of maltreatment (such as physical or emotional abuse and emotional neglect) increase psychiatric vulnerability in adolescents, whereas the effects of sexual abuse appear to be less striking [20]. The rather weak association between sexual abuse and psychiatric outcomes is still subject to debate and methodological difficulties to identify effects of sexual abuse without confounding effects of other forms of concomitant maltreatment have been discussed in order to explain these findings [21-24].

When comparing the effects of violent acts perpetrated by persons with stressful events which occurred outside a social interaction (e.g. natural disaster, car accident, physical illness) it was shown that interpersonal violence had a greater influence on subsequent SU in adolescents, than other forms of stressful events [25]. One possible explanation for the more deleterious effects of interpersonal violence in comparison to non-personal traumatic events might be the fact that interpersonal violence affects the bonding and resiliency capacities of a human being. This means that the belief to belong to a supportive and trustworthy community of human beings is highly challenged by the occurrence of interpersonal violence [26,27]. Furthermore, the devastating effects of interpersonal violence is even more pronounced if the maltreatment is perpetrated by persons who are expected to act in a respectful and loving manner, such as parents, family members or care-givers [28,29]. The question about how the multiple interactions between stress exposure and SU are related is further complicated by the fact that SU can be considered not only to be a consequence of stress reactivity related to potentially traumatic events, but also a risk factor for being exposed to stressful incidents [30]. Although there are many studies that test the associations between various stressors and outcomes there is to our knowledge no study that directly compares the influences of external stress factors (ESF) with those of family-related stressors (FSF) on subsequent SU in young men. As SU is a behaviour that can - in some cases but by far not in all cases - develop towards substance-related problems and SUD, it is of interest to better understand the relationship between distinct factors of stress during childhood and youth and SU in young adults. Thus, the present study aimed to determine whether FSF influences SU in a different way than ESF. Our initial hypothesis was that FSF would show a higher association with SU than ESF and that physical or sexual violence perpetrated within the family would be associated most strongly with SU.

Methods

Study design

Data for this analysis were drawn from the Swiss *Cohort Study on Substance Use Risk Factors (C-SURF*). C-SURF investigates the SU patterns, socio-economic and psychopathological characteristics of young Swiss men over time. The study protocol was approved by the Human Research Ethics Committee of the Canton Vaud (protocol number 15/07). Before starting the assessments, all the participants were thoroughly informed about the study and signed a consent form.

Participants were enrolled at three of the six military service recruitment centres that conscript men for military service; these covered 21 of Switzerland's 26 cantons. The military services were only used to enrol participants, so the study and participation in it were totally independent of the army. Attending army recruitment is mandatory for all Swiss men. At around the age of 19 years they are evaluated to determine their eligibility for military service, civilian service or an exemption. All the men attending recruitment were eligible for participation in our study, regardless of their eligibility for service. Enrolling participants at these locations thus provided the C-SURF study with a representative sample of young Swiss men. The present study used C-SURF data collected during the initial baseline assessment of those enrolled (socio-demographic characteristics) and from the first follow-up evaluation (assessment of traumatic experiences and SU), which took place about 15 months later.

Participants

An initial group of 7,556 conscripts gave their written consent to participate. Among those, 5,987 (79.2%) participated in the baseline assessment (wave 1) and then 5,479 (91.5%) of them completed the follow-up assessment (wave 2) after 15 months. One hundred and seventy one participants were excluded from the analysis due to missing data. The final sample consisted of 5,308 (96.9%) participants. More information on enrolment procedure, non-consent and non-response bias was provided in previous publications of our group [31,32].

Outcome variables

Use of illicit substances and alcohol

All participants were asked whether they had used psychoactive substances during the past 12 months, as measured at follow-up. Each substance was coded as "used" or "non-used". These substances included: 1) alcohol; 2) cannabis; 3) heroin; 4) cocaine (including crack and freebase); 5) MDMA (3,4-methylenedioxymethamphetamine [ecstasy]); 6) psychostimulants (amphetamines [speed] and metamphetamines [ice or crystal meth]); and 7) hallucinogens (lysergic acid diethylamide [LSD], phencyclidine [PCP)/angel dust, 2-CB or 2-CI], salvia divinorum, magic mushrooms, psilocybin, peyote, mescaline and ketamine). In addition, for alcohol and cannabis, the occurrence of risky consumption was assessed. For alcohol, binge drinking was determined to be drinking six or more standard drinks on a single occasion. For men binge drinking corresponds to the ingestion of approximately 66 grams of pure alcohol (six drinks containing 10-12g of pure alcohol) which is in line with the definition of the National Institute on Alcohol Abuse and Alcoholism (NIAAA, approximately 70 grams of pure alcohol being calculated based on five drinks containing 14 grams of pure alcohol) [33]. Binge drinking once a month or more was considered to be a risky frequency of binge drinking [34]. Another alcohol-related measure was the total weekly volume of standard drinks ingested. This data was obtained by determining the number of days per week on which alcohol was consumed and the average number of standard drinks ingested on those days. Ingestion of more than 21 units of alcohol per week (approximately 231 grams of pure alcohol) was considered to be a risky volume use as this is a quantity indication that lies between the 196 grams definition by the NIAAA (14 drinks per week containing 14 grams [35]) and the 280 grams threshold of the "Primary Health Care European Project on Alcohol"[36]. Participants were informed about typically available standard drinks using photographs of drinks containing about 10–12 grams of pure alcohol. With regard to cannabis, participants were asked how frequently they used this substance during the evaluated period. At-risk cannabis use was defined as using this substance two or more times a week, which is compatible with the literature: Although there is no general consensus concerning the threshold of risky cannabis consumption, assessments differentiate in general between a moderate risk level for a once a week use and a high risk level for a daily use [37].

Independent Variables

Assessment of external stress factors

Exposure to external stress factors (ESF; such as traffic accidents, earthquakes, severe illness or injury, etc.) at the 15-month follow-up was assessed using part 1 of the Post-traumatic Diagnostic Scale (PDS-enhanced) [38]; this consists of a list of 12 stressful events, including one open question for a stressful event not otherwise specified. This list of ESF was complemented with six additional events drawn from the

Trauma History Questionnaire (THQ) [39] and two events from the Life Event Checklist [40] (see full questionnaire and follow-up question B12 on [41]). To assess lifetime and 12-month prevalence, participants were asked to indicate every event they had experienced during their life and in the last 12 months. Only events that occurred at least 12 months prior to the follow-up assessment were included in the present analysis, thus ensuring that stressful events preceded SU. Of the 20 items that were questioned, two questions from the PDS were removed from the ESF group as they asked about physical or sexual assault perpetrated by family members. These two items were used as single factors in the family-related stress factors (FSF) group. Two items concerning either physical or sexual assault committed by a stranger were used as single factors within the ESF group in the statistical model. The remaining 16 ESF items were grouped into those having endured none, one or two, and three or more stressful events in their lives. These groupings were used because finer-grained logistic regressions using sub-groups of three or more events (e.g. 3, 4–5 or 6–7 events) revealed that more than three stressful events did not result in higher dose-response effects than three events.

Assessment of family-related stress factors

In strict parallel to the timing of ESF, the assessment of FSF focused on any events and experiences that occurred more than 12 months prior to SU measurement at follow-up. The following five features were assessed. First, the quality of relationships with their parents before participants reached the age of 18 years was evaluated using two questions from the European School Survey Project on Alcohol and Drugs (ESPAD)[42]. Responses were given on a five-point Likert scale (from 1-very satisfactory relationship to 5-very unsatisfactory relationship). The mean of these responses was dichotomised at a cut-off of 3.0, thereby separating the responses into one group with higher satisfaction (coded 0, for means below and up to 2.99) and another with lower satisfaction (coded 1, for means equal or higher than 3.0). Second, the presence or absence of a parental mental health disorder, including SUD, was assessed using the family history section from the Addiction Severity Index [43]. This factor was coded in the final model when either the participant's mother or father was known to suffer from at least one mental health disorder. Third, the number of times participants had had serious problems with their family during the year preceding the baseline assessment was determined using a question from ESPAD. This variable was scored as an absence of problems with the family, one or two problems, and three or more problems. Fourth, quality of parenting during childhood and youth was assessed using four questions from the ESPAD at baseline, which allowed a measurement of whether participants were raised in a neglectful family environment. These four items were chosen as they describe a stressful life context for children and adolescents which is due to the

omission of emotional care, support and monitoring. This view is akin to the WHO definition of emotional neglect (failure of a parent to provide for the emotional development of the child – where the parent is in a position to do so) [44,45]. More precisely, two of these four ESPAD questions were related to the fact whether there was presence or absence of parental monitoring *("My parents knew where I spent my evenings", "My parents knew with whom I spent my evenings").* The two other ESPAD questions assessed directly whether the participants had the impression that they were raised in an emotionally supporting family environment *("I received warmth and affection from my parents", "My parents supported me"*). This selection of the items is in line with studies that used the ESPAD questionnaire for assessing family influences on SU [46,47]. Responses were given on a five-point Likert scale (from 1-almost always to 5-almost never). Scores were then averaged, dichotomised at a cut-off of 3.0 and coded as lack (coded 1, for means equal or higher than 3.0) or presence (coded 0, for means below or up to 2.99) of either parental monitoring or emotional support. Finally, the most severe forms of FSF, i.e. physical or sexual assault by a family member (or by someone well known by the participant), were derived from the PDS, as described above.

Confounding socio-demographic variables

Age, perceived family income and the highest level of educational attainment (number of years of training at school or university) were used to adjust for socio-demographic differences.

Statistical analysis

Data were analysed using version 23.0 of the Statistical Package for the Social Sciences software (SPSS). Uncorrected contingency tables were established to estimate correlations between the outcome and dependent variables. For each substance or group of substances, separate multiple logistic regression analyses were conducted to examine associations between the use of a substance and all the various factors of stress. All models were adjusted for the three confounding factors (age, family income, education). Odds ratios (OR) and 95% confidence intervals (95% CI) were calculated. Differences of the Akaike's Information Criterion (Δ-AIC), were used to compare the overall weight of a group of factors (ESF versus FSF) [48]. The advantages of AIC over log-likelihood ratio tests are that: a) they can be used for non-nested models; b) they can be used for comparing models containing uneven numbers of independent variables because the AIC penalizes models with a larger number of variables in the model; and c) they provide an informal comparison of strength. For each substance use outcome, AIC was calculated for the full model

(i.e. confounding factors, ESF, FSF) and two partial models: a model excluding ESF (i.e. confounding factors, FSF), and a model excluding FSF (i.e. confounding factors, ESF). Then, Δ- AIC were calculated, by subtracting the AIC of the full model from the AIC of the two partial models. As a rule of thumb, a Δ AIC < 2 suggests substantial evidence for the partial model, values between 3 and 7 indicate that the partial model has considerably less support, whereas Δ- AIC > 10 indicates that the partial model is very unlikely [48]. A positive and high AIC difference signifies that the partial model is worse, i.e. that the inclusion of variables not in the partial model is important. A negative value would mean that the partial model is more parsimonious and thus favours the exclusion of variables (either ESF or FSF). The comparison of Δ-AIC of the two models, excluding ESF on one hand and excluding FSF on the other, provided an informal indication of which group of variables was most important to the overall model.

Results

The mean age of participants at follow-up was 21.3 years (standard deviation, 1.3 years). Table 1 shows the study sample's underlying descriptive statistics. It is important to note that 1.2% and 0.9% of participants had suffered a sexual assault by a family member or by a stranger, respectively. Heroin had been used by only 0.8% of participants, putting it very far down the list of illicit substances used, especially far behind cannabis, which had been consumed by as much as 31.5% of participants, and cocaine, ecstasy, psychostimulants and the group of hallucinogens, which had been used by between 4.1% and 5.7 % of participants. As a consequence of the low prevalence of heroin use, this outcome was no longer investigated in this study for associations with independent variables. Alcohol had been used by as much as 93.0% of participants during the observed time period.

Bivariate associations are shown in Table 2. Most chi-square tests were significant, showing that most stressors were bivariately associated with SU.

Table 3 shows multiple logistic regression for each substance (group), simultaneously taking all independent variables into account. We will not describe every significant effect in detail. For example, with regard to risky alcohol binge drinking the occurrence of physical assault by a stranger, was a significant ESF (OR = 1.40, $p < .001$) as was the number of stressful external events (OR = 1.17, $p = .013$ for one or two events; OR = 1.33, $p = .003$ for three or more events). Regarding FSF, lack of parental monitoring (OR = 1.33, $p < .001$) was also significantly correlated with that outcome. Regarding risky alcohol volume use lack of parental monitoring was the only FSF positively associated with it. Cannabis use was strongly correlated with both FSF (unsatisfactory relationships with parents, parents having mental health problems,

problems with the family and lack of parental monitoring) and ESF (physical assault and the number of stressful external events). Risky consumption of cannabis was significantly associated with problems with the family and lack of parental monitoring. This outcome was also significantly but negatively associated with sexual aggression by a family member. With regard to ESF, risky consumption of cannabis was strongly associated with the number of stressful external events, and also significantly associated with a history of physical assaults by strangers but to a lesser extent. The use of cocaine, ecstasy and psychostimulants was significantly associated with parental mental health problems, problems with family, the lack of parental monitoring and unsatisfactory relationship with parents (not significant for use of psychostimulants). As to the effects of ESF, the use of these substances was significantly associated with the number of stressful external events. The use of psychostimulants was significantly associated with a history of sexual assault by a stranger, whereas cocaine use was significantly associated with physical assault by a stranger. Hallucinogen use was significantly associated with all the ESF in the model, with regard to FSF it was significantly associated with unsatisfactory relationships with parents, problems with the family and lack of parental monitoring.

In summary, all the stress factors were found to be positively associated with at least one substance outcome, with two important exceptions: physical or sexual assault by a family member. These stressors were not associated with any of the investigated outcomes, except for risky cannabis use, where there was a negative association with sexual assault by a family member. Within the FSF group, lack of parental monitoring consistently showed a positive relationship with all investigated SU outcomes. Within the ESF group, the number of stressful external events was found to be consistently and significantly associated with all outcomes except risky alcohol volume drinking. Physical assault by a stranger was the second most likely ESF predictive of SU, whereas sexual assault by a stranger was only found to be associated with two substance outcomes: psychostimulant and hallucinogen use. Cannabis, ecstasy and cocaine use were the substances which were associated with as many as four distinct FSF.

Our analysis, shown in Table 4, revealed that for almost all substances, the inclusion of both FSF and ESF had at least a positive improvement for the model (Δ-AIC > 2). One exception was risky alcohol volume drinking: inclusion of either FSF or ESF did not change the general model fit to an extend of a Δ-AIC bigger than 2. In summary, the effects of FSF were more important than those stemming from ESF. There was only one exception to this observation: alcohol binge drinking was shown to be more impacted by ESF than by FSF. Ecstasy use was the outcome most associated by FSF (difference of Δ-AIC of 69.6) in comparison to ESF, followed by cocaine use (difference of Δ-AIC of 41.2).

Discussion

This study's main results are that FSF have a greater impact on most SU outcomes than ESF, and that among FSF, lack of parental monitoring is the factor the most consistently associated with SU in young men. These findings fit well with many reports in the literature that showed that effective parental monitoring consistently diminishes SU in teenagers [46,47,49-51]. Interestingly, our results showing that the absence of parental support did not show any significant relationship with subsequent SU seem to contradict somehow the many reports in the literature describing the highly deleterious effects of parental neglect or violence on the emotional regulation of their children and the increased risk to develop problematic SU later in life [20,52,53]. However, our analysis showed that factors such as having a difficult relationship with the parents or having problems with them showed a positive relationship with SU, especially with the use of illicit drugs. These findings are in line with previous results in the literature [50,54,55]. In addition, bivariate analysis (Table 2) showed that problems with family, lack of parental support, and lack of parental monitoring, were often significantly associated with SU. Maybe these variables share important variance with the outcome, so that in multiple models only the most important variable remains significant, and absorbs the impact of the other two variables. It is also possible that participants have difficulties to admit not to have been supported emotionally by their parents in general. This view on their childhood would be more confronting than to simply acknowledge that their parents did not show interest in setting rules or monitoring their social contacts. However, even though the omission of parental care, control and monitoring does not provoke - in general - dramatic symptoms or recollections, studies showed, that an emotionally abusive or neglectful parenting style deeply affects the self-representations [56] or the cerebral activation patterns of the individual later in life [57]. For example, students who had experienced and evaluated experiences of emotional abuse or neglect were shown to have developed profoundly anchored cognitive schemas of vulnerability and the impact of these internalizations on observed outcomes such as anxiety and depression might be even stronger, than the direct effects of the underlying events themselves [58].

Our results indicating that the quality of the relation between participants and their parents was not associated with alcohol binge drinking or risky alcohol volume drinking but that lack of parental monitoring was positively correlated with these outcomes is also in line with the literature showing that a good relationship with their parents does not prevent teenagers from drinking alcohol, but that parental control is related to lower alcohol use [59].

Interestingly the study, which only investigated men, found no significant positive associations between SU and highly stressful events, such as physical or sexual assaults by family members. On the contrary,

these factors are well known to correlate significantly with SU problems in studies focusing on samples of women [60,61]. However, as shown by Simpson and Miller [62], the influence of such stressful events on subsequent SU among men is much weaker than in female samples. They suggested that other family-related factors, such as a family history of mental illness or SUD may have a stronger impact on the development of SU problems in men. Our results, showing that the occurrence of mental health problems (including SUD) in the family was significantly associated with all SU outcomes, except for alcohol, risky cannabis and hallucinogen use, were in line with these studies. The differential effects of physical and sexual assaults on women or men have been confirmed in studies that showed that women who had been sexually assaulted had a greater risk of developing an SUD than men. However, men were shown to be at a high risk for developing an SUD after having been physically assaulted, raised in a hostile family environment or having developed a PTSD due to various other prior traumatic events [63,64]. The fact that physical and sexual assaults by family members have particular effects on SU by men is also illustrated by the observation that these factors were very often negatively associated (OR < 1) with the SU outcomes in our study. However, these associations were commonly non-significant and reached the threshold of significance only for risky cannabis use. It is possible that boys or adolescent males undergo aversive learning which makes them prefer to avoid psychoactive substances if they had been physically or sexually assaulted by members of their families perpetrating them while being under the influence of such drugs. Our findings concerning the lack of association between sexual assault by family members and SU in young men can only be generalized with caution as our analysis is based on relatively low numbers of occurrences resulting in low statistical power in comparison to the other investigated stress factors.

Our results showed that many of the familial factors that describe an environment in which stable and supportive relationships were available during youth contribute to lower SU in young men. Our findings were in line with the literature describing the “risky family model”, which states that family contexts characterised by aggressive, neglectful relationships contribute to creating or enhancing vulnerabilities in children and adolescents. This occurs by disrupting their acquisition of psychosocial competencies and their responsiveness to stress, and as a consequence these contexts place children at risk of developing mental health problems, especially SUD, later in life [53,65].

With regard to ESF, our results corresponded well with the aforementioned literature: we showed that most outcomes were significantly associated with the number of various stressful external events and that, as single factors, physical or sexual assault committed by a stranger were less consistently associated with SU than the cumulative effects of those other external stressful events. Several explanations have been formulated to try to explain this lack of strong associations between physical and sexual assault and SU and SUD in young men, as there seems to be a gender difference in experiencing and processing stressful or

traumatic events. Women appear to be more deeply affected by these kinds of events than men, as they face a greater risk than men of developing PTSD or other psychiatric illnesses after having suffered a stressful incident [66,67]. Psychosocial environmental factors, differences in coping styles, and differences in the neurobiology of learning and memory have all been put forward to explain the differential responses to stress and trauma when comparing male with female samples [68].

Of all the SU-related outcomes investigated, only alcohol binge drinking was shown to be associated more with ESF than with FSF. This result might be best explained by the presence of a third, mediating factor, such as impulsivity or sensation-seeking personality traits which put individuals at an increased risk of both being exposed to ESF and exhibiting binge drinking behaviour [69]. However, the present study did not control for additional confounding factors which might mediate specific patterns of risky alcohol consumption.

Our analysis failed to show any distinct link between the types of stressful events young men had faced in their lifes and the use of a specific psychoactive substance. However, our data could not rule out the possibility that there might be an indirect influence between the type of stress encountered and the choice of specific class of drugs. As shown by the literature, SU in men is mediated by other individual factors, such as personality and the presence of a psychiatric disorder [62,70], and this mediation by other etiologic factors is stronger in men than in women. Another important bias might be the fact that possession and use of most of the substances investigated were illegal. This reduces the availability of these substances for use, especially in comparison to alcohol, which is legal and readily available. Consequently, alcohol, which was used by as much as 93% of our study participants, might be the “substance of choice”, not as a result of a conscious decision, but rather as a result of a lack of alternatives.

An important limitation of our study is the fact that the outcome analysed was SU, and not SUD. Most studies focus on obvious SU problems or even SUD. As a consequence, it is difficult to compare our findings directly with those from these studies. Also, a substance is rarely used exclusively. Hence, there may be overlap in SU outcomes, and therefore the presented effects on two different drugs may have some shared variance due to concurrent or concomitant use of these substances. Nevertheless, our findings show that there are very differential effects (e.g. odds ratio below 1 and above 1 of the same exposure variable for different drugs), which justifies separate analysis of different drugs. Furthermore, our study did not control for the presence or absence of specific personality traits or psychiatric disorders, to which SU or SUD would be concomitant conditions. This reduces the possibility of making assumptions about the associations between stressful events, personality, psychiatric illnesses and concomitant SU, as it is well established that mental illness or personality traits strongly mediate SU. Another limitation is to see in the

lack of a severity measure for most stress factors which makes it impossible to weight the specific impact of the independent variables. Also, other relevant life stressors, such as problems with peers or within intimate relationships, were not included in our model. Another important limitation of this study is the fact that no information was available about the question whether the various experienced stressful events had an impact on directly trauma-related outcomes, such as PTSD (post-traumatic stress disorder). Thus, available data did not allow distinguishing between stressful, potentially traumatic and evident traumatic events. In addition, since the reference period for stressful events precedes the reference period of our SU outcomes, it is adequate to interpret results in the direction that stressful events may predispose individuals to use substances. However one cannot rule out the possibility that the findings may be partially attributable to a reverse causation, i.e. early SU may cause stressful events. This direction of causation may particularly apply to the association between physical assault by strangers and SU as it is possible that study participants presenting a high level of SU at follow-up assessment also had a high level of SU in preceding years, which may have contributed to finding themselves engaged in physical conflicts, as assessed at baseline. Finally, the results presented here are only representative of Swiss young males; further studies should be conducted to investigate whether the findings of the present study may be generalized to older men and to men living in different socio-economical contexts.

Conclusion

In summary, our study showed that the lack of parental monitoring during childhood and youth was the factor the most consistently associated with SU in young men and that FSF had a greater impact on subsequent SU than ESF. Other important FSF factors were the fact of having had a difficult relationship with the parents, problems with the family or the fact that one parents suffered a mental health disorder. Interestingly, other factors such as lack of support, or physical or sexual aggression by a family member were not positively associated with SU in the study participants. The clinical implications with regard to the prevention of abusive SU are important, as it is difficult to assess the quality of parenting or the existence of a “risky family” setting. Many forms of stressful family settings are barely visible from the outside, and even highly affected children and teenagers might not be able to identify and communicate that care givers are acting inappropriately towards them as long as they are not overtly violent or abusive [71]. Also, intervening with dysfunctional families is very difficult and in the absence of strong evidence of mistreatment, violence or abuse, such interventions are only feasible at the request of the family concerned.

However, most families in which there might be a problematic culture of caring would characterise themselves as normal and not in need of support [72].

As a consequence, our results suggest to raise the awareness of general practitioners, child and youth psychiatrists and social counsellors in order to improve screening and interventions in families in which "risky family" settings are suspected.

Conflict of interest statement:

The authors have no potential conflict of interest to declare

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Table 1: Descriptive statistics of sample

	N (total = 5,308)	%
Education		
9 years	393	7.4
12 years	2,465	46.4
13 years or more	2,450	46.2
Family income		
below average	748	14.1
average	2,199	41.4
above average	2,361	44.5
Family-related stress factors		
Unsatisfactory relationship with parents (ref. satisfied)	721	13.6
Parental mental health problems (ref. no)	587	11.1
Problems with family within past year (ref. no)		
once or twice	876	16.5
three times or more	347	6.5
Lack of parental support (ref. adequate support)	474	8.9
Lack of parental monitoring (ref. adequate monitoring)	969	18.3
Physical assault by a family member (ref. no)	215	4.1
Sexual assault by a family member (ref. no)	64	1.2
External stress factors		
Physical assault by a stranger (ref. no)	515	9.7
Sexual assault by a stranger (ref. no)	50	0.9
Number of stressful external events (ref. none)		
one or two	1,682	31.7
three or more	681	12.8
Risky alcohol binge drinking at FU1 (once a month or more)	2,355	44.4
Risky alcohol volume drinking at FU1 (more than 21 units / week)	467	8.8
Cannabis use at FU1	1,670	31.5
Risky cannabis use at FU1 (more than once / week)	438	8.3
Heroin use at FU1	41	0.8
Cocaine use at FU1	222	4.2
Ecstasy use at FU1	292	5.5
Psychostimulant use at FU1	218	4.1
Hallucinogen use at FU1	302	5.7

Note: FU1 = first follow-up assessment; ref. = reference.

Table 2. Covariate statistics of all evaluated variables towards all substance use outcomes

N = 5,308	Risky alcohol binge drinking at FU1			Risky alcohol volume drinking at FU1			Cannabis use at FU1			Risky cannabis use at FU1		
	less than once a month	once a month or more	*p*	≤ 21 drinks per week	> 21 drinks per week	*p*	no	yes	*p*	no	yes	*p*
FSF												
Unsatisfactory relation with parents (ref. satisfactory)	14.0%	13.1%	.338	13.6%	13.9%	.825	11.8%	17.4%	<.001	12.6%	24.0%	<.001
Parents having mental health problems (ref. no)	11.0%	11.2%	.821	10.9%	12.2%	.408	9.7%	14.1%	<.001	10.3%	18.9%	<.001
Problems with family within past year (ref. no)			.086			.290			<.001			<.001
once or twice	15.9%	17.3%		16.4%	17.8%		14.7%	20.4%		16.0%	22.6%	
three times or more	7.1%	5.8%		6.4%	7.9%		5.7%	8.3%		5.9%	13.7%	
Lack of parental support (ref. adequate support)	9.4%	8.3%	.166	8.8%	10.1%	.368	8.2%	10.4%	.010	8.5%	13.2%	.001
Lack of parental monitoring (ref. adequate monitoring)	16.9%	20.0%	.004	17.6%	25.1%	<.001	15.8%	23.5%	<.001	16.8%	34.0%	<.001
Physical assault by family member (ref. no)	4.0%	4.1%	.932	3.9%	6.0%	.026	3.5%	5.2%	.004	3.9%	6.2%	.019
Sexual assault by family member (ref. no)	1.4%	1.0%	.266	1.1%	2.1%	.052	1.1%	1.4%	.438	1.2%	0.9%	.558
ESF												
Physical assault by a stranger (ref. no)	8.1%	11.7%	<.001	9.3%	13.7%	.002	7.6%	14.3%	<.001	9.0%	17.1%	<.001
Sexual assault by a stranger (ref. no)	0.9%	1.0%	.815	0.8%	1.9%	.021	0.9%	1.0%	.934	0.9%	1.6%	.138
Number of external stressful events (ref. none)			.001			.027			<.001			<.001
one or two	30.5%	33.2%		31.5%	33.6%		30.4%	34.4%		31.3%	35.6%	

three or more	11.9%	14.1%	12.5%	16.1%	11.0%	16.9%	11.8%	24.2%

Table 2. continued

N = 5,308	Cocaine use at FU1			Ecstasy use at FU1			Psychostimulant use at FU1			Hallucinogen use at FU1		
	no	yes	*p*	no	yes	*p*	no	yes	*p*	no	yes	*p*
FSF												
Unsatisfactory relation with parents (ref. satisfactory)	12.9%	29.7%	<.001	12.8%	27.4%	<.001	13.1%	24.8%	<.001	12.8%	25.8%	<.001
Parents having mental health problems (ref. no)	10.4%	26.1%	<.001	10.4%	22.3%	<.001	10.5%	24.3%	<.001	10.6%	18.9%	<.001
Problems with family within past year (ref. no)			<.001			<.001			<.001			<.001
once or twice	16.3%	22.1%		16.2%	21.2%		16.4%	19.7%		16.3%	19.2%	
three times or more	6.1%	16.2%		5.9%	17.5%		6.1%	16.1%		6.1%	14.6%	
Lack of parental support (ref. adequate support)	8.5%	18.5%	<.001	8.5%	16.4%	<.001	8.6%	16.1%	<.001	8.5%	15.9%	<.001
Lack of parental monitoring (ref. adequate monitoring)	17.4%	38.7%	<.001	17.1%	37.3%	<.001	17.6%	34.4%	<.001	17.3%	34.4%	<.001
Physical assault by family member (ref. no)	3.9%	7.2%	.015	3.8%	8.2%	<.001	3.9%	7.8%	.004	3.8%	8.9%	<.001
Sexual assault by family member (ref. no)	1.2%	2.3%	.144	1.2%	2.1%	.171	1.2%	1.8%	.385	1.1%	2.3%	.068
ESF												
Physical assault by a stranger (ref. no)	9.2%	20.3%	<.001	9.2%	18.2%	<.001	9.4%	17.0%	<.001	9.2%	18.5%	<.001
Sexual assault by a stranger (ref. no)	0.9%	2.7%	.006	0.9%	2.4%	.008	0.8%	3.7%	<.001	0.8%	4.0%	<.001
Number of external stressful events (ref. none)			<.001			<.001			<.001			<.001
one or two	31.5%	35.6%		31.5%	34.2%		31.7%	32.6%		31.7%	31.5%	
three or more	12.2%	26.1%		12.2%	24.0%		12.2%	27.1%		12.1%	25.5%	

Note: FU1 = first follow-up assessment; ref. = reference; FSF = Family-related Stress Factors; ESF = External Stress Factors.

Table 3: Multiple regression statistics of all evaluated variables towards all substance use outcomes

N = 5,308	Risky alcohol binge drinking at FU1			Risky alcohol volume drinking at FU1			Cannabis use at FU1			Risky cannabis use at FU1		
		CI 95%			CI 95%			CI 95%			CI 95%	
	odds ratio	lower limit	upper limit	odds ratio	lower limit	upper limit	odds ratio	lower limit	upper limit	odds ratio	lower limit	upper limit
FSF												
Unsatisfactory relationship with parents (ref. satisfactory)	0.98	0.82	1.18	0.90	0.66	1.23	1.24*	1.03	1.49	1.33	1.00	1.76
Parents having mental health problems (ref. no)	1.13	0.94	1.35	1.06	0.78	1.44	1.27*	1.05	1.54	1.30	0.98	1.73
Problems with family within past year (ref. no)	[a] $p = .060$			[a] $p = .611$			[a] $p < .001$			[a] $p < .001$		
once or twice	1.10	0.95	1.29	1.09	0.84	1.42	1.38***	1.18	1.62	1.37*	1.07	1.77
three times or more	0.81	0.63	1.03	1.18	0.80	1.73	1.26	0.99	1.61	1.88***	1.34	2.64
Lack of parental support (ref. adequate support)	0.87	0.70	1.09	0.90	0.63	1.28	0.89	0.71	1.12	0.72	0.51	1.02
Lack of parental monitoring (ref. adequate monitoring)	1.33***	1.15	1.55	1.51***	1.19	1.91	1.54***	1.32	1.79	2.10***	1.67	2.64
Physical assault by family member (ref. no)	0.93	0.69	1.26	1.21	0.77	1.90	1.03	0.76	1.40	0.84	0.53	1.33
Sexual assault by family member (ref. no)	0.66	0.38	1.16	1.32	0.61	2.86	0.89	0.50	1.57	0.32*	0.11	0.97
ESF												
Physical assault by a stranger (ref. no)	1.40***	1.15	1.71	1.36*	1.00	1.84	1.62***	1.33	1.97	1.38*	1.03	1.86
Sexual assault by a stranger (ref. no)	1.06	0.58	1.94	1.50	0.66	3.39	0.72	0.37	1.37	1.38	0.57	3.34
Number of external stressful events (ref. none)	[a] $p = .003$			[a] $p = .481$			[a] $p < .001$			[a] $p < .001$		
one or two	1.17*	1.03	1.32	1.12	0.90	1.39	1.26***	1.10	1.44	1.46**	1.16	1.84

three or more	1.33**	1.10	1.60	1.16	0.85	1.58	1.52***	1.25	1.84	2.15***	1.61	2.88

Table 3: continued

N = 5,308	Cocaine use at FU1			Ecstasy use at FU1			Psychostimulant use at FU1			Hallucinogen use at FU1		
		CI 95%			CI 95%			CI 95%			CI 95%	
	odds ratio	lower limit	upper limit	odds ratio	lower limit	upper limit	odds ratio	lower limit	upper limit	odds ratio	lower limit	upper limit
FSF												
Unsatisfactory relationship with parents (ref. satisfactory)	1.55*	1.08	2.22	1.50*	1.08	2.07	1.24	0.84	1.81	1.52*	1.10	2.10
Parents having mental health problems (ref. no)	1.93***	1.37	2.73	1.64**	1.19	2.26	1.94***	1.36	2.77	1.36	0.97	1.89
Problems with family within past year (ref. no)	[a] $p = .041$			[a] $p < .001$			[a] $p = .025$			[a] $p = .027$		
once or twice	1.24	0.87	1.76	1.31	0.96	1.79	1.13	0.79	1.63	1.11	0.81	1.52
three times or more	1.73*	1.12	2.68	2.26***	1.55	3.29	1.84**	1.18	2.85	1.71**	1.16	2.53
Lack of parental support (ref. adequate support)	0.99	0.65	1.50	0.88	0.60	1.29	0.92	0.59	1.42	0.95	0.65	1.40
Lack of parental monitoring (ref. adequate monitoring)	2.16***	1.59	2.93	2.26***	1.72	2.95	1.87***	1.37	2.57	2.02***	1.54	2.65
Physical assault by family member (ref. no)	0.77	0.42	1.40	1.14	0.69	1.89	0.95	0.53	1.72	1.25	0.77	2.04
Sexual assault by family member (ref. no)	0.77	0.27	2.26	0.74	0.28	1.98	0.46	0.14	1.50	0.61	0.24	1.58
ESF												
Physical assault by a stranger (ref. no)	1.56*	1.06	2.28	1.40	0.99	1.98	1.20	0.79	1.80	1.43*	1.01	2.01
Sexual assault by a stranger (ref. no)	1.79	0.67	4.79	1.59	0.63	4.02	3.09*	1.28	7.48	3.29**	1.51	7.13
Number of external stressful events (ref. none)	[a] $p = .003$			[a] $p = .007$			[a] $p = .001$			[a] $p = .002$		
one or two	1.43*	1.04	1.98	1.28	0.96	1.69	1.29	0.93	1.79	1.14	0.86	1.51
three or more	1.97***	1.32	2.93	1.75**	1.23	2.50	2.17***	1.47	3.20	1.84***	1.31	2.60

Note: regressions were adjusted for the following confounders: age, family income, and education. FU1 = first follow-up assessment; ref. = reference; CI = confidence interval of odds ratio; FSF = Family-related Stress Factors; ESF = External Stress Factors. [a] p = p-value for the whole factor; * = $p < .05$; **= $p < .01$; ***= $p < .001$

Table 4: Akaike's Information Criterion (AIC) calculated for the full model as well as for the partial models including either ESF (External Stress Factors), or FSF (Family-related Stress Factors).

	Full model	ESF model only		Σ - Δ-AIC	FSF model only		Σ - Δ-AIC
	AIC	AIC	Δ-AIC	favouring ESF	AIC	Δ- AIC	favouring FSF
Risky alcohol binge drinking at FU1	7200.2	7208.6	8.4	**14.9**	7223.5	23.3	
Risky alcohol volume use at FU1	3148.2	3146.7	-1.5	**1.6**	3148.3	0.1	
Cannabis use at FU1	6440.0	6500.8	60.8		6491.9	52.0	**8.8**
Risky cannabis use at FU1	2851.7	2918.4	66.7		2885.7	34.0	**32.7**
Cocaine use at FU1	1718.5	1776.4	57.9		1735.2	16.7	**41.2**
Ecstasy use at FU1	2139.5	2220.3	80.8		2150.7	11.2	**69.6**
Psychostimulant use at FU1	1725.8	1761.3	35.5		1743.5	17.7	**17.8**
Hallucinogen use at FU1	2219.3	2267.4	48.1		2243.4	24.1	**24.0**

Note: Full model: contains the sociodemographic confounders (age, family income, education) as well as all the External Stress Factors (ESF: physical assault by a stranger, sexual assault by a stranger, number of external stressful events) and the Family-related Stress Factors (FSF: unsatisfactory relationship with parents, parents having mental health problems, problems with family within past year, lack of parental support, lack of parental monitoring, physical assault by family member, sexual assault by family member); ESF model only: contains only the sociodemographic confounders and the ESF; FSF model only: contains only the sociodemographic confounders and the FSF

Σ - Δ-AIC is the absolute value of the difference between the Δ-AIC from the partial models. FU1 = first follow-up assessment