



# CONSUMO DE SUSTANCIAS EN LA ADOLESCENCIA: PATRONES LONGITUDINALES, FACTORES DE RIESGO Y PROTECCIÓN

## SUBSTANCE USE IN ADOLESCENCE: LONGITUDINAL PATTERNS, RISK AND PROTECTIVE FACTORS



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**PROGRAMA DE DOCTORADO EN CIENCIAS SOCIALES Y JURÍDICAS**

TITULO: *Substance use in adolescence: longitudinal patterns, risk and protective factors*

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PSICOLOGÍA

DEPARTAMENTO DE PSICOLOGÍA

**TESIS DOCTORAL**

Programa de Doctorado en Ciencias Sociales y Jurídicas

**Consumo de sustancias en la adolescencia: patrones  
longitudinales, factores de riesgo y protección**

Substance use in adolescence: longitudinal patterns, risk and  
protective factors

Autor: Joaquín Rodríguez Ruiz

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Abril 2023

Córdoba, España



*“To be human is to become visible  
while carrying what is hidden as a gift  
to others”*

**-David Whyte-**



Este trabajo se rige por la séptima edición del Manual de Publicaciones de la American Psychological Association (2020).

En atención a la Ley 3/2007, de 22 de marzo, para la igualdad efectiva de las mujeres y hombres, todas las menciones en la presente tesis doctoral referidas a personas, colectivos, etc. cuyo género sea masculino, se estará refiriendo al género gramatical neutro y así incluyendo la posibilidad de referirse a mujeres y a hombres.







**TÍTULO DE LA TESIS: Consumo de sustancias en la adolescencia: patrones longitudinales, factores de riesgo y protección // Substance use in adolescence: longitudinal patterns, risk and protective factors**

**DOCTORANDO:** Joaquín Rodríguez Ruiz

**INFORME RAZONADO DE LA DIRECTORA DE LA TESIS**

La tesis doctoral realizada por D. Joaquín Rodríguez Ruiz dirigida por la Dra. Izabela Zych presenta, a mi juicio, indicios de calidad y rigor científico para que sea defendida y evaluada por la Comisión Académica del Programa de Doctorado de Ciencias Sociales y Jurídicas para la obtención del título de Doctor por la Universidad de Córdoba. El trabajo se ha financiado a través de diversas fuentes. Por un lado, se ha desarrollado en el marco de un contrato para la Formación de Profesorado Universitario (FPU19/02907) del Ministerio de Ciencia, Innovación y Universidades. Asimismo, se ha contado con financiación del Programa Propio de la Universidad de Córdoba y de una beca Fulbright para la realización de dos estancias internacionales. Por otro lado, esta tesis doctoral ha sido parte de tres proyectos de investigación más amplios financiados por el Ministerio de Economía y Competitividad [PSI2015-64114-R]; por el Ministerio de Sanidad, Consumo y Bienestar Social dentro del Plan Nacional sobre Drogas (2019/016); y por la Fundación Nacional Suiza de Ciencia (10FI14\_170409).

La tesis doctoral, realizada por compendio de artículos, se centra en una temática de actualidad y de importancia para la salud pública. Para ello, el objetivo del trabajo fue analizar patrones longitudinales del consumo de sustancias en la adolescencia, así como explorar diversos factores de riesgo y protección para el consumo de sustancias en la adolescencia. El primer artículo científico reporta perfiles longitudinales de consumo de sustancias en la infancia tardía y la adolescencia, analizando el papel de las competencias sociales y emocionales y la empatía como factores de riesgo/protección. El segundo artículo científico estudia, desde una perspectiva ecológica, la relación longitudinal del consumo de sustancias con variables individuales, escolares y socio-económicas. El tercer artículo científico se centró en distintas dimensiones de la relación padre-hijo en la infancia que predicen el consumo de sustancias en distintos momentos de la adolescencia y el rol mediador del autocontrol. Los tres artículos derivados de esta tesis doctoral han sido publicados en revistas indexadas en el primer cuartil del Journal Citation Report.

Por todo ello, se autoriza la presentación de la tesis doctoral.

Córdoba, 18 de abril de 2023

Firma de la directora

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# **EXTENDED ABSTRACT**

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Substance use is one of the most challenging health concerns worldwide. Substance use causes thousands of deaths every year (World Health Organization, 2021) and entails a number of adverse consequences for physical and mental health (Feinstein et al., 2012), as well as for social, emotional and cognitive development (Castellanos-Ryan et al., 2013). Substance use initiation usually occurs in adolescence (Johnston et al., 2022; Moreno et al., 2020), when it can be even more harmful due to the deep cerebral (Spear, 2013), psychological, biological and social changes (National Academies of Sciences, Engineering, and Medicine, 2019) of this period. For these reasons, it is essential to understand how substance use evolves during adolescence and explore risk and protective factors for adolescent substance use.

The Gateway Theory (Kandel et al., 1975) states that substance use usually starts with licit substances, giving rise to the consumption of more obnoxious, typically illicit substances. Cross-sectional research has successfully tested this theory (Kirby & Barry, 2012; Nkansah-Amankra & Minelli, 2016; Sánchez-Niubó et al., 2020). Longitudinal evidence shows that a powerful predictor of substance use is having used substances in the past (Best et al., 2018; Martínez-Fernández et al., 2018). Moreover, different longitudinal studies agree in a common pattern of substance use: the likelihood of increasing consumption over time is much higher than the probability of reducing it (Chung et al., 2013; Oliva et al., 2008; Zych et al., 2020). However, new studies analysing within-individual changes in the frequency of substance use are still needed.

A systematic review found that emotional intelligence was a powerful protective factor against substance use (Kun & Demetrovics, 2010). In this way, a good development of several social and emotional skills has been found to protect against substance use: self-awareness (Estévez et al., 2017; Hodder et al., 2016; Parolin et al., 2017), social skills (Hernández-Serrano et al., 2016; Vorobjov et al., 2014), decision making (Alameda et al.,

2012; Clay & Parker, 2018), and self-regulation (Estévez et al., 2017; Parolin et al., 2017). Nonetheless, more studies exploring the link between substance use and social and emotional competencies using longitudinal designs and including a wide variety of competencies in the same model are still needed.

The association between empathy and substance use has also been approached. Although a number of cross-sectional studies found significant lower levels of empathy among substance users (Schmits & Glowacz, 2018; Pérez de la Barrera, 2012), results are contradictory when they try to distinguish between affective and cognitive empathy in relation to substance use. Ferrari et al. (2014) found lower levels of affective empathy in drug addicted participants in comparison with non-addicted, but differences in cognitive empathy were not significant. Dolder et al. (2016) discovered that affective empathy increased while cognitive empathy decreased after using LSD. Another experimental study reported that MDMA use increases affective empathy, but it does not affect cognitive empathy. More longitudinal studies using validated measures of empathy in general population are needed to shed light to the link between substance use and empathy taking into account its bidimensional nature (cognitive and affective).

According to the Self-Control Theory of Crime (Gottfredson & Hirschi, 1990), inappropriate parenting in childhood prevents individuals from developing adequate self-control, which, in turn, sows the seed of problem behaviour, among them substance use. In line with the Social Capital Theory (Putnam, 2000), scientific literature reports that substance use is predicted by neglectful parenting (Martínez-Loredo et al., 2019), low of positive parenting (Boden et al., 2021) and parental monitoring (Valente et al., 2019). A meta-analysis of longitudinal studies found that positive parenting in childhood is essential for the development of self-control in adolescence (Li et al., 2019). Many empirical studies also highlighted that self-control is a strong protective factor against

substance use (Grindal et al., 2019; Schaefer et al., 2015; Yun et al., 2016). Notwithstanding this evidence, the Self-Control Theory of Crime (Gottfredson & Hirschi, 1990) has not yet been accurately tested in relation to substance use. Thus, it is still necessary to explore how different dimensions of the parent-child relationship in childhood prospectively impact on substance use in adolescence and check if this possible association is mediated by low levels of self-control.

School is another essential context of influence in childhood and adolescence. Poor academic performance increases the likelihood of substance use (Center for Disease Control and Prevention, 2020; Gaete & Araya, 2017; Heradstveit et al., 2017). The relation of different school domains with substance use can be analysed from the perspective of the Social Bond Theory (Hirschi, 1969), presuming that the acquisition of social bonds can prevent adolescents from developing problem behaviours, such as substance use. Accordingly, a positive school climate (Daily et al., 2020), school belonging (Syed et al. 2021) or liking school (King et al., 2020) are protective factors against substance use. Substance use has also been found to be lower among students who reported good relationships with teachers (Aston, 2015; Han et al., 2016; Wenzel et al., 2009) and classmates (Forster et al., 2015; Henty et al., 2019; Rodzlan et al., 2021). Nevertheless, there is a paucity of research exploring how the consumption of different substances is longitudinally impacted by school bonding, including bonding to teachers, classmates and school itself.

According with scientific literature, socio-economic status is closely related to health behaviours in general (De Hoog et al., 2020) and substance use in particular (Spooner & Hetherington, 2004). The concept of socio-economic status includes several elements: income, education, prestige, religion, ethnicity, residence, etc. (American Psychological Association, 2015). Following the Ecological Theory (Bronfenbrenner,

1979), the socio-economic status of different contexts could have a differential impact on substance use. This way, it is known that low neighbourhood socio-economic status was related to more substance use (Lee et al., 2018; Shih et al., 2017), while the link between family socio-economic status and substance use is controversial. Some studies related high family socio-economic status with more substance use (Patrick et al., 2020; Petruzelka et al., 2020) while others found that it was a protective factor against substance use (Andrabi et al., 2017; Leventhal et al., 2015). Despite these outcomes provided by empirical data, there is a dearth of research analysing in a single study the prospective differential impact of family and neighbourhood socio-economic status on substance use in adolescence.

After analysing the scientific literature on the topic and in order to address the identified gaps in knowledge, the current doctoral dissertation aims to study longitudinal patterns of substance use in adolescence, as well as analyse possible individual and contextual risk and protective factors related to substance use. To do that, three independent but interrelated studies were conducted. All the studies, followed a longitudinal design, used validated instruments for data collection and included large samples of students.

Study 1 set out two objectives: to discover specific longitudinal profiles of substance use over time in a sample of students aged 9-17 followed up for one year (Objective 1); and to explore if social and emotional competencies and empathy can act as longitudinal protective factors against substance use (Objective 2). There were two hypotheses linked to the proposed objectives: the most prevalent substance use profile would be non-users, followed by those profiles reporting an increase in substance use from time 1 to time 2 (Hypothesis 1); and social and emotional competencies, as well as

empathy, would act as longitudinal protective factors against substance use (Hypothesis 2).

The final sample in this study was entailed by 861 participants (49.9% girls, 50.1% boys) from eight different Primary and Secondary Schools from the provinces of Cordoba and Seville (Spain). Age range was 9-17 at time 1 ( $M = 11.98$ ;  $SD = 1.87$ ) and 10-18 at time 2 ( $M = 12.99$ ;  $SD = 1.87$ ). The instruments administrated in this study were the Social and Emotional Competencies Questionnaire (*SEC-Q*; Zych et al., 2018), the Basic Empathy Scale (*BES*; Jolliffe & Farrington, 2006) and the substance use subscale from the Self-Reported Antisocial Behavior Questionnaire (*SRA*; Loeber et al., 1989).

After combining the individual frequency of substance use at time 1 and at time 2, nine longitudinal profiles of substance use were obtained: Non-user (68.1%), stable occasional user (12.7%), new user (6.4%), ascending user (4.2%), chronic user (4%), experiencer (3.8%), extreme new user (0.5%), extreme descending user (0.2%), descending user (0.1%). According to multinomial regression analyses, the profile experiencer was predicted by low levels social awareness and affective empathy. Low scores in self-management and responsible decision making predicted the profiles chronic user and ascending user, respectively.

Study 2 aimed to explore, from an ecological perspective, the cross-sectional and prospective impact of different factors -including individual, school, family and neighbourhood- on the use of different licit and illicit substances and intoxication in early adolescence. It was hypothesised that: rates of substance use would be higher among boys, older students and participants with poorer academic performance (Hypothesis 1); low levels of liking school, bonding with teachers and bonding with classmates would be related to more substance use (Hypothesis 2); low neighbourhood and family socio-economic status would be risk factors for substance use (Hypothesis 3).



The sample in this study was made up of 881 individuals ( $M_{age} = 12.57$ ;  $SD_{age} = 0.80$ ), of which 686 ( $M_{age} = 13.51$ ;  $SD_{age} = 0.72$ ) could be followed-up one year later. There was a similar proportion of girls (51.8%) and boys (48.1%). The following instruments were used: Bonding School Questionnaire (Ribeaud & Eisner, 2010), substance use subscale from the Self-Reported Antisocial Behavior Questionnaire (SRA; Loeber et al., 1989) and questionnaires *ad hoc* to measure socio-economic status, intoxication and academic performance.

Linear and ordinal regression analyses showed that high family socio-economic status was cross-sectionally linked to alcohol use and it was a longitudinal predictor of using alcohol, tobacco, cannabis and other illicit substances. Low neighbourhood socio-economic status was cross-sectionally but not longitudinally related to a higher likelihood of using alcohol, tobacco, illicit substances, as well as to more intoxication. A higher number of exclusions from school and low grades were cross-sectionally linked to tobacco use and they predicted alcohol use and intoxication, both cross-sectionally and longitudinally. Liking school was a cross-sectional protective factor against alcohol and tobacco use and it was longitudinally related to lower alcohol use and intoxication. Bonding with teachers and bonding with friends were cross-sectional protective factors against illicit substances use. Moreover, low scores in bonding with teachers and bonding with friends were related to higher rates of alcohol use and intoxication, respectively.

The objectives of Study 3 were: to explore a model of a prospective impact of different dimensions of parent-child relationship in childhood -namely parental involvement, positive parenting, parental supervision, child disclosure, authoritarianism and aversive parenting- on substance use (Objective 1); and to analyse if these relations are mediated by low levels of self-control (Objective 2). The hypotheses were: low parental involvement, low positive parenting, low parental supervision and child disclosure, as

well as high authoritarianism and high aversive parenting in childhood are predictors of more substance use later in adolescence and early adulthood (Hypothesis 1); and the relation between the above mentioned dimensions of parent-child relationship and substance use was expected to be mediated by low levels of self-control (Hypothesis 2).

The sample included 1,147 participants ( $M_{age} = 11.3$ ;  $SD_{age} = 0.37$ ) at baseline of which 49.1% were female. There were five waves of data collection from age 11 to age 20. The instruments administered for data collection were: the Alabama Parenting Questionnaire (APQ; Shelton et al., 1996), the Self-Control Scale (Grasmick et al., 1993), the International Socio-Economic Index (ISEI; Ganzeboom et al., 1992) and a questionnaire *ad hoc* to measure substance use.

Linear regression analyses showed that low positive parenting and authoritarianism, as well as high parental involvement and aversive parenting at age 11 were longitudinal predictors of substance use at different stages of adolescence. Low scores in child disclosure at age 11 was a risk factor for substance use at all stages of adolescence and even at early adulthood (age 20). Substance use in the past and low self-control (measured at age 13) were the strongest and more persistent predictors of substance use. Mediation analyses proved that all the associations between substance use during adolescence and early adulthood with dimensions of the parent-child relationship at age 11 were mediated by low levels of self-control at age 13.

Findings from the current doctoral dissertation shed light on some gaps in knowledge identified in the literature review and provide an holistic overview of substance use in adolescence, including its development over time, as well as individual and contextual risk and protective factors. The trend to increase the frequency of substance use was much more likely than the trend to decrease it, even from late childhood. Moreover, individual variables (including social and emotional competencies,

empathy and self-control) were found to be important longitudinal protective factors against substance use. Our results also provide empirical evidence about the prospective impact of different dimensions of the parent-child relationship on substance use in adolescence and early adulthood. The mediating role of self-control in these associations was also tested. In addition, the differential impact of family and neighbourhood socioeconomic status on substance use was addressed. The importance of a positive school climate and promoting healthy students-teachers and students-students relationships in order to prevent substance use is also derived from our outcomes. Given that substance use in the past was identified as the most powerful predictor of substance use and prevalence from pre-adolescence, substance use prevention programmes should be conducted from very early stages.

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# **RESUMEN EXTENSO**

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El consumo de sustancias es una de las preocupaciones sanitarias más desafiantes a nivel mundial. El consumo de sustancias causa miles de muertes cada año (World Health Organization, 2021) y conlleva numerosas consecuencias adversas para la salud física y mental (Feinstein et al., 2012), así como para el desarrollo social, emocional y cognitivo (Castellanos-Ryad et al., 2013). El inicio del consumo de sustancias normalmente ocurre en la adolescencia (Johnston et al., 2022; Moreno et al., 2020), cuando puede ser incluso más perjudicial debido a los profundos cambios cerebrales (Spear, 2013), psicológicos y biológicos (National Academies of Sciences, Engineering, and Medicine, 2019) de este período. Por todo ello, es fundamental entender cómo el consumo de sustancias evoluciona durante la adolescencia y explorar factores de riesgo y protección contra el consumo de sustancias por parte de los y las adolescentes.

La Teoría de Puerta de Entrada (Kandel et al., 1975) postula que el consumo de sustancias típicamente comienza con sustancias lícitas, el cual se va incrementado hacia el consumo de sustancias más tóxicas, normalmente sustancias ilícitas. Esta teoría ha sido exitosamente testada en investigaciones de carácter transversal (Kirby y Barry, 2012; Nkansah-Amankra y Minelli, 2016; Sánchez-Niubó et al., 2020). Estudios longitudinales muestran que un poderoso predictor del consumo de sustancias es el hecho de haber consumido sustancias en el pasado (Best et al., 2018; Martínez-Fernández et al., 2018). Además, diferentes estudios longitudinales coinciden en un patrón común de consumo de sustancias: la probabilidad de incrementar el consumo a través del tiempo es mucho mayor que la probabilidad de disminuirlo (Chung et al., 2013; Oliva et al., 2008; Zych et al., 2020). Sin embargo, se hacen aún necesarios nuevos estudios que analicen cambios intra-individuales en la frecuencia del consumo de sustancias.

Una revisión sistemática encontró que la inteligencia emocional era un poderoso factor de protección contra el consumo de sustancias (Kun y Demetrovics, 2010). En esta

línea, se ha encontrado que un correcto desarrollo de diversas competencias sociales y emocionales protege contra el consumo de sustancias: auto-conocimiento (Estévez et al., 2017; Hodder et al., 2016; Parolin et al., 2017), habilidades sociales (Hernández-Serrano et al., 2016; Vorobjov et al., 2014), toma de decisiones (Alameda et al., 2012; Clay y Parker, 2018), y auto-regulación (Estévez et al., 2017; Parolin et al., 2017). No obstante, siguen siendo necesarios nuevos estudios que exploren la relación entre consumo de sustancias y competencias sociales y emocionales empleando un diseño longitudinal y que incluyan una amplia variedad de competencias en un mismo modelo.

También se ha abordado la relación entre empatía y consumo de sustancias. Aunque un considerable número de estudios transversales encontraron niveles significativamente más bajos de empatía entre consumidores de sustancias (Schmits y Glowacz, 2018; Pérez de la Barrera, 2012), los resultados son contradictorios cuando se intenta distinguir entre empatía afectiva y empatía cognitiva en relación al consumo de sustancias. Ferrari et al. (2014) encontró niveles más bajos de empatía afectiva en participantes adictos a sustancias cuando fueron comparados con participantes sin adicción, pero las diferencias en empatía cognitiva no fueron significativas. Dolder et al. (2016) descubrieron un aumento en empatía afectiva y una disminución de empatía cognitiva tras consumir LSD. Otro estudio experimental reportó que el consumo de MDMA aumenta la empatía afectiva, pero no afectaba a la empatía cognitiva. Más investigación longitudinal utilizando medidas validadas de empatía en población general es necesaria para esclarecer el vínculo entre consumo de sustancias y empatía, teniendo en cuenta su naturaleza bidimensional (cognitiva y afectiva).

Según la Teoría del Auto-Control (Gottfredson y Hirschi, 1990), inadecuadas prácticas parentales en la infancia impiden el desarrollo de adecuados niveles de auto-control, lo cual, a su vez, siembra el germen de diversos problemas de conducta,

incluyendo el consumo de sustancias. En línea con la Teoría del Capital Social (Putnam, 2020), la literatura científica reporta que una crianza negligente (Martínez-Loredo et al., 2019), bajos niveles de crianza positiva (Boden et al., 2021) y escaso monitoreo parental (Valente et al., 2019) predicen consumo de sustancias. Un meta-análisis de investigaciones longitudinales encontró que la crianza positiva en la infancia es fundamental para el desarrollo del auto-control en la adolescencia (Li et al., 2019). Diversos estudios empíricos también destacaron que el auto-control es un poderoso factor de protección contra el consumo de sustancias (Grindal et al., 2019; Schaefer et al., 2015; Yun et al., 2016). A pesar de esta evidencia, la Teoría del Auto-Control (Gottfredson y Hirschi, 1990) no ha sido testada con precisión a día de hoy en relación al consumo de sustancias. Por lo tanto, es aún necesario explorar cómo distintas dimensiones de la relación padre-hijo en la infancia impactan longitudinalmente en el consumo de sustancias en la adolescencia, así como comprobar si esta hipotética relación está mediada por bajos niveles de auto-control.

La escuela es otro contexto esencial para el desarrollo en la infancia y la adolescencia. Un pobre desempeño académico aumenta la probabilidad de consumir sustancias (Center for Disease Control and Prevention, 2020; Gaete y Araya, 2017; Heradstveit et al., 2017). La relación de distintas dimensiones escolares con el consumo de sustancias puede analizarse desde la Teoría de los Vínculos Sociales (Hirschi, 1969). Esta teoría considera que la adquisición de vínculos sociales puede prevenir el desarrollo de conductas problemáticas en la adolescencia, como el consumo de sustancias. En este sentido, un clima escolar positivo (Daily et al., 2020), sentimiento de pertenencia a la escuela (Syed et al., 2021) o el gusto por ir a la escuela (King et al., 2020) han resultado ser factores de protección contra el consumo de sustancias. También se ha encontrado que el consumo de sustancias es menor entre escolares que mantienen buenas relaciones



con el profesorado (Aston, 2015; Han et al., 2016; Wenzel et al., 2009) y con sus iguales (Forster et al., 2015; Henty et al., 2019; Rodzlan et al., 2021). No obstante, hay una escasez de investigaciones que exploren cómo el consumo de diferentes sustancias se encuentra influenciado a nivel longitudinal por el apego hacia la escuela, incluyendo el apego hacia el profesorado, hacia los iguales y hacia la propia escuela.

De acuerdo con la literatura científica, el status socio-económico está estrechamente relacionado con conductas saludables en general (De Hoog et al., 2020) y con el consumo de sustancias en particular (Spooner y Hetherington, 2004). El concepto de status socio-económico incluye diversos elementos: salario, educación, prestigio, religión, etnia, residencia, etc. (American Psychological Association, 2015). Siguiendo la Teoría Ecológica (Bronfenbrenner, 1979), el status socio-económico de diferentes contextos puede tener un impacto diferencial en el consumo de sustancias. Así, se conoce que un bajo estatus socio-económico del vecindario se asoció con más consumo de sustancias (Lee et al., 2018, Shih et al., 2017), al tiempo que unos estudios relacionaron alto status socio-económico familiar con mayor consumo de sustancias (Patrick et al., 2020; Petruzelka et al., 2020) mientras que otros encontraron que era un factor de protección contra el consumo de sustancias (Andrabi et al. 2017; Leventhal et al., 2015). A pesar de que ha sido un fenómeno explorado en estudios empíricos, existe una escasez de investigación analizando en un único estudio el impacto longitudinal del status socio-económico familiar y del vecindario en el consumo de sustancias en la adolescencia.

Tras analizar la literatura científica y con el objetivo de abordar las lagunas en el conocimiento detectadas, la presente tesis doctoral pretende estudiar patrones longitudinales del consumo de sustancias en la adolescencia, así como analizar posibles factores de riesgo y protección individuales y contextuales relativos al consumo de sustancias. Para ello, tres investigaciones independientes pero interrelacionados fueron

llevadas a cabo.. Todos los estudios siguieron un diseño longitudinal, utilizaron instrumentos validados para la recolección de datos e incluyeron una amplia muestra de estudiantes.

El Estudio 1 planteó dos objetivos: descubrir perfiles longitudinales específicos de consumo de sustancias a través del tiempo en una muestra de estudiantes de 9 a 17 años seguidos durante un año (Objetivo 1); y explorar si las competencias sociales y emocionales y la empatía pueden actuar como factores de protección longitudinales contra el consumo de sustancias (Objetivo 2). Hubo dos hipótesis vinculadas a los objetivos propuestos: el perfil de consumo de sustancias más prevalente sería el de no consumidores, seguido por aquellos perfiles que incrementen el consumo del tiempo 1 al tiempo 2 (Hipótesis 1); y que las competencias sociales y emocionales, así como la empatía actuarían como factores de protección longitudinales contra el consumo de sustancias (Hipótesis 2).

La muestra final de este estudio estuvo compuesta por 861 participantes (49.9% chicas) procedentes de ocho escuelas de Educación Primaria y Educación Secundaria de las provincias de Córdoba y Sevilla (España). El rango de edad fue de 9-17 en el tiempo 1 ( $M = 11.98$ ;  $DT = 1.87$ ) y de 10-18 años en el tiempo 2 ( $M = 12.99$ ;  $DT = 1.87$ ). Los instrumentos administrados en este estudio fueron el el Cuestionario de Competencias Sociales y Emocionales (*SEC-Q*; Zych et al., 2018), la Escala Básica de Empatía (*BES*; Jolliffe y Farrington, 2006) y la subescala de consumo de sustancias del Cuestionario de Conducta Antisocial (*SRA*; Loeber et al., 1989).

Tras combinar la frecuencia individual de consumo de sustancias en el tiempo 1 y el tiempo 2, se obtuvieron nueve perfiles longitudinales de consumo de sustancias: no consumidor (68.1%), consumidor ocasional estable (12.7%), nuevo consumidor (6.4%), consumidor ascendente (4.2%), consumidor crónico (4%), experimentador (3.8%), nuevo

consumidor extremo (0.5%), consumidor descendiente extremo (0.2%), consumidor descendiente (0.1%). De acuerdo a los análisis de regresión multinomial, el perfil experimentador fue predicho por bajo niveles de conciencia social y empatía afectiva. Bajas puntuaciones en auto-gestión y toma de decisiones responsable predijeron los perfiles de consumidor crónico y consumidor ascendente, respectivamente.

El objetivo del Estudio 2 fue explorar, desde una perspectiva ecológica, el impacto transversal y prospectivo de diferentes factores -incluyendo factores individuales, escolares, familiares y comunitarios- en el consumo de diversas sustancias y de la embriaguez en la adolescencia temprana. Se hipotetizó que: la prevalencia del consumo de sustancias sería mayor entre chicos, estudiantes de mayor edad y participantes con un pobre desempeño académico (Hipótesis 1); baja puntuación en apego hacia la escuela, hacia el profesorado y hacia los iguales se relacionaría con mayor consumo de sustancias (Hipótesis 2); un bajo status socio-económico familiar y del vecindario sería un factor de riesgo para el consumo de sustancias (Hipótesis 3).

La muestra de este estudio la compusieron 881 participantes ( $M_{edad} = 12.57$ ;  $DT_{edad} = 0.80$ ), de los cuales 686 ( $M_{edad} = 13.51$ ;  $DT_{edad} = 0.72$ ) pudieron ser seguidos un año después. La proporción chicas (51.8%) y de chicos (48.1%) fue similar. Se utilizaron los siguientes instrumentos: Cuestionario de Apego a la Escuela (Ribeaud y Eisner, 2010), la subescala de consumo de sustancias del Cuestionario de Conducta Antisocial (SRA; Loeber et al., 1989) y cuestionarios *ad hoc* para medir el status socio-económico, la embriaguez y el desempeño académico.

Los análisis de regresión lineal y ordinal mostraron que un alto status socio-económico familiar se relacionó transversalmente con el consumo de alcohol y fue un predictor longitudinal del consumo de alcohol, cannabis y otras sustancias ilícitas. Un bajo status socio-económico del vecindario se relacionó transversalmente, pero no

longitudinalmente, con una mayor probabilidad de consumir alcohol, tabaco y sustancias ilícitas, así como con mayor embriaguez. Un mayor número de expulsiones de la escuela y bajas calificaciones se relacionaron transversalmente con el consumo de tabaco y predijeron consumo de alcohol y embriaguez, tanto transversalmente como longitudinalmente. El apego a la escuela fue un factor de protección transversal contra el consumo de alcohol y de tabaco y se relacionó longitudinalmente con menos consumo de alcohol y embriaguez. El apego hacia el profesorado y hacia los iguales fueron factores de protección transversales contra el consumo de sustancias ilícitas. Además, bajas puntuaciones en apego hacia el profesorado y hacia los iguales se relacionaron con mayor consumo de alcohol y mayor embriaguez, respectivamente.

Los objetivos del Estudio 3 fueron: explorar un modelo del impacto prospectivo de diferentes dimensiones de la relación padre-hijo en la infancia -implicación parental, crianza positiva, supervisión parental, revelación filial, autoritarismo y crianza aversiva- en el consumo de sustancias (Objetivo 1); y analizar si estas relaciones están mediadas por bajos niveles de auto-control (Objetivo 2). Las hipótesis fueron: baja implicación parental, baja crianza positiva, baja supervisión parental y revelación filial, así como alto autoritarismo y alta crianza aversiva en la infancia serían predictores de mayor consumo de sustancias en la adolescencia y la adultez temprana (Hipótesis 1); y que la relación entre las mencionadas dimensiones de la relación padre-hijo y el consumo de sustancias estaría mediada por bajos niveles de auto-control (Hipótesis 2).

La muestra incluyó 1,147 participantes en el tiempo 1 ( $M_{edad} = 11.3$ ;  $DT_{edad} = 0.37$ ), de los cuales el 49.1% fueron chicas. Las recogidas de datos se produjeron en cinco momentos distintos desde los 11 años de edad hasta los 20 años. Los instrumentos administrados para la recolección de datos fueron: el *Alabama Parenting Questionnaire* (APQ; Shelton et al., 1996), la Escala de Auto-Control (Grasmick et al., 1993), el Índice

Socio-Económico Internacional (*ISEI*; Ganzenboom et al., 1992) y un cuestionario *ad hoc* para medir el consumo de sustancias.

Los análisis de regresión lineal mostraron que baja crianza positiva y autoritarismo, así como alta implicación parental a los 11 años fueron predictores longitudinales del consumo de sustancias en distintos momentos de la adolescencia. Baja puntuación en revelación filial a los 11 años fue un factor de riesgo para el consumo de sustancias en todos los momentos de la adolescencia y en la adultez temprana (20 años). Haber consumido sustancias en el pasado y bajo auto-control (medido a los 13 años) fueron los predictores más robustos y persistentes del consumo de sustancias. Los análisis de mediación probaron que todas las asociaciones entre consumo de sustancias durante la adolescencia y la adultez temprana con dimensiones de la relación padre-hijo a los 11 años estuvieron mediadas por bajos niveles de auto-control a los 13 años.

Los hallazgos de la presente tesis doctoral, contribuyen a cubrir algunas lagunas en el conocimiento indentificadas durante la revisión de la literatura y aportan una mirada holística del consumo de sustancias en la adolescencia, incluyendo su desarrollo a través del tiempo, así como factores de riesgo y protección individuales y contextuales. La tendencia a incrementar la frecuencia del consumo de sustancias fue mucho más probable que la tendencia a disminuir el consumo, incluso desde la infancia tardía. Además, variables individuales (incluyendo competencias sociales y emocionales, empatía y auto-control) fueron importantes factores de protección longitudinales contra el consumo de sustancias. Nuestros resultados también aportan evidencia empírica del impacto prospectivo de distintas dimensiones de la relación padre-hijo en el consumo de sustancias en la adolescencia y la adultez temprana. El papel mediador del auto-control en estas relaciones fue también testada. Asimismo, el impacto diferencial del status socio-económico familiar y del vecindario fue también abordado. La importancia de un clima

escolar positivo y de promover relaciones saludables entre alumnado y entre el alumnado y el profesorado como medio para prevenir el consumo de sustancias también se deriva de nuestros resultados. Dado que el consumo de sustancias en el pasado fue indentificado como el predictor más poderoso del consumo de sustancias y que se trata de un fenómeno prevalente desde la pre-adolescencia, los programas de prevención del consumo de sustancias deberían implementarse desde etapas tempranas.



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# **CHAPTER 1: THEORETICAL FRAMEWORK**

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Adolescence is a key stage in human development, which means the transition from childhood to adulthood. This is a period characterised by deep biological, social and psychological changes (National Academies of Sciences, Engineering, and Medicine, 2019). Adolescent brain shows more plasticity in comparison to adult brain, as well as a higher activity in reward regions (Spear, 2013). According to a literature review by Dahl et al. (2018), these biological changes are a basis for the onset of a crucial period for learning and maturation. At the same time, the neurobiological distinctive features of adolescence are related to immediate sensation seeking and risky behaviours (Steinberg, 2010). This propensity to take risks and look for enjoyment can be the basis for substance use initiation, which is a prevalent phenomenon in adolescence (Poudel & Gautam, 2017).

Substance use is internationally considered as a serious health concern. The World Health Organization (2021) estimated that drug use brings about 500 000 of deaths every year. Substance use can be especially harmful in adolescence, given that it can interfere with the normative brain development (Volkow et al., 2019). Substances can negatively affect not only physical and mental health (Feinstein et al., 2012), but also social, emotional and cognitive development (Catellanos-Ryan et al., 2013). It was found that adolescent substance use has undesirable consequences in learning, memory and attention (Spear, 2018); and it is related to other addictive behaviours such as gambling (Livazovic & Bojicic, 2019). Depression is another adverse consequence predicted by prolonged periods of drug use (Chen et al., 2019).

Scientific literature also reports long-term outcomes of adolescent substance use. Silins et al. (2014) found lower high school completion and an increased risk of cannabis dependence among participants who have used cannabis before the age of 17. Another longitudinal research showed that low wellbeing, physical aggression and problematic

substance use at age 20 were predicted by frequent substance use between ages 13 and 17 (Shanahan et al., 2021). Taking all of this into account, the current doctoral dissertation aims to contribute to a growing body of knowledge regarding longitudinal patterns of substance use in adolescence, along with its related risk and protective factors.

## **1.1. Substance use among adolescents**

### *1.1.1. Prevalence, age and gender*

Prevalence of substance use among adolescents seems to have decreased in different countries across the world (ESPAD Group, 2020; Johnston et al., 2022; Moreno et al., 2020). However, according to the last European Drug Report (European Monitoring Center for Drugs and Drug Addiction, 2022), the current drug situation is more complex, characterized by a higher availability of substances and a greater diversity in the patterns of use. For this reason, substance use prevalence monitoring is essential in order to get a comprehensive vision of the phenomenon. This theoretical framework reviews the data regarding prevalence of adolescent substance use from three prestigious national and international reports, namely: Health Behaviour in School-aged Children in Spain (*HBSC*; Moreno et al., 2020), European School Survey Project on Alcohol and Other Drugs (ESPAD Group, 2020) and Monitoring the Future (*MTF*; Johnston et al., 2022). These reports described adolescent substance use in Spain, Europe and the United States, respectively. Their results for alcohol, tobacco and cannabis (the most frequently used substances) are summarized in Table 1, Table 2 and Table 3.

Table 1. *Prevalence of alcohol use in Europe, Spain and the United States*

Study	Location	Age	Subgroups	Prevalence	
				Lifetime	Last 30 days
ESPAD Group (2020)	Europe	15-16 years	Boys	79%	47%
			Girls	78%	46%
			Total	79%	47%
Moreno et al. (2020)	Spain	11-18 years	11-12 years	9.9% (13.3% boys; 6.5% girls)	2.5% (3.3% boys; 1.7% girls)
			13-14 years	29.3% (30.1% boys; 28.6% girls)	12.2% (11.5% boys; 12.9% girls)
			15-16 years	65.4% (63.1% boys; 67.7% girls)	37.4% (34.9% boys; 39.8% girls)
			17-18 years	82.9% (81.2% boys; 84.7% girls)	59.7% (58.9% boys; 60.4% girls)
			Total	66% (66% boys; 65.9% girls)	27.5% (26.7% boys; 28.3% girls)
Johnston et al. (2022)	United States	13-18 years	8 <sup>th</sup> Grade (13-14 years)	21.7%	7.3%
			10 <sup>th</sup> Grade (15-16 years)	34.7%	13.1%
			12 <sup>th</sup> Grade (17-18 years)	54.1%	25.8%
			Total	36.3%	15.1%

Table 2. *Prevalence of tobacco use in Europe, Spain and the United States*

Study	Location	Age	Subgroups	Prevalence	
				Lifetime	Last 30 days
ESPAD Group (2020)	Europe	15-16 years	Boys	43%	20%
			Girls	40%	20%
			Total	41%	20%
Moreno et al. (2020)	Spain	11-18 years	11-12 years	2.1% (2.9 % boys; 1.4 % girls)	0.9% (1.1% boys; 0.8% girls)
			13-14 years	11.3% (10% boys; 12.6% girls)	5.1% (3.9% boys; 6.2% girls)
			15-16 years	32.2% (29.9% boys; 34.6% girls)	17.3% (15.4% boys; 19.1% girls)
			17-18 years	47.3% (44.1% boys; 50.3% girls)	28% (26.4% boys; 29.5% girls)
			Total	22.4% (21.1 % boys; 24% girls)	12.5% (11.4% boys; 13.6% girls)
Johnston et al. (2022)	United States	13-18 years	8 <sup>th</sup> Grade (13-14 years)	7%	1.1%
			10 <sup>th</sup> Grade (15-16 years)	10%	1.8%
			12 <sup>th</sup> Grade (17-18 years)	17.8%	4.1%
			Total	11.4%	2.3%

Table 3. *Prevalence of cannabis use in Europe, Spain and the United States*

Study	Location	Age	Subgroups	Prevalence	
				Lifetime	Last 30 days
ESPAD Group (2020)	Europe	15-16 years	Boys	18%	8.5%
			Girls	13%	5.8%
			Total	16%	7.1%
Moreno et al. (2020)	Spain	11-18 years	11-12 years	Non reported	Non reported
			13-14 years	Non reported	Non reported
			15-16 years	18.9% (21.1% boys; 16.8% girls)	8.8% (10.4% boys; 7.3% girls)
			17-18 years	36.4% (39.6% boys; 33.3% girls)	16.1% (19.7% boys; 12.7% girls)
			Total	28.2% (31% boys; 25.5% girls)	12.7% (15.3% boys; 10.1% girls)
Johnston et al. (2022)	United States	13-18 years	8 <sup>th</sup> Grade (13-14 years)	10.2%	4.1%
			10 <sup>th</sup> Grade (15-16 years)	22%	10.1%
			12 <sup>th</sup> Grade (17-18 years)	38.6%	19.5%
			Total	23.1%	11%

The most frequent substance among adolescents in Europe in general and Spain in particular is alcohol, followed by tobacco and, thirdly, cannabis. The total lifetime prevalence of alcohol use is 79% among European adolescents aged 15-16 and 66% among 11-18 years old Spanish students. Lifetime prevalence of tobacco use by these samples was 41% and 22.4%, respectively. Lifetime cannabis use was reported by 16% of participants in Europe and 28.2% in Spain (ESPAD Group, 2020; Moreno et al., 2020). The findings related to tobacco and cannabis use in the HBSC report in Spain seem contradictory, given that overall prevalence of cannabis use is higher than tobacco use. This could be because this study only measured cannabis use from 15 to 18 years, excluding the sample aged 11-14 from the prevalence of this substance. Thus, when comparing the results in the same age range (15-18), tobacco use is more frequent (39.7%) than the cannabis use (28.2%).

Compared to the Spanish and European adolescents, US adolescents reported a similar order of the most frequently used substances (first alcohol, second tobacco and third cannabis) until the first decade of the 20<sup>th</sup> Century, but this order has changed. MTF report (Johnston et al., 2022) found the following lifetime prevalence of substance use among 13-18 US adolescents: 36.3% alcohol use, 23.11% cannabis use and 11.4% tobacco use. This order difference between the United States and Europe can be due to the increasing legalization of cannabis in different states of the US, given that the perception of harmfulness of this substance is lower in areas where it is legal (UNODC, 2022). Illicit substances use other than cannabis was reported by 10.1% in the United States, 2.3% in Europe (ecstasy) and 2.1% in Spain.

Age is another key element in substance use prevalence. In Spain and in the United States, the reported past month substance use has increased during adolescence. This increase is especially remarkable in Spain, with a notable difference among age ranges.

Last 30 days alcohol use increases almost five-fold from 11-12 years (2.5%) to 13-14 years (12.2%). It is multiplied by three at 15-16 years (37.4%), reaching the 59.7% at ages 17-18. The pattern is similar for tobacco use: 0.9% at 11-12 years, 5.1% at 13-14 years, 17.3% at 15-16 years and 28% at 17-18 years. Cannabis also doubles its prevalence from ages 15-16 (8.8%) to ages 17-18 (16.1%) (Moreno et al., 2020). These increases across time are weaker in the US adolescents, whose reported last 30 days alcohol use was 21.7% at ages 13-14, 34.7% at 15-16 and 54.1% at 17-18. Last month tobacco use was reported by 1.1%, 1.8% and 4.1% at ages 13-14, 15-16 and 17-18 respectively. Cannabis was found to be used by 4.1% of 13-14 years students, 10.1% of 15-16 years and 19.5% of 17-18 years participants (Johnston et al., 2022). The prevalence difference across ages in illicit substance use other than cannabis is smaller in the US (2.4% at Grade 8<sup>th</sup>, 2.5% at Grade 10<sup>th</sup> and 2.9% at Grade 12<sup>th</sup>) in comparison to Spain (1.4% among 15-16 years old participants and 2.7% at ages 17-18).

Gender differences should also be taken into account regarding substance use. Historically, research shows that substance use is more prevalent among boys in comparison to girls (Halladay et al., 2020; Lee et al., 2021). Nevertheless, this gender gap between girls and boys is continuously narrowing in the last few years (Krauss et al., 2018). According to the ESPAD Group (2020), substance use is still more prevalent among boys in Europe in general: alcohol was used by 79% of boys and 78% of girls, tobacco use was reported by 43% of boys and 40% of girls, 8.5% of boys and 5.8 % of girls reported cannabis use, and ecstasy was also more prevalent among boys (2.5%) when compared to girls (2.1%). However, these gender differences are changing in Spain. The last HBSC report (Moreno et al., 2020) showed that overall alcohol use is slightly more prevalent among boys (0.1% of difference among genders), but this substance is more used by girls at ages 15-18. Tobacco use is more frequent among Spanish girls (2.9%



overall difference with boys) at all ages, except among 11-12 years old students. Illicit substances were found to be more prevalent among boys (cannabis: 31%; illicit substances other than cannabis: 2.6%) than among girls (cannabis 25.5%; illicit substances other than cannabis: 1.6%).

All these data provide useful information about the percentage of adolescents who use different types of substances, the increasing prevalence at each period of adolescence and the differences between girls and boys. However, the cross-sectional design of these reports does not make it possible to explore within-individual patterns of substance use during adolescence. Therefore, longitudinal studies about patterns of substance use are needed.

#### *1.1.2. Longitudinal patterns of substance use*

One of the most popular theories explaining longitudinal patterns of substance use is the Gateway Theory (Kandel et al., 1975). This theory states that substance use follows an ascending slope. This is, the use of licit substances (usually alcohol and/or tobacco) can trigger the use of more obnoxious substances, such as cannabis or other kinds of illicit drugs. This theory has been supported through different studies. Kirby and Barry (2012) conducted secondary analyses from the MTF report and they found that alcohol was the gateway for using illicit substances in the future among the US students. In addition, tobacco use predicted cannabis and cocaine use in a sample of 2,069 Spanish individuals (Sánchez-Niubó et al., 2020). Nkansah-Amankra and Minelli (2016) analysed alcohol, tobacco and marijuana use in early adolescence as possible predictors of other substances use in late adolescence and adulthood. Their results showed that alcohol, tobacco and marijuana use in early adolescence predicted illicit substance use in late adolescence, but only early marijuana use predicted the use of psychoactive substances in adulthood.

Findings from a study with Scottish adolescents showed that 40.4% of e-cigarette users at baseline reported tobacco use the following year, whereas only 12.8% of participants who had not used e-cigarettes became tobacco smokers one year later (Best et al., 2018). A research project by Martínez-Fernández et al. (2018) with 12-13 years old Spanish students followed-up one year later found that alcohol, tobacco and cannabis use increased over time in this period from 9.7% to 18.5%, from 3.2% to 11.1% and from 1.6% to 8.7%, respectively. Moreover, 30.4% of alcohol users at time 1 were also alcohol users after one year; and 15.4% of tobacco users at time 2 had already reported tobacco use during the previous year.

Three latent classes of substance use, including alcohol, cigarettes and marijuana, were found in a study that compared substance use by Black and White adolescent girls in Pittsburgh (Chung et al., 2013). The three latent classes were non-users, alcohol users and polydrug users. Although there were some racial differences, groups remained relatively stable over time. Longitudinal transitions among groups usually occurred towards a more harmful substance use group. A cohort study including adolescents from the UK aged 13-18 years showed four different latent classes of cannabis use: non-users (80.1%), late-onset occasional (14.2%), early-onset occasional (2.3%) and regular users (3.4%). The likelihood of nicotine dependence, harmful alcohol use and illicit drug use later in adulthood was significantly lower for non-users (Taylor et al., 2017).

The number of studies about longitudinal patterns of adolescent substance use in Spain is low. Oliva et al. (2008) analysed substance use trajectories of Spanish adolescents at ages 13, 15 and 18. According to their results, the sample was divided in three groups: a low-use group (low substance use in all waves of data collection), ascending use (substance use increased from time 1 to time 2, and again from time 2 to time 3), and early experimentation group (moderate substance use at time 1, increasing at

time 2, but decreasing at time 3). A recent study by Zych et al. (2020) included 879 Spanish participants aged 9-17 years with a 1-year-follow-up. They reported three latent classes: non-users (74.4% at time 1, 70.74% at time 2), occasional users (20.96% at time 1, 20.25% at time 2) and frequent users (4.30% at time 1, 9% at time 2). High stability over time was found with 89.12%, 58.51% and 90.68% of non-users, occasional users and frequent users, respectively, remaining in the same group. Among non-users, 10.46% transitioned to occasional users and 0.42% to frequent users; while 18.63% of occasional users moved to non-users and 22.86% to frequent users. From the group of frequent users, 5.38% shifted to non-users and 3.93% to occasional users.

A review of scientific literature focused on longitudinal trends of substance use points out that substance use tends to remain stable or increase over time. However, there is a dearth of research about within-individual longitudinal patterns of stability and change in substance use.

## **1.2. Individual factors related to substance use**

### *1.2.1. Social and Emotional Competencies*

Emotions are intrapersonal signals that people experience when they live a significant situation for their lives. Emotions allow people to interpret these situations in a positive or negative way and give the corresponding response (Ekman, 2007). An adequate emotional development is essential in order to face different events in the most adaptive way. For this reason, individuals need to be emotionally competent. Saarni (1999) defined emotional competence as the skill to demonstrate suitable emotional responses in diverse social settings. On the other hand, social competence is the skill to build and maintain healthy and successful relationships over time (Cicchetti &

Bukowski, 1995). Considering both constructs together, Bar-On (2006) proposed the concept of Emotional-Social Intelligence (ESI). This is, the set of abilities and skills that makes possible to understand own and others' emotions, as well as manage them effectively. This allows individuals to adapt to different social situations, solve conflicts and overcome personal and social challenges.

One of the most popular models regarding social and emotional education is the Collaborative for Academic Social and Emotional Learning (CASEL, 2020). They defined social and emotional competencies as a multidimensional construct composed of five interrelated competencies: self-awareness, self-management, social-awareness, relationship skills and responsible decision making. Self-awareness is the capacity to recognize own emotions and be aware of their influence over behaviour. Self-management implies the regulation of emotions, thoughts and behaviours according to the contextual requirements. Social-awareness is the ability to take other's perspective, empathize with other people and understand social and ethical rules that drive behaviour. Relationship skills refer to the capacity to establish and keep relationships with diverse individuals and groups. Responsible decision making is the skill to make choices based on cultural and ethics rules, and values, focusing on own and other people's wellbeing.

A cross-sectional study including 13-21 years old Spanish students from vocational schools showed that low emotional control and emotional awareness predicted drug abuse, and low emotional regulation correlated positively with alcohol abuse (Estévez et al., 2017). Hodder et al. (2016) investigated a number of protective factors against substance use in a sample of 18,310 Australian students aged 11-17. They found that self-awareness and self-efficacy were protective factors against alcohol, tobacco and illicit substances use. Parolin et al. (2017) measured different intrapersonal characteristics comparing a group of 41 patients under treatment for substance use disorder with a control

group of 27 individuals without substance use disorder. Levels of self-awareness, emotional regulation, social awareness and interpersonal competencies were significantly lower among participants in the substance use disorder group.

Vorobjov et al. (2014) conducted secondary analyses using data from the 2011 ESPAD report corresponding to Estonian students enrolled in Secondary Education schools. The odds of using tobacco, cannabis, inhalants and medicines without a prescription were significantly higher among participants with low levels of social skills. Another study by Hernández-Serrano et al. (2016) aimed to explore the relation between substance use and prosocial behaviour, as well as between substance use and problem solving in a sample of Spanish adolescents aged 14-17. After controlling for sex and age, results revealed that prosocial behaviour was protective against lifetime and last year cannabis and alcohol use.

Alameda et al. (2012) approached the differences in decision making between cannabis users and non-users by comparing their performance in a computer-based task to measure the decision-making process in ambiguous situations. They concluded that there are alterations in the decision-making process among cannabis users. Vélez et al. (2010) used the Iowa Gambling Task to assess decision making in a sample of 18-30 years old Mexican participants. Marijuana users tended to look for immediate gratification and ignore adverse consequences. A study run with students and workers from Portsmouth University suggested that poor skills for decision making increased the likelihood of alcohol use (Clay & Parker, 2018).

A systematic review of 36 articles found that emotional intelligence was a protective factor against alcohol, tobacco and illicit drug use (Kun & Demetrovics, 2010). Despite this evidence, most of the studies relating substance use and social and emotional

competences are cross-sectional. So, longitudinal research in this field is needed in order to discover chronological relationships among both variables.

### *1.2.2. Empathy*

Empathy is a key element for social interactions, given that it is the basis of social behaviour (Hoffman, 2000). Rizolati (2005) showed that empathy is based on a neurological process known as mirror neurons. Cohen and Strayer (1996) defined empathy as the capacity to understand and share other people's emotions, as well as their emotional context. Although some authors suggested a tridimensional model of empathy, including emotional disengagement (Herrera-López et al., 2017), there is a robust body of knowledge demonstrating that empathy is divided into two different factors: cognitive empathy and affective empathy (Jolliffe & Farrington, 2006). Cognitive empathy is the ability to understand other people's emotions; while affective empathy makes people feel the emotions that other people are experiencing. Both types of empathy are closely related to each other (Davis, 1980), since both mechanisms typically occur simultaneously (Walter, 2012).

Spanish adolescents who reported substance use were less skilful in recognizing somebody else's emotions (Ruiz-Aranda et al., 2010). A study with adolescent substance users and non-users in Mexico found that mean levels of empathy were significantly lower among participants who reported tobacco, inhalants and marihuana use (Pérez de la Barrera, 2012). Furthermore, Schmits and Glowacz (2018) tested the relation between empathy and alcohol use, as well as between empathy and cannabis use in a sample of 608 Belgian participants aged 15-25 years. Empathy correlated significantly with less alcohol use, albeit the correlation between empathy and cannabis use was not significant.

These studies suggest that empathy is a protective factor against substance use, but they do not differentiate between cognitive and affective empathy. In this manner, Ferrari et al. (2014) contrasted levels of empathy between a group of drug addicted patients under treatment and a control group. Mean scores in affective empathy were significantly higher in the control group, but differences among groups in cognitive empathy were nonsignificant.

Scientific literature also provides information about the relation between substance use and empathy using an experimental methodology. Dolder et al. (2016) administrated a recreational dose of LSD to the experimental group and a placebo dose to the control group before measuring empathy in both groups. Findings showed that LSD use significantly increased affective empathy and decreased cognitive empathy. A similar experiment was run by Hysek et al. (2014) who administrated MDMA to the experimental group. According to their results, differences in cognitive empathy between the experimental group and the controls were not significant, but the experimental group showed significantly higher levels of affective empathy after having used MDMA in comparison to the control group, who was administrated a placebo.

Although scientific research seems to point out that substance users have a lower capacity to empathize with other people (Ciarrochi et al., 2001), the results from different studies are contradictory. It can be due to the differences among studies in terms of design, population or instruments used to measure empathy. Besides, some investigations do not differentiate between affective and cognitive empathy when they measure the construct. For these reasons, more research about the relation of empathy and substance is needed using a longitudinal design, validated instruments, representative samples and considering both dimensions of empathy (cognitive and affective).

### *1.2.3. Self-control*

Self-control is defined as the ability to postpone an instant reward, waiting for a larger recompense in the future (Fujita et al., 2011). Adequate self-control can prevent individuals from a wide variety of negative outcomes, including critical health problems such as cancer or heart disease (Hoffman et al., 2008). A high self-control was found to be protective against pathology and academic failure (Tangney et al., 2004). A study with 32-years-old people followed-up from birth demonstrated that self-control in childhood was one of the strongest predictors of success in adulthood (Moffitt et al., 2011). The Self-Control Theory of Crime (Gottfredson & Hirschi, 1990) states that low levels of self-control result in different manifestations of criminal and problematic behaviour later in life, including substance use. One of the assumptions of this theory is that education is a key element in self-control development and undesirable parenting can lead to a low self-control in children.

The relation between self-control and substance use has been the focus of empirical research. Self-control was identified as a protective factor against alcohol use (Tangney et al., 2004). Grindal et al. (2019) found that low levels of self-control were linked to heavy alcohol drinking in a sample of Latino university students in the United States. Schaefer et al. (2015) used the data from the MTF report and showed that cocaine use was higher among secondary school students who reported low levels of self-control one year before. A study including a sample of 1,092 undergraduate students from a public university in the United States found that low self-control was related to binge drinking, marijuana use, as well as prescription drugs misuse (Ford & Blumstein, 2013). Another study with high school students in South Korea by Yun et al. (2016) highlighted that low self-control was strongly related to alcohol and tobacco use in adolescence. Participants who scored high in self-control reported lower rates of alcohol, tobacco,



marihuana and hard drug use in a research project conducted with 2,048 adolescents and young adults in Chicago (Jones & Adams, 2018).

As described above, one of the essential assumptions of the Self-Control Theory of Crime is that poor self-control comes from inappropriate parental practices. However, more empirical evidence is needed to support this assumption. Nofziger (2008) run a longitudinal study that measured the prospective impact of maternal practices at age 6-7 on the levels of self-control at ages 10-11. Supervision, TV monitoring and talking to children when they were 6-7 increased their levels of self-control at ages 10-11. In contrast, self-control was poorer in children whose mothers included spanking, isolating and removing privileges in their practices. Additionally, low maternal self-control was a predictor of low self-control in their offspring. A meta-analysis of 191 longitudinal studies concluded that positive parenting is a fundamental element for a satisfactory self-control development in adolescence (Li et al., 2019). Accordingly, it is necessary to explore not only direct relations between self-control and substance use, but also the possible role of self-control as a mediating element between parental practices and substance use.

Kabiri et al. (2020) examined the relation among parental practices (attachment and monitoring), self-control and the use of substances to improve performance in 784 professional athletes in Iran. They found that ineffective parenting was related to an increased likelihood of using doping substances and this relation was mediated by low levels of self-control. Low levels of self-control were found to mediate the impact of maternal conflict on deviant behaviour (including alcohol use) in a sample of adolescents from Czech Republic (Vazsonyi et al., 2016). A cross-sectional study of 928 undergraduate US female students showed that parent-child conflict was significantly linked to a wide variety of illicit substance use. This association was mediated by poor

self-control (Tarantino et al., 2015). Regardless of the fruitful evidence provided by these studies, their cross-sectional design does not make it possible to establish predictive relations among parenting, self-control and substance use.

Koning et al. (2014) measured parental rules about alcohol use, quality of parental communication with children about alcohol, self-control and alcohol use in a sample of 874 adolescents in the Netherlands followed up twice through three different school years. They found that strict rules about alcohol use at time 1 predicted better scores in self-control in time 2, which was related to a reduction in alcohol use in time 3. These results were significant only when the quality of communication about alcohol between parents and adolescents was also high. The little existing evidence on the topic seems to support the Self-Control Theory of Crime. Nonetheless, more longitudinal research is needed to explore how parental practices in childhood prospectively impact substance use at different stages of adolescence, including the mediating effect of self-control.

### **1.3. Contextual factors related to substance use**

#### *1.3.1. Family*

According to the Social Capital Theory (Putnam, 2000), social capital is a set of social relationships, that makes a beneficial contribution to the lives of people who take part in these social interactions. In this way, social capital fosters desirable development and prevents individuals from several risky behaviours, such as substance use. Social capital can be developed in a variety of social settings including friendship, school and workplace, among others. Nonetheless, family is typically the earliest and foremost context of development for children (Berk, 2009). A systematic review conducted by

Carrillo et al. (2017) including 30 studies, focused on family social capital, pointed out the essential role of family functioning in children's health outcomes.

There is a wide body of research that analysed the relation between parenting and substance use from the social capital perspective. In general, authoritarian and neglectful parenting styles were identified as risk factors (Tur-Porcar et al., 2019; Vidourek et al., 2018), while indulgent and authoritative parenting styles have been found as protective factors against substance use (Calafat et al., 2014; García et al., 2020). A Swiss cohort study reported that substance use was higher when parental values related to substance use tended to be permissive (Baggio et al., 2016). Ferguson et al. (2012) investigated different protective factors against substance use among homeless youths enrolled in secondary education schools in California, highlighting the importance of adult support to prevent substance use. High levels of parental control and low perception of social capital were related to more likelihood of substance use in a sample of 18-25 years old university students in the United States (Yang et al., 2021).

The relation between parenting strategies and adolescent substance use was addressed by Cablova et al. (2016) in a sample of 10-18 years old students in Czech Republic. They found that substance use was higher when strict rules, family communication, parental control, warmth and affection were low. Findings from a sample of 13,269 Norwegian secondary education students aged 13-16 showed that conflicts with parents, low monitoring and lack of emotional support increased the odds of cannabis use (Haugland et al., 2019). These studies provide robust evidence about the effects of parental practices on adolescent substance use using a cross-sectional design. New longitudinal studies should further confirm these results.

Neglectful parenting at age 12 was related to increased odds of substance use two years later in a sample of 346 Spanish adolescents (Martínez-Loredo et al., 2019). A

prospective longitudinal study in New Zealand found that positive parenting in adolescence was a protective factor against alcohol use later in adulthood (Boden et al., 2021). Valente et al. (2019) discovered that the strongest protective factor against polydrug use was parental monitoring in a sample of Brazilian students aged 12 and followed up twice across 21 months. Another important longitudinal predictor of substance use was liability in child disclosure (Marceau et al., 2020). Moreover, Yap et al. (2017) conducted a meta-analysis including 131 studies and they concluded that parental monitoring, parental support and parental involvement were powerful longitudinal protective factors against substance use.

After analysing the existing literature regarding substance use and dimensions of parent-child relationship, two main gaps in knowledge are identified. First, although there is wide evidence of a relation between negative parental practices and substance use, there is a dearth of research about individual mechanisms mediating the association between parent-child relationship and the consequent impact on substance use. Second, parental monitoring has been found as a protective factor against substance use. However, the vast majority of studies consider monitoring only in terms of parental control, when Stattin and Kerr (2000) postulated that monitoring is a more complex construct built by two dimensions: parental supervision and child revelation. Therefore, more research is needed relating substance use and parental monitoring from a bidimensional conception of the variable.

### *1.3.2. School*

School is a powerful context of influence in childhood and adolescence. Students enrolled in secondary education in Spain spend 1,054 hours a year at school (Ministerio de Educación y Formación Profesional, 2019). Taking into account this considerable

amount of time, school-related factors should be considered in relation to different domains of adolescent behaviour. School performance is negatively associated with adolescent substance use (Centers for Disease Control and Prevention, 2020). Students who reported alcohol use had lower odds to continue with their studies later in life (Arria et al., 2017). Moreover, alcohol and illicit drug use is more frequent among adolescents with a low school performance (Heradstveit et al., 2017; Meda et al., 2017; Oelsner et al., 2011). Gaete and Araya (2017) found that tobacco users showed poorer school performance when compared to non-users. Illicit substance use also increased the likelihood of school dropout (Briere et al., 2014).

A systematic review conducted by Fletcher et al. (2008) concluded that intervention programmes based on the improvement of several school factors, such as school environment or relationships with teachers have a positive effect on reducing adolescent substance use. The impact of the different domains of the school environment on adolescents' behaviour can be analysed from the Social Bond Theory (Hirschi, 1969). This theory assumes that human beings are antisocial by nature, but they can behave according to social standards, avoiding delinquency, due to the influence of social bonds: attachment, commitment, involvement and belief. Attachment refers to the intensity of the link between the person and contexts. Commitment is the disposition to compliance with social expectations. Involvement is considered the level of engagement in social environments. Believe involves the awareness of social values and rules.

Students who scored higher in liking school had lower odds of marijuana use in a sample of African American adolescents (King et al., 2020). A longitudinal study found that substance use onset was delayed by a desirable school climate (Daily et al., 2020). School belonging was identified as a protective factor against opioid use in a study with adolescents in Ontario (Syed et al., 2021). In contrast, Bakhtiari et al. (2020) did not find

a significant association between marijuana use and school belonging. Similarly, school belonging did not buffer the impact of household chaos on risky behaviours, including substance use, among Chilean adolescents (Delker et al., 2020). Surprisingly, school belonging increased the likelihood of cannabis use in secondary school students in Barbados (Oshi, 2019). These discrepancies among studies can be explained by the diversity of instruments administered to measure school belonging, which can lead to different interpretations of the construct. Another plausible reason could be that school belonging has a differential impact depending on the substance. Thus, more research measuring school social bonds using validated instruments and considering a variety of substances is necessary.

The peer group can influence either positively or negatively adolescent's behaviour (Tomé et al., 2012). School friendship was identified as a protective factor against alcohol use (Henry et al., 2009) and substance use in general (Forster et al., 2015). In addition, higher rates of substance use were found among students who did not have a close friend or reported a lack of peer support (Rodzlan et al., 2021). However, Gaete and Araya (2017) found that spending more time with friends was a risk factor that increased substance use. Han et al. (2016) found that attachment to friends can advance substance use initiation in adolescence. Precisely, Foster and Spencer (2013) pointed out that substance use can be a mean to build intimate and affective friendships. In sum, there are deep discrepancies among studies when considering the effect of friendship and attachment to peers on adolescent substance use. New longitudinal research should explore how substance use and bonding to peers relate to each other during adolescence.

Wenzel et al. (2009) suggested that more long-term prevention programmes based on developing closer bonds with teachers are required to reduce substance use in students. A cohort study in Edinburgh concluded that bad relationships with teachers was a risk

factor for drug use at ages 13 and 16 (Aston, 2015). A five-waves longitudinal study by Han et al. (2016) examined the impact of teacher-student attachment on alcohol over six years in Korean adolescents. They found that alcohol use initiation occurred later in students whose attachment to their teachers was stronger. Tobacco use was also more frequent among students who reported troubles with teachers in a sample of 12-16 years old Chinese participants (Xie et al., 2013). Although scientific literature provides a lot of information about school bonding as a longitudinal protective factor against substance use (Oelsner et al., 2011), there is a paucity of research exploring the longitudinal link of a wide range of substance use in adolescence with school bonding understood as a broad concept (including bonding to teachers, classmates and also bonding to school itself).

### *1.3.3. Socio-economic status*

The Ecological Theory (Bronfenbrenner, 1979) states that individuals are surrounded by different closer or broader social environments that influence their development and behaviour. The closer the environment is, the more influence it has on the individual. In the current world, socioeconomic status is usually related to the broader context where the person lives, the schools he or she attends and the kind of leisure activity that the person is involved in. All these elements, in turn, also influence socioeconomic status.

Socio-economic status has been defined as the position of an individual or a group on the socioeconomic scale, which is determined by a combination of social and economic factors such as income, amount and kind of education, type and prestige of occupation, place of residence, and—in some societies or parts of society—ethnic origin or religious background (American Psychological Association, 2015, p. 1003).

Several studies have linked substance use to socio-economic status and related factors. A longitudinal study with a racially diverse sample in Seattle found that neighbourhood stability at age 10 was a protective factor against alcohol and cannabis use at age 39 (Lee et al., 2018). Similarly, neighbourhood disorganization at age 16 was identified as a strong risk factor for alcohol, tobacco and illicit substance use one year later (Shih et al., 2017). A one-year follow-up investigation by Tucker et al. (2013) showed diverse results regarding the relation between substance use and neighbourhood characteristics. On the one hand, safety perception in the neighbourhood increased the likelihood of binge drinking onset. On the other hand, unemployment rates in the neighbourhood were positively related to marijuana use onset. Fagan et al. (2015) discovered that diversity of migration background in the neighbourhood was a protective factor against alcohol use in adolescence.

Family socio-economic status is also closely related to adolescent substance use. Lower socio-economic status (measured as parental education) increased the likelihood of alcohol, tobacco and cannabis use onset (Leventhal et al., 2015) and it was a longitudinal predictor of alcohol and cannabis use in the US adolescents (Andrabi et al., 2017). Gerra et al. (2020) found that illicit drug use was higher among participants who perceived their socio-economic status as low in a sample of 15-16 years old participants from 28 European countries. However, a longitudinal study in the United States showed that participants who scored higher on household socio-economic status in childhood were more prone to use alcohol and cannabis in young adulthood (Patrick et al., 2020). Among Czech high school students, those whose family wealth was above the average were at a higher risk of alcohol and cannabis use (Petruzelka et al. 2020). In Spain, cannabis and alcohol use, as well as intoxication, were more prevalent among adolescents who reported high family socio-economic status, whereas tobacco and other illicit drug



use excluding cannabis were more frequent in adolescents who belonged to families with low socio-economic status (Moreno et al., 2020).

The scientific literature relating substance use and socio-economic status seems to point out that low neighbourhood socio-economic status is a risk factor for substance use, while the relation between substance use and family socio-economic status is still contradictory. Nevertheless, new longitudinal research should further study these associations across adolescence and also explore the possible differential impact of neighbourhood and family socio-economic status on adolescent substance use in a single study.

#### **1.4. The current study**

After a thorough literature review, it can be concluded that substance use usually follows an ascending trajectory. However, few empirical studies have analysed specific longitudinal profiles considering within-individual changes in substance use over time. In addition, previous research pointed out that empathy and social and emotional competencies are protective factors against substance use, but almost all of these studies used a cross-sectional design or considered empathy as a single dimension instead of considering the possible differential impact of affective and cognitive empathy.

Furthermore, the Self-Control Theory of Crime states that undesirable parenting sow the seed for low levels of self-control which, in turn, increased the likelihood of involvement in risky behaviours, including substance use. Empirical research reports that self-control is a powerful protective factor against substance use and adequate parental practices can prevent adolescents from substance use. Notwithstanding, there is a lack of research exploring a model about the impact of parental practices in childhood on

substance use in adolescence, analysing the possible mediation of self-control in this association.

Contextual variables such as socio-economic status and school have also been widely studied in relation to substance use. Although scientific literature suggests that low neighbourhood socio-economic status could be risk factors for substance use, the association between family socio-economic status and substance should be further study, given the contradictory results reported. Moreover, a positive school climate and good relationships with teachers were found to prevent adolescents from substance use, while good relationships with friends seem to increase the likelihood of substance use. Nevertheless, more studies are needed to explore the longitudinal link between school-related factors and substance use using validated instruments.



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## **CHAPTER 2: OBJECTIVES AND METHODOLOGY**

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## 2.1. Objectives

The general objective of the current doctoral dissertation was to analyse longitudinal patterns of substance use in adolescence, as well as to explore prospective risk and protective factors for adolescent substance use. In particular, three specific objectives were:

- a) To discover specific longitudinal profiles of substance use and their relation with social and emotional competencies and empathy (Study 1).
- b) To explore a possible longitudinal link of different individual and contextual variables with substance use (Study 2).
- c) To analyse the association between different factors of the parent-child relationship and substance use, considering the possible role of self-control as a mediating variable (Study 3).

This doctoral dissertation is a compendium of three different and interrelated scientific articles. The particular objectives of each scientific article are defined below.

### Study 1 (Rodríguez-Ruiz, Zych, Llorent & Marín-López, 2021)

A deep knowledge about longitudinal patterns of substance use during adolescence would be helpful for having a better understanding of this phenomenon in such a crucial period of life. However, there is a paucity of research about specific longitudinal profiles of substance use considering within-individual changes in its frequency. In addition, studies exploring the relation between substance use and social and emotional competencies or empathy generally use cross-sectional designs. Thus, the aims of this study were:

- a) To discover specific longitudinal profiles of substance use over time in a sample of students aged 9-17 followed up for one year.

b) To explore if social and emotional competencies and empathy can act as longitudinal protective factors against substance use.

The hypotheses linked to these objectives were:

- Hypothesis 1: The most prevalent substance use profile would be non-users, followed by those profiles reporting an increase in substance use from time 1 to time 2.
- Hypothesis 2: Social and emotional competencies, as well as empathy, would act as longitudinal protective factors against substance use.

Study 2 (Rodríguez-Ruiz, Zych, Llorent, Marín-López, Espejo-Siles & Nasaescu, 2023)

There is a fruitful body of research relating substance use with school, family or community domains. Nevertheless, these relations are usually addressed using cross-sectional designs or focusing on one or a few substances. So, more research is needed on contextual factors related to substance use using a longitudinal design and including a wide range of substances and also intoxication. This is why the aim of this study was:

- To explore, from an ecological perspective, the cross-sectional and prospective impact of different factors -including individual, school, family and neighbourhood- on the use of different licit and illicit substances and intoxication in early adolescence.

Three hypotheses were set out:

- Hypothesis 1: Rates of substance use would be higher among boys, older students and participants with poorer academic performance.

- Hypothesis 2: Low levels of liking school, bonding with teachers and bonding with classmates would be related to more substance use.
- Hypothesis 3: Low neighbourhood and family socio-economic status would be risk factors for substance use.

Study 3 (Rodríguez-Ruiz, Zych, Ribeaud, Steinhoff, Eisner, Quednow & Shanahan, 2023)

Although scientific literature points out that different dimensions of the parent-child relationship are related to substance use, there is a lack of research analysing this associations from childhood to adolescence, from a longitudinal perspective. Moreover, in order to empirically support the Self-Control Theory of Crime, is still necessary to carry out new studies to check if self-control mediates the possible longitudinal link between substance use and dimensions of parent-child relationship. Accordingly, the two objectives of this study were:

- a) To explore a model of a prospective impact of different dimensions of parent-child relationship in childhood (namely parental involvement, positive parenting, parental supervision, child disclosure, authoritarianism and aversive parenting) on substance use.
- b) To analyse if these relations are mediated by low levels of self-control.

The hypotheses related to each objective were:

- Hypothesis 1: Low parental involvement, low positive parenting, low parental supervision and child disclosure, as well as high authoritarianism and high aversive parenting in childhood are predictors of more substance use later in adolescence and early adulthood.



- Hypothesis 2: The relation between the abovementioned dimensions of parent-child relationship and substance use was expected to be mediated by low levels of self-control.

## 2.2. Methodology

The three scientific articles integrating this doctoral dissertation consisted of quantitative longitudinal studies. Validated questionnaires were used to collect data. Three different samples were recruited: Primary and Secondary Education students from Cordoba and Sevilla (Study 1), Secondary Education students from Cordoba (Study 2) and Primary Education students from Zurich followed up in adolescence and adulthood (Study 3).

### 2.2.1 *Participants*

#### Study 1

The original sample in this study consisted of 1,271 participants from eight different schools selected by convenience. Out of these 1,271 students, 410 were not followed up at wave 2. Thus, 861 students (49.9% girls and 50.1% boys) from Cordoba and Sevilla (Spain) were included in the final sample. They were enrolled in Grades 4, 5 and 6 of Primary Education and Grades 1, 2 and 3 of Secondary Education at time 1; and Grades 5 and 6 of Primary Education and Grades 1, 2, 3 and 4 of Secondary Education one year later. Their age range was 9-17 at T1 ( $M_{age} = 11.98$ ;  $SD_{age} = 1.87$ ) and 10-18 at T2 ( $M_{age} = 12.99$ ;  $SD_{age} = 1.87$ ).

## Study 2

Using convenience sampling, 881 ( $M_{age} = 12.57$ ;  $SD_{age} = 0.80$ ) participants from 16 schools in the province of Cordoba (Spain) were recruited. The followed-up rate was 78%. This is, 686 ( $M_{age} = 13.51$ ;  $SD_{age} = 0.72$ ) were included for the longitudinal analysis at time 2. They were enrolled in Grade 1 and 2 of Secondary Education at time 1 and Grade 2 and 3 at time 2. Regarding gender, 51.8% were girls and 48.1% boys.

Participants reported information about their self-perceived socio-economic status. Family's socio-economic status was: 94% neither rich nor poor, 5% rich or very rich; 1% poor or very poor. Moreover 88.3% labelled their neighbourhoods as neither rich nor poor, 8.3% rich or very rich and 3.4% poor or very poor.

## Study 3

Participants in this study were from the *Zurich Project on the Social Development from Childhood to adulthood* (z-proso). This project originally included 1,675 children from 56 randomly selected Primary Schools in the city of Zurich (Switzerland). Our study included 1,147 participants (49.1% girls; 50.9% boys) from wave four of data collection who had less than 33% of missing data in the *Alabama Parenting Questionnaire*. At this stage, the mean age was 11.3 years ( $SD = 0.37$ ). Out of these 1,147 children, 1,011 were followed up at wave 5 ( $M_{age} = 13.7$ ;  $SD_{age} = 0.4$ ), 1,080 at wave 6 ( $M_{age} = 15.4$ ;  $SD_{age} = 0.4$ ), 987 at wave 7 ( $M_{age} = 17.4$ ;  $SD_{age} = 0.4$ ) and 914 at wave 8 ( $M_{age} = 20.6$ ;  $SD_{age} = 0.4$ ). At baseline (wave 4; 11 years), 45% of the sample reported that their both parents were born abroad and 55% had at least one parent born in Switzerland.

### 2.2.2. Instruments

The three studies employed self-reported surveys for data collection. As further described below, all of them showed good psychometric properties. Table 4 summarizes the instrument used in each study.

Table 4. *Instruments*

Study	Instrument	Variable
Study 1 (Rodríguez-Ruiz, Zych, Llorent & Marín-López, 2021)	Self-Reported Antisocial Behavior Questionnaire ( <i>SRA</i> ; Loeber et al., 1989)	Substance use
	Social and Emotional Competencies Questionnaire ( <i>SEC-Q</i> ; Zych et al., 2018)	Social and emotional competencies
	Basic Empathy Scale ( <i>BES</i> ; Jolliffe & Farrington, 2006)	Empathy
Study 2 (Rodríguez-Ruiz, Zych, Llorent, Marín-López, Espejo-Siles & Nasaescu, 2023)	Instrument <i>ad hoc</i>	Socio-economic status
	Self-Reported Antisocial Behavior Questionnaire ( <i>SRA</i> ; Loeber et al., 1989)	Substance use
	Instrument <i>ad hoc</i> Bonding School Questionnaire (Ribeaud & Eisner, 2010)	Intoxication Bonding School
Study 3 (Rodríguez-Ruiz, Zych, Ribeaud, Steinhoff, Eisner, Quednow & Shanahan, 2023)	Instrument <i>ad hoc</i> Alabama Parenting Questionnaire ( <i>APQ</i> ; Shelton et al., 1996)	Academic performance Parent-child relationship
	Self-Control Scale (Grasmick et al., 1993)	Self-control
	Instrument <i>ad hoc</i> International Socio-Economic Index ( <i>ISEI</i> ; Ganzenboom et al., 1992)	Substance use Socio-economic status

#### Study 1

Self-Reported Antisocial Behavior Questionnaire (*SRA*; Loeber et al., 1989). This instrument was validated in Spanish population by Espejo-Siles et al. (2023). The six

items from the substance use subdimension of this scale were used. Participants were asked how many times in the last six months they had used beer, wine, liquor, tobacco, cannabis or other illicit drugs. The possible responses were: 1 = *No*; 2 = *Yes, once*; 3 = *Yes, twice*; and 4 = *Yes, more times*. This instrument showed a good reliability at time 1 ( $\Omega = .92$ ) and at time 2 ( $\Omega = .93$ ).

The Social and Emotional Competencies Questionnaire (*SEC-Q*;  $\Omega = .82$ ) was designed and validated by Zych et al. (2018). It is compound by 16 items organized in four factors. These factors are: self-awareness (four items, such as “I am aware of the thoughts that influence my emotions”;  $\Omega = .64$ ), self-management and motivation (three items, like “I pursue my objectives despite the difficulties”;  $\Omega = .65$ ), social-awareness and prosocial behaviour (six items, e.g.: “I have good relationships with my classmates or workmates”;  $\Omega = .71$ ), and decision-making (three items, such as “I usually consider advantages and disadvantages of each option before I make decisions”;  $\Omega = .70$ ). Participants answered on a Likert scale, in which 1 = *strongly disagree*; 2 = *somewhat disagree*; 3 = *neither agree nor disagree*; 4 = *somewhat agree*; 5 = *strongly agree*.

Basic Empathy Scale (*BES*; Jolliffe & Farrington, 2006). This questionnaire was validated in Spanish by Villadangos et al. (2016). It consists of two dimensions of ten items each (20 items the whole questionnaire). Affective empathy ( $\Omega = .76$ ) is measured with items such as “After being with a friend who is sad about something, I usually feel sad”. Cognitive empathy ( $\Omega = .78$ ) is measured with items like “I can often understand how people are feeling even before they tell me”. Individuals responded following a five-point Likert scale: 1 = *strongly disagree*; 2 = *somewhat disagree*; 3 = *neither agree nor disagree*; 4 = *somewhat agree*; 5 = *strongly agree*. McDonald’s Omega for the full instrument in this study was .82.

## Study 2

An adaptation of the substance use subscale from the Self-Reported Antisocial Behavior Questionnaire (*SRA*) by Loeber et al. (1989) was used for this study and it showed adequate psychometric properties ( $\Omega = .94$  at time 1;  $\Omega = .92$  at time 2). It included seven items measuring the use of soft alcohol (beer, wine), strong alcohol (whisky, vodka, etc.), tobacco, cannabis and other illicit drugs (cocaine, MDMA, etc.). It measured substance use in the previous school year using four possible responses: 1 = *No*; 2 = *Yes, once*; 3 = *Yes, twice*; and 4 = *Yes, more times*.

A three-items *ad hoc* instrument was designed to measure intoxication ( $\Omega = .94$  at time 1;  $\Omega = .95$  at time 2). Participants answered, according to a four-point scale: 1 = *No*; 2 = *Yes, once*; 3 = *Yes, twice*; and 4 = *Yes, more times*. This scale included three questions: “Have you ever got drunk with alcohol?”, “Have you ever been heavily affected by any drug (excluding alcohol)?”, “Have you ever drunk a lot and quickly to get drunk?”.

Self-perceived socio-economic status was measured using an *ad hoc* instrument. It consisted of two questions (“When compared to other Spanish families, I consider my family as...” and “When compared to other Spanish neighbourhoods, I consider my neighbourhood as...”) and five possible responses (1 = *very poor*, 2 = *poor*, 3 = *neither rich nor poor*, 4 = *rich*, 5 = *very rich*).

Bonding with school was measured by the instrument designed for the z-proso project (Ribeaud & Eisner, 2010). It showed good reliability in previous studies (e.g. Zych et al., 2021) and also in the current study ( $\Omega = .90$ ). It included 10 items grouped into three factors: liking school ( $\Omega = .82$ ; e.g. “I enjoy going to school”), bonding with teachers ( $\Omega = .82$ ; e.g. “My teacher helps me when necessary”); bonding with classmates ( $\Omega =$

.84; e.g. “I have a good relationship with the other adolescents in my class”). Participants answered following a five-point Likert scale: 1 = *never*, 2 = *almost never*, 3 = *sometimes*, 4 = *usually*, 5 = *always*.

A brief scale designed *ad hoc* was used to measure academic performance. Students reported an open response. They answered the first question: “How many times were you expelled from school in the last year?” and the second question: “What grade do you usually achieve?”. Based on the Spanish education system score, there were four possible responses: 1 = *fail*, 2 = *pass*, 3 = *very good*, 4 = *outstanding*.

### Study 3

An adapted version of the Alabama Parenting Questionnaire (*APQ*; Shelton et al., 1996) was administrated to measure different dimensions of parent-child relationship. This adapted version used in the z-proso project showed appropriate psychometric properties ( $\Omega = .81$ ) and was organized in seven dimensions: involvement (6 items; e.g. “Your mother or father hugs you to comfort you when you are sad”;  $\Omega = .82$ ), positive parenting (2 items; e.g. “Your parents compliment you if you were particularly good at school, in a sport, or at a hobby”;  $\Omega = .78$ ), parental supervision (2 items; e.g. “If you go out in your free time, your parents ask you where you are going”;  $\Omega = .96$ ), child disclosure (2 items; e.g. “You keep secret from your parents what you do in the evenings and at the weekends”;  $\Omega = .81$ ), authoritarianism (3 items; e.g. “Your parents order you around and do not let you talk back to them”;  $\Omega = .65$ ) and aversive parenting and violence (6 items; e.g. “Your parents yell or scream at you”;  $\Omega = .77$ ). These items were answered according to the following options: 1 means *never*, 2 is *rarely*, 3 is *sometimes* and 4 is *often/always*.

The Self-Control Scale by Grasmick et al. (1993) was also adapted for this study, displaying good reliability ( $\Omega = .81$ ). It consisted of ten items such as “If I don’t get something I want immediately, I get angry pretty quickly” or “I often do whatever brings me pleasure here and now, even at the cost of some distant goal”. Participants had four possible responses: 1 = *false*; 2 = *more false than true*; 3 = *more true than false*; 4 = *true*.

Last year substance use was measured at age 13 ( $\Omega = .99$ ), age 15 ( $\Omega = .80$ ), age 17 ( $\Omega = .75$ ) and age 20 ( $\Omega = .90$ ). The response options were: 1 = *never*, 2 = *once*, 3 = *2-5times*, 4 = *monthly*, 5 = *weekly*, 6 = *daily*. The number of substances included in the questionnaire increased across waves of data collection. Soft alcohol (beer and wine), liquors (vodka, rum, etc.), tobacco and cannabis made up the questionnaire at age 13. All the previous substances and ecstasy (3,4-methylenedioxymethamphetamine [MDMA]), cocaine, amphetamine/ methamphetamine, and LSD/psilocybin were included in the scale at ages 15 and 17. The wider variety of substances was measured at age 20: soft alcohol (beer and wine), liquors (vodka, gin, etc.), tobacco, cannabis, stimulants (cocaine, amphetamine/methamphetamine, etc.), Ecstasy and similar hallucinogens, as well as nonmedical use of opioids, tranquilizers, and anabolic steroids.

The International Socio-Economic Index (*ISEI*) designed by Ganzeboom et al. (1992) was administered to measure socio-economic status in this sample. This instrument measures economic incomes, as well as occupational status.

### 2.2.3. *Design and procedure*

The three studies included in this doctoral dissertation followed a prospective longitudinal design. Study 1 belonged to the project “E-Intelligence: risks and opportunities of the emotional competencies expressed online” [PSI2015-64114-R],

funded by the Spanish Ministry of Economy and Competitiveness within the I+D+I 2015 National Program for Research Aimed at the Challenges of the Society (RETOS). Study 2 was developed within the project “School bullying as a determinant of substance use: a longitudinal study of risk and protective factors”, granted by the Spanish Ministry of Health, Consumer Affairs and Social Welfare within the National Plan against Drugs 2019 (reference 2019/016). Study 3 used data from the Zurich Project on the Social Development from Childhood to Adulthood, which received financial support from the Swiss National Science Foundation (fund 10FI14\_170409 as to the present study), the Jacobs Foundation, and the Swiss Federal Office of Public Health, the Swiss State Secretariat for Migration, the Department of Education of the Canton of Zurich, the Bank Baer Foundation, and the Visana Foundation.

Study 1 and study 2 were conducted following similar procedures. Both studies included two waves of data collection in two different and consecutive school years. In study 1, data were collected in May and June 2017 at wave 1, and May-June 2018 at wave 2. Data collections in study 2 were carried out in October and November 2020 (wave 1) and again in October and November 2021 (wave 2). Participants were matched from wave 1 to wave 2 using anonymous codes. In both cases, school board directors were contacted to ask for their participation. If they agreed, parental consents were collected from the students participating in the investigation. Surveys were administered in the regular hours by specialized researchers. Before filling out the questionnaires, participants were informed that the study was voluntary, anonymous, confidential and they could withdraw at any time. Data collection took approximately 35-40 minutes. These studies were approved by the Ethics Committee of the University of Cordoba (Spain) and followed all the national and international ethical standards including Declaration of Helsinki and data protection laws.



Study 3 used data from the Zurich Project on the Social Development from Childhood to Adulthood (z-proso). Z-proso is an ongoing longitudinal project focused on life-course development from a broad perspective, including a set of social, educational and psychological factors. Z-proso started in 2005 when participants were 7 years old, and the most recent wave of data collection (wave 8) took place in 2018, at age 20 (Ribeaud et al., 2022). Written informed consents were signed by participants and parental consents were required until they were 15 years old (wave 6 of data collection). Until wave 7 (age 17), data were collected in participant's classrooms using paper-and-pencil surveys. At wave 8 (age 20) data were collected by a computer-based questionnaire in a laboratory. The duration of data collection was of about 90 minutes. Individuals were economically rewarded for their participation, ranging from \$30 at age 13 to \$75 at age 20. For the current study, we used data corresponding to wave 4 (age 11), wave 5 (age 13), wave 6 (age 15), wave 7 (age 17) and wave 8 (age 20). The study was approved by the regional ethics committee and followed all the national and international standards.

#### *2.2.4. Data analyses*

There were different types of data analyses in every study. The shared analyses among the three studies were: descriptive analysis conducted with PASW IBM version 25 to explore the samples' characteristics; and instrument's reliability by calculating their McDonald's omegas using FACTOR software (Lorenzo-Seva & Ferrando, 2006). Data analyses in each study are summarized in Table 5 and further details about them are provided below.

Table 5. *Data analyses*

Study	Analysis	Software
1, 2, 3	Descriptive analysis	
3	Spearman correlations	
2, 3	Linear regression	PASW IBM version 25
2	Ordinal regression	
1	Multinomial logistic regression	
3	Mediation analysis	PROCESS macro
1, 2, 3	Instrument's reliability	FACTOR

### Study 1

This study built on a previous research project in which a latent transition analysis was performed with SAS 9.4 software Proc latent class analysis, LTA macros (Lanza et al., 2015). According to that analysis, three latent classes were found: non-users, occasional users and frequent users. For more details see Zych et al. (2020).

Based on the belonging of each individual to any specific latent class at both waves, longitudinal within-individual profiles of substance use were obtained. To do that, each latent class was coded as follows: non-user (W1 and W2) = 0; occasional users W1 = 1; occasional users W2 = 10; frequent users W1 = 2; frequent users W2 = 20. After that, we combined the group of each individual at wave 1 and wave 2, resulting in nine different longitudinal profiles.

Then, a multinomial logistic regression was run to explore if these longitudinal profiles were predicted by any of the following independent variables: self-awareness, self-management and motivation, social-awareness and prosocial behaviour, responsible decision making, affective empathy, cognitive empathy and age. The longitudinal profiles extreme new users, extreme descending users and descending users were excluded from the multinomial logistic regression analysis because they did not have enough cases.

## Study 2

Predictors of substance use were studied through linear regression analyses (for alcohol, other illicit drugs and intoxication) and ordinal regression analyses (for tobacco and cannabis). Ordinal regression analyses were run for substances measured with a single item, whilst linear regression analyses were run for variables measured with more than one item. When calculating variables linked with substance use at wave 1, the dependent variables were each substance use and intoxication at wave 1. When calculating predictors of substance use at wave 2, the dependent variables were each substance use and intoxication at wave 2. In both cases, the independent variables were age, sex, family socio-economic status, neighbourhood socio-economic status, number of school exclusions due to misconduct, grades, liking school, bonding with teachers and bonding with classmates. All these measures corresponded to wave 1. Moreover, previous substance use was controlled for in the prediction of substance use in wave 2. Previous substance use was coded as a dichotomous variable, in which 0 meant *no past substance use* and 1 was *use at least once of at least one substance*.

## Study 3

The variable substance use at each wave was calculated as a total score combining the frequency of use of all the substances measured in this study. After that, Spearman correlation coefficients were calculated among the following variables: substance use at age 13, substance use at age 15, substance use at age 17, substance use at age 20, parental involvement, positive parenting, parental supervision, child disclosure, authoritarianism and aversive parenting at age 11 and self-control at age 13. Previous substance use was calculated as a dichotomous variable (0 = *no past substance use*, 1 = *the participant reported substance at least once in the past*).

Then, linear regression analyses were performed. The dependent variables were substance use at ages 13, 15, 17 and 20. The independent variables were parental involvement, positive parenting, parental supervision, child disclosure, authoritarianism and aversive parenting at age 11 and low self-control at age 13. These regression analyses were also controlled for sex, parental migration background and socio-economic status.

Finally, mediation analyses were run with PROCESS macro (Hayes, 2013). Model 4 was used, including substance use at each wave as dependent variables (Y). Dimensions of the parent-child relationship significantly associated with substance use in the previous regression analyses were introduced as independent variables (X). Self-control at age 13 was the mediating variable.

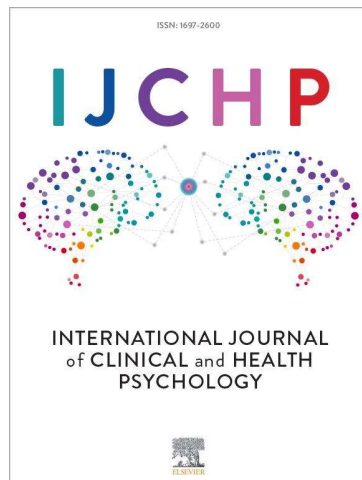


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**CHAPTER 3: STUDY 1. A  
LONGITUDINAL STUDY OF  
PREADOLESCENT AND  
ADOLESCENT SUBSTANCE USE:  
WITHIN-INDIVIDUAL  
PATTERNS AND PROTECTIVE  
FACTORS**

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**Rodríguez-Ruiz, J., Zych, I., Llorent, V. J., & Marín-López, I. (2021). A longitudinal study of preadolescent and adolescent substance use: within-individual patterns and protective factors. *International Journal of Clinical and Health Psychology*, 21, 100251. <https://doi.org/10.1016/j.ijchp.2021.100251>**





### **3.1. Abstract**

Substance use is one of the main risks for adolescent health. Many research projects have studied longitudinal patterns of use and risk/protective factors, but the number of studies focused on within-individual stability and change is low. The objective of this study was to discover specific longitudinal profiles of drug use and explore the role of social and emotional competencies, and empathy as possible protective factors against substance use. This was a longitudinal study with 879 students (9-17 years at wave 1, 10-18 at wave 2). Substance use, social and emotional competencies, and empathy were measured with a survey. Nine longitudinal profiles of substance use were found in this sample. Multinomial regression analysis found that low responsible decision making, self-management and affective empathy predicted the profiles of ascending user, chronic user and experiencer, respectively. Experiencer was also predicted by a low level of social awareness. The trend to a higher use over time can increase the odds of addiction in future. Some personal variables were found as protective factors against drug use. Thus, school interventions addressed to promote social and emotional competencies, and empathy seem necessary in order to decrease the adolescent drug use.

**Keywords:** substance use, adolescence, longitudinal profiles, protective factors, ex post facto study

### 3.2. Introduction

Drug use is widespread among adolescents in most countries (ESPAD Group, 2016) and it is one of the main risks for adolescent health (World Health Organization, 2018), as well as a public health problem in Europe (EMCDDA, 2018). Drug use in childhood and adolescence can change the normative and crucial brain development, which occurs in this period of life (Volkow et al., 2019). Indeed, many research studies have found that early consumption increases the odds of acquiring addictive behaviours in future, including a more noxious substance use (Woodcock et al., 2015) and other psychosocial problems (Poudel & Gautam, 2017). A recent study by Chen et al. (2019) found that a prolonged drug use was a predictor of depression. Thus, in-depth knowledge of protective factors against drug use, especially at early stages such as childhood and adolescence is essential (Gázquez et al., 2016).

Cross-sectional studies on drug use have been fruitful, and there is a wide knowledge about the prevalence rates of drug use at different ages. Different reports agree that substance use increases with age from childhood to late adolescence (ESPAD Group, 2016). Moreover, most findings are consistent regarding the frequency of use of different substances: the most used is alcohol, followed by tobacco, cannabis and, finally, other strong drugs -cocaine, LSD, inhalants, etc.- (EMCDDA, 2018).

Although information regarding prevalence rates of use of different substances at different ages is plentiful, the number of studies about within-individual stability and change in substance use over time considering the frequency, onset and sequences of use is still low. Regarding between-individual changes in the frequency of use over time, in a study conducted by Martínez-Fernández et al. (2018), students in Grade 1 of secondary education were followed up for one year. Alcohol use increased from 9.7% to 18.5%, tobacco use from 3.2% to 11.1% and cannabis use from 1.6% to 8.7%. Regarding within-

individual stability, 30.4% of alcohol consumers in Grade 1 continued in Grade 2, and 15.4% of tobacco users in Grade 2 already reported consumption of this substance in Grade 1.

Taylor et al. (2017) studied within-individual stability in frequency and onset of cannabis use in a sample of students from 13 to 18 years old. They found four profiles: non-users (the vast majority of the sample belonged to this group), late-onset occasional, early-onset occasional (the least prevalent group) and regular users. Both occasional groups and regular users included 20% of the sample, and they were more likely to evolve to a hazardous consumption.

In Spain, there are a few studies focused on longitudinal stability and change in substance use. Oliva et al. (2008) followed up 101 students at ages 13, 15 and 18. Three groups were found. A low-use group, which showed low consumption in the three waves, although it increased slightly throughout the adolescence. An ascending-use group showed more frequency of use than the low-use group, especially between ages 15 and 18. There was also an early-experimentation group that reported moderate use in early adolescence, increasing in mid-adolescence, and decreasing in late adolescence. Zych et al. (2020) examined longitudinal stability of drug use in a sample of Spanish students aged 9-17 years, followed up one year later. An increase in drug use over time was tested and three groups were found: non-users, occasional users and frequent users. While occasional users were quite unstable from wave 1 to wave 2 (22.86% became frequent users and 18.63% became non-user), frequent users and non-users showed high stability over time with 90.68% of frequent users and 89.12% of non-users who remained in the same group.

Thus, most of the longitudinal studies showed that the most numerous group is usually non-users (or a group with low drug use). Participants tend to remain in the same

group over time and an increase in substance use is more common than a decrease in substance use. Nevertheless, there is a dearth of research about within-individual stability and change combining frequency, onset and sequences of substance use and, in general, the number of studies focused on within-individual stability and change is still low.

Different studies linked social and emotional competencies and substance use. Self-knowledge was identified as a protective factor against the use of alcohol, tobacco and illicit drugs in a research with 11 to 17 years old Australian students (Hodder et al., 2016). Moreover, Estévez et al. (2017) found that low emotional management predicted drug abuse, and difficulties in goal-oriented behaviour predicted alcohol abuse. In a research study that compared samples of addicted and non-addicted young adults, it was observed that people with drug addiction showed greater difficulties in emotional regulation, less self-knowledge, social knowledge and interpersonal skills (Parolin et al., 2017). Self-knowledge and emotional regulation and management are key variables to prevent school burnout and foster academic engagement, which are two factors related to alcohol use (Pérez-Fuentes et al., 2021).

Regarding relational variables, Hernández-Serrano et al. (2016) pointed out that prosocial behaviour was a protective factor against alcohol and cannabis use in adolescence. A research study, based on a sample of Estonian students aged 15-16 years, found that participants who scored low on social skills reported higher drug use than their peers with higher social skills (Vorobjov et al., 2014). Moreover, alterations in the decision making process were related to alcohol use (Clay & Parker, 2018) and cannabis use (Alameda et al., 2012; Velez et al., 2010)

Given the cross-sectional nature of these studies, it is not possible to conclude if social and emotional competencies are predictors, correlates, or outcomes of substance use. Thus, new longitudinal studies focused on the evolution of substance use, and social

and emotional competencies at the within-individual level are necessary. Moreover, it is still necessary to further investigate the association of social and emotional competencies with different groups of substance users depending on the frequency of use, or even with specific longitudinal patterns of substance use.

Empathy has been linked to substance use in several studies. Ciarrochi et al. (2001) pointed out that substance users have less capacity to empathize with other people. Furthermore, Pérez de la Barrera (2012), in a study with adolescents, found that empathy was a protective factor against tobacco, alcohol, inhalants and cannabis use. On the other hand, a study conducted by Schmits and Glowacz (2019) with adolescents and young adults, showed that alcohol users had lower levels of empathy, but they did not find a link between empathy and cannabis use. Ferrari et al. (2014) compared empathy scores between a group of patients with a clinical diagnosis of drug addiction and a group of people with no history of substance abuse. The addicted participants showed significantly lower levels of affective empathy compared to non-addicted. However, the differences in cognitive empathy were not statistically significant.

On the other hand, some research studies have found that some drugs may increase affective empathy in psychotherapy patients. In this line, Hysek et al. (2014) developed an experiment with healthy 20 to 31 years old participants. The experimental group was administered a dosage of MDMA, whereas the control group was administered a placebo. The results showed that the experimental individuals got better results in affective empathy, although no alteration was observed in cognitive empathy. Furthermore, Dolder et al. (2016) carried out another research study with a similar procedure to Hysek et al. (2014), administering LSD to 25 to 65 years old participants. Higher levels of affective empathy were also found in the experimental group, as well as a decrease in cognitive empathy when compared to the control group.

The outcomes of the studies described above are inconsistent. Furthermore, most of the projects were conducted with a cross-sectional design, and some did not distinguish between affective and cognitive empathy. Therefore, it is still necessary to carry out studies that provide evidence about the longitudinal link between substance use and affective, and cognitive empathy.

Although drug use and its protective factors have been widely studied, there are still some gaps in knowledge that need to be addressed. Longitudinal research reports a general trend to remain in the same group of use over time, or an increase in substance use over time. However, few studies explored specific longitudinal profiles of drug use, taking into account the frequency, sequencing, stability and change at several time points. Most of the research projects are focused on one or a few substances, instead of considering a wide range of drugs. Moreover, a notable body of research found relations between social and emotional competencies, empathy and drug use, but the low number of longitudinal studies does not allow to draw conclusions regarding the chronological order in these variables.

Patterns of substance use are traditionally studied in adolescent samples. Nonetheless, Zych et al. (2020) found that 9 years old students already reported substance use. Precisely, the current study builds on the study conducted by Zych et al. (2020). They classified the participants into three groups (non-users, occasional users, frequent users) at each wave according to their frequency of use. Stability and change among groups over time were also measured in that research. However, within-individual change in frequency of substance use, and protective factors against substance use were not studied. Thus, the current study aims to explore within-individual change in substance use, combining the frequency of use of each participant at both waves. Specific longitudinal profiles are calculated taking into account the belonging group (non-user, occasional user

or frequent user) of each participant combining wave 1 and wave 2. Protective factors against each profile are also explored, relating each specific profile to empathy and social and emotional competencies reported at wave 1.

Therefore, the current study has been conducted to: i. discover specific longitudinal profiles of drug use over time in a sample of students aged 9-17 followed up for one year; ii. explore if social and emotional competencies and empathy can act as longitudinal protective factors against drug use.

### **3.3. Method**

#### *3.3.1. Participants*

The sample was selected by convenience. Eight schools located in Cordoba and Seville (Spain) took part in the study. The sample comprised 879 participants (49.9% girls, 50.1% boys) enrolled in grades 4, 5 and 6 of Primary Education and 1, 2 and 3 of Compulsory Secondary Education at wave 1, followed up one year later. The age range of the participants at wave 1 was 9-17 years ( $M = 11.98$ ,  $SD = 1.87$ ). At wave 2, participants were aged 10-18 years ( $M = 12.99$ ,  $SD = 1.87$ ).

There were 1,271 participants in the original sample, but 21 were excluded because they did not fill out at least 66% of the substance use scale. Moreover, 371 were not followed up at wave 2 due to different motives (absent, moving to another school or illegible anonymous codes). The largest sampling mortality occurred between Grade 1 and Grade 2 of Secondary Education (91 students could not be followed up) and between Grade 6 of Primary Education and Grade 1 of Secondary Education (79 students could not be followed up).



Out of the 879 participants, 18 were excluded from the study of protective factors because they had more than 33% of missing data in the questionnaires focused on social and emotional competencies or empathy.

### 3.3.2. Instruments

Substance use was measured with the Self-Reported Antisocial Behavior Questionnaire (SRA; Loeber et al., 1989). Specifically, the items corresponding to the Substance use subscale ( $\alpha = .92$  at W1,  $\Omega = .92$  at W1;  $\alpha = .93$  at W2,  $\Omega = .93$  at W2) were: having drunk beer, having drunk wine, having drunk liquor (strong alcohol), having smoked tobacco, having smoked marijuana, and having used other strong drugs (pills, cocaine, mushrooms, etc.). This instrument measures substance use in the past six months, with a Likert scale, in which 1 means *No*; 2 *Yes, once*; 3 *Yes, twice*; and 4 *Yes, more times*.

Social and Emotional Competencies Questionnaire (SEC-Q; Zych et al., 2018) is made up of 16 items, divided into four subscales such as: Self-awareness ( $\alpha = .64$ ,  $\Omega = .64$ ) with items such as "I know how to label my emotions", Self-management and motivation ( $\alpha = .64$ ,  $\Omega = .65$ ) with items such as "I know how to motivate myself", Social-awareness and prosocial behaviour ( $\alpha = .70$ ,  $\Omega = .71$ ) with items such as "I usually listen in an active way", and Responsible decision making ( $\alpha = .68$ ,  $\Omega = .70$ ) with items such as "I do not make decisions carelessly". The questionnaire was answered on a five-point Likert type, ranging from 1 (*totally disagree*) to 5 (*totally agree*) and showed good reliability ( $\alpha = .81$ ,  $\Omega = .82$ ).

The instrument used to measure empathy was the Spanish version of the Basic Empathy Scale (BES) by Jolliffe and Farrington (2006), validated in Spain (Villadangos et al., 2016). It has 20 items grouped in two factors: Affective empathy ( $\alpha = .76$ ,  $\Omega = .76$ )

and Cognitive empathy ( $\alpha = .77$ ,  $\Omega = .78$ ). It has a Likert-type response scale ranging from 1 (*totally disagree*) to 5 (*totally agree*) with a good reliability in the current sample ( $\alpha = .83$ ,  $\Omega = .82$ ).

Substance use subscale scores at wave 1 and wave 2 were used in this study, whereas *SEC-Q* and *BES* scores were used only at wave 1.

### *3.3.3. Procedure*

This was a prospective longitudinal study in which participants were followed up twice (W1 and W2) over two school years. W1 and W2 questionnaires were matched using an anonymous code repeated in each data collection. This anonymous code made it possible to pair data of each participant at wave 1 with their data at wave 2 in order to measure within-individual change. School board directors were contacted to request their participation in this research study.

Students were under 18; thus, parental consents were obtained. Participants filled in the questionnaires during their regular classroom hours in approximately 35-45 minutes. Students were informed that participation was voluntary, anonymous and confidential, and that they could withdraw from the study at any time. Data collection was done personally by members of the research team. This study was approved by the Ethics Committee of the University of Cordoba (Spain).

### *3.3.4. Data analyses*

Patterns of substance use were formed through latent transition analysis using SAS 9.4 software Proc LTA macro (Collins & Lanza, 2010). The number of patterns in

the dataset was determined using a combination of statistics including G2, AIC, BIC, and log-likelihood. Participants were classified to each pattern at wave 1 and wave 2 based on their probabilities of “no”, “1-2 times” and “more times” answers regarding each substance use. Probabilities of transitions among these patterns from wave 1 to wave 2 were calculated (see Zych et al., 2020 for more details).

The current study analysed, for the first time, within-individual change in these patterns. To address objective 1 and obtain longitudinal within-individual profiles of substance use, participants were coded as shown in Table 1. After that, the number of participants belonging to each profile was calculated together with the percentage of use of each substance in each wave. Descriptive analyses were conducted to determine prevalence rates of each substance use in different profiles.

Regarding the second objective, once different longitudinal profiles were obtained, a multinomial logistic regression analysis was conducted. It was aimed to test possible predictors of each longitudinal profile of drug use including self-awareness, self-management and motivation, social-awareness and prosocial behaviour, responsible decision making, affective empathy, cognitive empathy and age. All these analyses were performed using software SPSS version 25.

Table 1. *Longitudinal profiles of drug use*

		Wave 2		
		Non-users (0)	Occasional users (10)	Frequent users (20)
Wave 1	Non-users (0)	Non-user (0)	New user (10)	Extreme new user (20)
	Occasional users (1)	Experiencer (1)	Stable occasional user (11)	Ascending user (21)
	Frequent users (2)	Extreme descending user (2)	Descending user (12)	Chronic user (22)

*Note: numbers in brackets are the recodification of original patterns of use to obtain longitudinal profiles of substance use.*

### 3.4. Results

#### 3.4.1. Longitudinal profiles of drug use

According to latent transition analysis, the best fitting model classified participants into three patterns including non-users, occasional users, and frequent users (two-group model log-likelihood = 3782.87, G2 = 2050.92, AIC = 2104.92, BIC = 2233.95; three-group model: log-likelihood = 3599.01, G2 = 1683.21, AIC = 1771.21, BIC = 1981.48; four-group model: log-likelihood = 3554.45; G2 = 1594.10; AIC = 1720.10; BIC = 2021.16).

Longitudinal within-person profiles of substance use were obtained by combining wave 1 and wave 2 profiles for each participant. Numbers of participants and percentages of the sample belonging to each profile are shown in Table 2. The most prevalent profile

was non-users (65.7%), followed by stable occasional users (13.2%). The least prevalent profiles were extreme descending users (0.3%) and descending users (0.7%). Table 3 shows prevalence rates of each substance use in each profile.

Table 2. *Numbers and percentages of participants in each longitudinal profile of substance use*

Profile	Number of participants	Percentage
Non-user	599	68.1 %
Stable occasional user	112	12.7 %
New user	56	6.4 %
Ascending user	37	4.2 %
Chronic user	35	4 %
Experiencer	33	3.8 %
Extreme new user	4	0.5 %
Extreme descending user	2	0.2 %
Descending user	1	0.1 %

Table 3. *Percentage of each substance use in each longitudinal profile*

	Beer		Wine		Strong alcohol		Tobacco		Cannabis		Other drugs	
	Wave 1	Wave 2	Wave 1	Wave 2	Wave 1	Wave 2	Wave 1	Wave 2	Wave 1	Wave 2	Wave 1	Wave 2
New user	0 %	56.2 %	0 %	78.3 %	0 %	62.5 %	0 %	25 %	0 %	4.3 %	0 %	2.1 %
Extreme new user	0 %	100 %	0 %	64.3 %	0 %	100 %	0 %	64.3 %	0 %	31.4 %	0 %	14.3 %
Experiencer	79.3 %	0 %	83.9 %	0 %	58.1 %	0 %	6.7 %	0 %	3.3 %	0 %	19.4 %	0 %
Stable occasional user	52.4 %	54.2 %	57.6 %	57.6 %	50 %	59 %	15.7 %	13.5 %	1.2 %	6 %	0 %	1.2 %
Ascending user	61.2 %	92.4 %	47 %	67.2 %	65.7 %	97 %	21.5 %	63.6 %	3 %	29.1 %	3 %	3 %
Extreme descending user	100 %	0 %	100 %	0 %	100 %	0 %	100 %	0 %	100 %	0 %	100 %	0 %
Descending user	100 %	60 %	80 %	0 %	100 %	80 %	80 %	40 %	0 %	0 %	0 %	0 %
Chronic user	79.1 %	86 %	66.7 %	73.8 %	97.7 %	100 %	82.1 %	81 %	31.2 %	48.8 %	16.3 %	7 %

### *3.4.2. Predictors of longitudinal profiles of substance use*

Table 4 shows the results of a multinomial logistic regression analysis that included social and emotional competencies, empathy and age as predictors of different profiles of substance use compared to non-users. Only profiles with more than 30 participants were included in the regression analysis. Thus, extreme new users, extreme descending users and descending users were excluded because they did not have enough participants to conduct the analysis. The results showed that participants with low levels of social-awareness were more likely to be experiencers (OR = 0.47; 95% CI = 0.22-0.99;  $p = .046$ ). Low levels of responsible decision making and self-management predicted being an ascending user (OR = 0.49; 95% CI = 0.33-0.74;  $p < .001$ ) and a chronic user (OR = 0.54; 95% CI = 0.31-0.92 ; $p = .024$ ), respectively .Age was also a predictor of stable occasional user (OR = 1.77; 95% CI = 1.54- 2.02 ;  $p < .001$ ), new user (OR = 1.51; 95% CI = 1.28-1.78;  $p < .001$ ), ascending user (OR = 2.52; 95% CI = 1.92-3.32;  $p < .001$ ) and chronic user (OR = 3.33; 95% CI = 2.41-4.60;  $p < .001$ ).

Table 4. Longitudinal predictors of each profile of substance use.

	Experiencer			Stable occasional user			New user			Ascending user			Chronic user		
	OR	95%CI		OR	95%CI		OR	95%CI		OR	95%CI		OR	95%CI	
Self-awareness	1.49	0.76	2.92	0.90	0.62	1.34	0.98	0.58	1.65	0.85	0.45	1.59	0.84	0.45	1.58
Self-management	1.18	0.68	2.06	0.87	0.62	1.22	0.79	0.51	1.24	1.03	0.58	1.81	0.54*	0.31	0.92
Social awareness	0.47*	0.22	0.99	0.64	0.39	1.04	1.19	0.61	2.34	0.74	0.32	1.70	0.74	0.33	1.69
Responsible decision making	0.68	0.43	1.06	1.04	0.79	1.37	0.99	0.69	1.42	0.49**	0.33	0.74	0.69	0.45	1.07
Cognitive empathy	1.18	0.62	2.22	0.74	0.49	1.12	1.07	0.61	1.88	1.46	0.66	3.20	0.99	0.46	2.13
Affective empathy	0.54*	0.31	0.92	0.97	0.67	1.39	1.03	0.65	1.64	0.94	0.52	1.71	0.70	0.37	1.33
Age	1.04	0.84	1.29	1.77**	1.54	2.02	1.51**	1.28	1.78	2.52**	1.92	3.32	3.33**	2.41	4.60

Note: all comparisons with non-users as a reference group

\* $p < .05$ ; \*\* $p < .01$



### **3.5. Discussion**

Substance use is a widespread behaviour which can be harmful for adolescents in a crucial period of development (Volkow et al., 2019). Nevertheless, there are still some gaps in knowledge, especially concerning specific longitudinal within-individual profiles of substance use considering its frequency, stability and change, together with protective factors against consumption. Therefore, this study was conducted to determine specific longitudinal profiles of substance use in a sample of adolescents, and to explore if empathy and social and emotional competencies can be longitudinal protective factors against substance use.

Regarding longitudinal profiles of substance use, the majority of the sample reports no use at both waves. This result is congruent with previous studies in which the most numerous group was non-users (Taylor et al., 2017). Despite this large group of non-users, results are worrying, taking into account that almost a third of the students between 9 and 17 years are substance users. The next most prevalent longitudinal profile is stable occasional users, which could be a sign of the normalization of sporadic use among school age children.

Comparing the set of profiles where the frequency of use increased over time (new users, extreme new users, and ascending user) with the set of profiles where substance use decreased (experiencer, descending user and extreme descending user), there is a notable tendency to increase use rather than to decrease it. Adolescents are almost three times more likely to increase the frequency of drug use over time. These results are consistent with the study conducted by Oliva et al. (2008), who found the highest prevalence in the low-use group, followed by ascending use and, lastly, those that decreased their consumption over time. Nonetheless, the sample used by Oliva et al. (2008) had a minimum age of 13, while in our sample the minimum age was 9. These

data suggest that longitudinal change in the frequency of use may occur even in young participants. The increase of experimental behaviours and hazardous habits during adolescence could be an explanation of why ascending use is more prevalent than descending use.

In relation to social and emotional competencies as predictors of substance use, a low level of responsible decision-making predicted the role of ascending users. A possible reason could be that this profile does not weigh the possible negative consequences and seeks short-term rewards (Velez et al., 2010). In addition, low levels of self-management are a risk factor to be chronic users, which is congruent with the results by Estévez et al. (2017). A lack of behavioural regulation is closely related to substance abuse. Likewise, low social awareness was negatively associated with sporadic use and experiencers. A plausible explanation could be that difficulties in understanding the mechanisms of social relationships could be related to accepting certain risky behaviours. This result is in line with Parolin et al. (2017), who also found a relationship between low social knowledge and drug use, but in their study, in participants with addiction.

Results show that participants who score low in affective empathy at wave 1 were more likely to be experiencers. These students could use drugs as a mean to feel part of a group. On the other hand, cognitive empathy was not related to any profile of users. These results are congruent with the study by Ferrari et al. (2014). However, other authors found an increase in affective empathy after using some specific drugs (Dolder et al., 2016; Hysek et al., 2014). Nonetheless, comparisons should be made with caution because these research projects studied clinical samples (Ferrari et al., 2014) or healthy samples but with an experimental design and specific substances (Dolder et al., 2016; Hysek et al., 2014). Future studies could further investigate the relation between drug use and empathy in order to solve these methodological differences. Given that some adolescents show

different problem behaviours at the same time (Espejo-Siles et al., 2020; Nasaescu et al., 2020), it is important to study substance use in relation to other problems. Future studies should focus on these problem behaviours from a holistic and comprehensive perspective.

The biggest strength of this study is its longitudinal design, which made it possible to find specific profiles of use over time and to discover predictors of substance use. This study uses a broad sample of children and adolescents, and its results are probably generalizable to other similar contexts. Moreover, we provided information about drug use in 9 to 17 years old participants. Nevertheless, the convenience sampling used in this study has some limitations and future studies should confirm our results with representative samples to make sure that they are generalizable. Although this study uses validated measures with good psychometric properties, reliability of some subscales could be improved. Also, measuring social desirability could be useful to discover possible response bias that may occur in studies with self-reports. New longitudinal studies with more waves of data collection and differentiating profiles according to the type of drug could provide a wider pattern of drug use over time. Also, emerging phenomena such as buying drugs online (Oksanen et al., 2021) should be studied in relation to different patterns of drug use.

Even with some limitations, these results have important implication for policy and practice. Prevention programs against drug use should be implemented from Primary Education in order to prevent early use and delay as much as possible the increase in the frequency of use. These programs should include activities to promote affective empathy and social and emotional competencies, especially self-management, social awareness and prosocial behaviours, and responsible decision making. These competencies could also be promoted in clinical settings where profiles of substance use should be assessed in preadolescence and adolescence.

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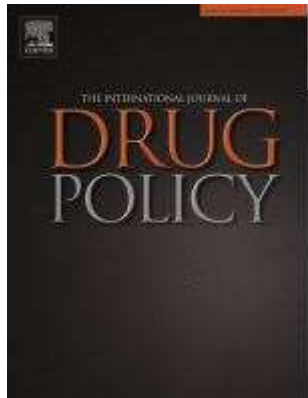
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**CHAPTER 4: STUDY 2. A  
LONGITUDINAL STUDY OF  
PROTECTIVE FACTORS AGAINST  
SUBSTANCE USE IN EARLY  
ADOLESCENCE. AN  
ECOLOGICAL APPROACH**

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**Rodríguez-Ruiz, J., Zych, I., Llorent, V. J., Marín-López, I., Espejo-Siles, R., Nasaescu, E. (2023). A longitudinal study of protective factors against substance use in early adolescence. An ecological approach. *International Journal of Drug Policy*, 112, 103946. <https://doi.org/10.1016/j.drugpo.2022.103946>**



#### **4.1. Abstract**

Adolescent substance use has been widely related to different individual, school, family and community factors. Yet, the number of studies with all these variables together in a model from an ecological perspective is still low, and they rarely used a longitudinal design. The aim of this study was to explore, from an ecological perspective, the prospective impact of different individual, school, family and neighbourhood factors on adolescent substance use. This was a longitudinal study with a one-year follow up. There were 881 participants ( $M_{\text{age}} = 12.57$ ; 48.1% females) at wave 1, of which 686 ( $M_{\text{age}} = 13.51$ ; 51.8% females) were followed-up at wave 2. Validated questionnaires were used for data collection. Regression analyses showed that higher substance use was predicted by high family socio-economic status cross-sectionally and longitudinally, and it was related to low neighbourhood socio-economic status cross-sectionally only. Participants who disliked school and had a poor academic performance were more likely to use substances, both cross-sectionally and longitudinally. The inclusion of families in substance use prevention programmes could be a key component in these interventions. Moreover, promotion of a positive school climate could protect adolescents from using substances.

**Keywords:** substance use, adolescence, ecological approach, longitudinal study

## 4.2. Introduction

Research projects usually address adolescent substance use taking into account personal (Rodríguez-Ruiz et al., 2021), interpersonal (Foster & Spencer, 2013) or contextual (Kipping et al., 2015) risk or protective factors, but rarely approach substance use from a holistic and more complex perspective. An Ecological Theory proposed by Bronfenbrenner (1979) includes different social and interpersonal environments that influence behaviours and human development. These levels include individual, school, family and neighbourhood domains, which are likely to impact adolescent substance use, but their influence still need to be thoroughly described.

### *4.2.1. Individual factors*

Individual factors such as sex, age or academic performance have been related to adolescent substance use. Some studies showed higher prevalence rates of substance use in boys in comparison to girls (Halladay et al., 2020; Lee et al., 2021), but sex differences have decreased in the past decade (Kraus et al., 2018). Spanish adolescent females reported even higher levels of alcohol and tobacco use than males (Moreno et al., 2020). Age is another important individual factor that has been broadly studied in relation to substance use. The STUDES Report (Ministerio de Sanidad, 2021) showed that 14 years of age was the mean onset of the most popular substances (alcohol and tobacco) used. Moreover, recent research has shown that substance use is higher among older students (Zych et al., 2020). Thus, most studies show that substance use is more common in males and older adolescents, but findings are inconsistent.

Regarding academic performance, previous studies found that illicit drug use was significantly related to school dropout (Brière et al., 2014) and alcohol users were less

likely to continue their studies later in life (Arria et al., 2020). Low academic performance also increases the likelihood of alcohol and illicit drug use according to data reported by Norwegian (Heradstveit et al., 2017) and US students (Meda et al., 2017).

#### *4.2.2. School-based relationships and connectedness*

Social Bond Theory (Hirschi, 1969) states that social control and cohesion prevent adolescents from delinquent behaviour and increase their likelihood to behave according to social standards. In line with this theory, some studies found a relationship between different school variables and adolescent substance use. It was found that a positive school climate delays substance use onset (Daily et al., 2020). King et al. (2020) reported higher odds of cannabis use among African American male students who disliked going to school. Low school connectedness has been associated with opioid use in Canada (Syed et al., 2021) and marijuana use in the USA (Mulla et al., 2020). Therefore, most studies in the field show that a positive school climate can be protective against substance use. Relationships with teachers and classmates also have an impact on adolescent substance use. Wenzel et al. (2009) included the promotion of desirable student-teacher relationships in a drug prevention programme in Germany and obtained desirable outcomes. Daily et al. (2020) found that bonding with teachers was a strong longitudinal protective factor against substance use. The relation between bonding with classmates and substance use has barely been reported by scientific literature. School friendships (Forster et al., 2015) and peer support (Rodzlan et al., 2021) have been identified as protective factors against substance use, but little is known about the possible protective role of bonding with classmates.



#### *4.2.3. Family and neighbourhood status*

Family socio-economic status has also been related to adolescent substance use. Gerra et al. (2020) identified low socio-economic status as a risk factor for episodic and frequent substance use among 16-year-old students from 28 European countries. Low family socio-economic status also predicted substance use in a sample of Czech high school students in a structurally disadvantaged region (Petruzelka et al., 2020).

Neighbourhood is another context of influence in adolescent behaviour including substance use. Tucker et al. (2013) found that high rates of neighbourhood unemployment, as an indicator of low socio-economic status, increased the odds of marijuana use and binge drinking. Lee et al. (2018) conducted a longitudinal project according to which neighbourhood stability in childhood decreased the likelihood of alcohol and cannabis use later in adulthood. The results of the studies described above indicate a link between low socio-economic status and adolescent substance use. However, new longitudinal studies are needed to test the impact of the family and neighbourhood socio-economic status on substance use and intoxication combined with other possible risk and protective factors.

#### *4.2.4. Ecological perspective*

Despite the considerable amount of scientific data relating adolescent substance use to individual, school, family and neighbourhood factors, these relationships still need to be analysed together to approach substance use from an ecological perspective. There are only several studies that used the ecological perspective to explain substance use. Among them, a cross-sectional study with gang-involved US adolescents in Grades 8, 10 and 12 found less family rules, more access to drugs in the neighbourhood and higher

acceptance of substance use by friends and family among participants who use substances more frequently (Bishop et al., 2020). Another cross-sectional study conducted by Connell et al. (2010) with a sample of US adolescents identified individual (being male, higher academic performance and low antisocial behaviour), family (parental monitoring and parental disapproval of consumption) and community (availability of substances) protective factors against substance use. A longitudinal study by Shih et al. (2017) showed that neighbourhood disorganization at age 16 was the strongest predictor of alcohol, tobacco and other substances use one year later, followed by relationships with peers. Thus, research studies focused on adolescent substance use from an ecological perspective are usually conducted with specific populations, rarely use a longitudinal design and, when they do, the number of factors measured is low.

#### *4.2.5. The current study*

There is a fruitful body of research about substance use and different risk and protective factors, but most of these studies focused on specific populations or did not explore the use of different substances. Moreover, it is still necessary to approach substance use from an ecological perspective, analysing unique relations of different risk and protective factors with the use of different substances, which would provide a better understanding of this phenomenon. Some previous studies approached substance use from an ecological perspective, albeit chronological relations could not be established in most of them because they used cross-sectional designs. Most of the past results cannot be generalized given that participants had a particular profile such as gang-involved youth (Bishop et al., 2020), non-metropolitan students (Connell et al., 2010) or girls involved in justice system (Staton et al., 2020). Thus, the objective of the current study was to explore, from an ecological perspective, the cross-sectional and prospective impact of

different factors -including individual, school, family and neighbourhood- on the use of different licit and illicit substances and intoxication in early adolescence.

Based on the scientific literature, we hypothesised that: i. rates of substance use would be higher among boys, older students and participants with poorer academic performance; ii. low levels of liking school, bonding with teachers and bonding with classmates would be related to more substance use; iii. Low neighbourhood and family socio-economic status would be risk factors for substance use.

### **4.3. Method**

#### *4.3.1. Participants*

The original sample included 905 participants, but students with more than 33% of missing data were excluded. In the final sample, there were 881 participants (48.1% females, 51.9% males) at wave 1 (W1) selected by convenience from schools in the province of Cordoba (Spain). Participants were enrolled in Grade 1 and Grade 2 of Secondary Education, with a mean age of 12.57 years ( $SD = 0.80$ ). Regarding socio-economic status, 94% self-identified their families as neither rich nor poor, 5% declared their families were rich or very rich, and 1% poor or very poor. Moreover, 88.3% considered their neighbourhood as neither rich nor poor, 8.3% rich or very rich and 3.4% poor or very poor.

At wave 2 (W2), 686 participants (51.8% females, 48.2% males) were followed-up. At this wave they were enrolled in Grade 2 and Grade 3 of Secondary Education ( $M_{age} = 13.51$ ;  $SD = 0.72$ ). Thus, 78% of the participants were followed-up one year later.

#### 4.3.2. Instruments

Individual characteristics were measured by asking the participants about their current age (continuous variable), school year (1 = Grade 1, 2 = Grade 2, 3 = Grade 3) and sex (0 = female, 1 = male).

To explore socio-economic status, participants were asked, “When compared to other Spanish families, I consider my family as” and “When compared to other Spanish neighbourhoods, I consider my neighbourhood as”. These items were answered on a five-point Likert scale including: 5 = “very rich”, 4 = “rich”, 3 = “neither rich nor poor”, 2 = “poor”, 1 = “very poor”.

*Substance use* was measured using a subscale ( $\Omega = .94$ ,  $\alpha = .93$  at W1;  $\Omega = .92$ ,  $\alpha = .92$  at W2) of the Self-Reported Antisocial Behaviour Questionnaire (SRA; Loeber et al., 1989) with some additional items. The original scale had seven items that measured beer, wine, strong alcohol (whisky, rum, vodka, gin), tobacco, cannabis and other illicit drug use. Another item to measure cocaine use was added. This questionnaire was answered on a four-point scale (1 = *never*; 2 = *yes, once*; 3 = *yes, twice*; 4 = *yes, more times*) and focused on substance use during the past school year. Beer and wine were grouped together as “soft alcohol” and cocaine and other illicit drugs were grouped together as “other illicit drugs”.

A brief scale ( $\alpha = .94$ ,  $\Omega = .94$  at W1;  $\Omega = .95$ ,  $\alpha = .95$  at W2) including three items created *ad hoc* was used to measure *substance intoxication*. Items included: “Have you ever got drunk with alcohol?”, “Have you ever been heavily affected by any drug (excluding alcohol)?”, and “Have you ever drunk a lot and quickly to get drunk?”. Items were answered on a scale (1 = *never*; 2 = *yes, once*; 3 = *yes, twice*; 4 = *yes, more times*).

A three-factor questionnaire ( $\alpha = .90$ ;  $\Omega = .90$ ) was administered to measure *school climate factors*. The instrument was designed by the z-proso project team (Ribeaud & Eisner, 2010) and used in recent studies (e.g. Zych et al., 2021), showing adequate psychometric properties. The three dimensions were *liking school* ( $\alpha = .82$ ;  $\Omega = .82$ ), with items such as “I like going to school”; *bonding with teachers* ( $\alpha = .82$ ;  $\Omega = .82$ ), with items such as “My teachers are fair with me”; and *bonding with classmates* ( $\alpha = .83$ ;  $\Omega = .84$ ) with items such as “I get along with other kids”. Items were answered using a scale including 1 = *never*, 2 = *almost never*, 3 = *sometimes*, 4 = *usually*, and 5 = *always*.

Different aspects of academic performance were measured with two questions: “How many times were you expelled from school in the last year?” with an open answer, and “What grade do you usually achieve?”. This last question was answered according to four options in the Spanish education system: 1 = “fail”, 2 = “pass”, 3 = “very good”, and 4 = “outstanding”.

#### 4.3.3. Design and procedure

This was a prospective longitudinal study with two waves of data collection over two consecutive school years. School board directors were contacted to ask for their collaboration in the research and, if they agreed, parents were asked for collaboration and parental consent forms were collected. Data were collected in October and November 2020 (W1) and October and November 2021 (W2). Participants filled in the questionnaires in schools under the supervision of the research team. In seven out of sixteen schools, data were collected online at W1 because they did not have enough space to guarantee social distancing during the COVID-19 pandemic. In these cases, students were supervised by their teachers, who previously received instructions from the research

team. An anonymous code was used to match participants at W1 and W2. The current study was approved by the Ethics Committee of the University of Cordoba. The study followed all the national and international ethical standards including Declaration of Helsinki and data protection laws.

#### *4.3.4. Data analyses*

Descriptive analyses were conducted to describe socio-demographic characteristics of the sample. Linear and ordinal regression analyses were run to explore unique predictors of substance use. Linear regression analyses were used for alcohol use, illicit substance use and intoxication, while ordinal regression analyses were used for tobacco and cannabis use, given that these two substances were measured with a single item. The dependent variables were all substances and intoxication at wave 1; whereas independent variables were wave 1 age, sex, family SES, neighbourhood SES, number of school exclusions due to misconduct, grades, liking school, bonding with teachers and bonding with classmates. Other regression analyses were run with the same independent variables at wave 1 and all substances and intoxication at wave 2 as dependent variables in order to test longitudinal predictors. Regression analyses at wave 2 included previous substance use as predictor of substance use one year later. Previous substance use was a dichotomous variable (0 = *no past use*, 1 = *use at least once of at least one substance*). All these analyses were run using SPSS version 25 software. Instrument's reliability was tested by calculating polychoric alpha and McDonald's omega for each scale using FACTOR software (Lorenzo-Seva & Ferrando, 2006).

## 4.4. Results

### 4.4.1. Cross-sectional factors related to substance use

Tables 1 and 2 shows dimensions related to substance use and intoxication at wave 1. Soft alcohol use was related to family socio-economic status ( $\beta = .16$ ,  $p = .000$ ), neighbourhood socio-economic status ( $\beta = -.09$ ,  $p = .013$ ), liking school ( $\beta = -.13$ ,  $p = .004$ ) and bonding with teachers ( $\beta = -.20$ ,  $p < .001$ ). Strong alcohol use was linked to family socio-economic status ( $\beta = .15$ ,  $p < .001$ ), school exclusions ( $\beta = .17$ ,  $p < .001$ ), grades ( $\beta = -.16$ ,  $p < .001$ ), liking school ( $\beta = -.12$ ,  $p = .006$ ) and bonding with teachers ( $\beta = -.09$ ,  $p = .042$ ). Neighbourhood socio-economic status (Est = -1.188,  $p = .016$ ), school exclusions (Est = .505,  $p = .048$ ), grades (Est = -1.340,  $p < .001$ ) and liking school (Est = -.610,  $p = .003$ ) were associated with tobacco use. The likelihood of illicit drugs use was higher among participants reporting low levels of neighbourhood socio-economic status ( $\beta = -.08$ ,  $p = .031$ ), bonding with teachers ( $\beta = -.10$ ,  $p = .034$ ) and bonding with friends ( $\beta = -.11$ ,  $p = .009$ ). Intoxication was related to neighbourhood socio-economic status ( $\beta = -.08$ ,  $p = .020$ ), school exclusions ( $\beta = .09$ ,  $p = .012$ ), grades ( $\beta = -.10$ ,  $p = .009$ ) and bonding with friends ( $\beta = -.11$ ,  $p = .009$ ).

Table 1. *Cross-sectional predictors of alcohol use, illicit drug use and intoxication*

	Soft alcohol			Strong alcohol			Other illicit drugs			Intoxication		
	Beta	<i>t</i>	<i>p</i>	Beta	<i>t</i>	<i>P</i>	Beta	<i>t</i>	<i>p</i>	Beta	<i>t</i>	<i>p</i>
Age	.10	2.62	.009	.10	2.88	.004	-.01	-.29	.772	.09	2.18	.029
Sex	.07	2.04	.042	-.03	-.79	.431	-.01	-.05	.959	-.03	-.83	.410
Socio-economic status (family)	.16	4.61	.000	.15	4.41	<.001	.02	.58	.561	.065	1.79	.074
Socio-economic status (neighbourhood)	-.09	-2.52	.012	-.04	-1.16	.246	-.08	-2.17	.031	-.08	-2.32	.020
School exclusions	.02	.44	.663	.17	4.80	<.001	.03	.65	.514	.09	2.52	.012
Grade	-.06	-1.65	.099	-.16	-4.24	<.001	-.04	-1.04	.300	-.10	-2.64	.009
Liking school	-.13	-2.93	.004	-.12	-2.76	.006	.01	.06	.953	-.05	-1.02	.308
Bonding with teachers	-.20	-4.17	<.001	-.09	-2.03	.042	-.10	-2.12	.034	-.01	-.12	.908
Bonding with friends	.06	1.55	.122	-.01	-.12	.902	-.11	-2.63	.009	-.11	-2.63	.009



Table 2. *Cross-sectional predictors of tobacco and cannabis use*

	Tobacco			Cannabis		
	Est.	SE	<i>p</i>	Est.	SE	<i>p</i>
Age	.254	.193	.187	.476	.385	.217
Sex	-.249	.322	.439	.366	.691	.596
Socio-economic status (family)	.539	.624	.388	.206	1.007	.838
Socio-economic status (neighbourhood)	-1.188	.493	.016	-1.270	.878	.148
School exclusions	.505	.255	.048	.111	.562	.843
Grade	-1.340	.247	<.001	-.360	.489	.462
Liking school	-.610	.204	.003	-.672	.478	.160
Bonding with teachers	-.140	.207	.497	-.300	.390	.442
Bonding with friends	.287	.202	.157	-.538	.370	.146

#### 4.4.2. *Longitudinal predictors of substance use*

As can be seen in Tables 3 and 4 higher family socio-economic status predicted all substances use one year later: soft alcohol ( $\beta = .09$ ,  $p = .028$ ), strong alcohol ( $\beta = .10$ ,  $p = .007$ ), tobacco (Est = 1.506,  $p = .002$ ), cannabis (Est = 1.822,  $p = .007$ ), other illicit drugs ( $\beta = .12$ ,  $p = .004$ ). School exclusions were longitudinally related to strong alcohol ( $\beta = .08$ ,  $p = .029$ ) and intoxication ( $\beta = .09$ ,  $p = .027$ ). Low grades predicted soft alcohol ( $\beta = -.09$ ,  $p = .020$ ), strong alcohol ( $\beta = -.13$ ,  $p = .001$ ), tobacco (Est = -.830,  $p < .001$ ), cannabis (Est = -.704,  $p = .036$ ) and intoxication ( $\beta = -.15$ ,  $p < .001$ ). Soft alcohol ( $\beta = -.14$ ,  $p = .006$ ), strong alcohol ( $\beta = -.13$ ,  $p = .006$ ) and intoxication ( $\beta = -.13$ ,  $p = .009$ ) were predicted negatively predicted by liking school the previous year.

Table 3. *Prospective predictors of alcohol use, illicit drug use and intoxication one year later*

	Soft alcohol			Strong alcohol			Other illicit drugs			Intoxication		
	Beta	<i>t</i>	<i>p</i>	Beta	<i>t</i>	<i>p</i>	Beta	<i>t</i>	<i>p</i>	Beta	<i>t</i>	<i>p</i>
Age	.05	1.28	.202	.03	.78	.434	-.01	-.06	.951	.04	.97	.334
Sex (male)	-.03	-.87	.386	-.13	-3.60	.000	-.03	-.71	.476	-.16	-4.24	.000
Socio-economic status (family)	.09	2.20	.028	.10	2.73	.007	.12	2.92	.004	.07	1.76	.079
Socio-economic status (neighbourhood)	.03	.73	.463	.03	.71	.48	-.03	-.82	.413	-.04	-1.13	.260
School exclusions	-.01	-.02	.984	.08	2.20	.029	.05	1.17	.242	.09	2.22	.027
Grade	-.09	-2.33	.020	-.13	-3.34	.001	-.07	-1.57	.117	-.15	-3.72	.000
Liking school	-.14	-2.74	.006	-.13	-2.73	.006	-.09	-1.64	.102	-.13	-2.62	.009
Bonding with teachers	.03	.47	.637	.01	.26	.79	.01	.15	.879	.05	.89	.374
Bonding with friends	.04	.85	.397	.04	.82	.42	-.03	-.66	.511	-.03	-.69	.491
Previous substance use	.35	8.51	.000	.34	8.45	.000	.04	.97	.334	.24	5.83	.000

Table 4. *Prospective predictors of tobacco and cannabis use one year later*

	Est.	Tobacco			Cannabis		
		SE	<i>p</i>	Est.	SE	<i>p</i>	
Age	.069	.181	.702	.024	.310	.939	
Sex	-.925	.295	.002	-.741	.495	.135	
Socio-economic status (family)	1.506	.491	.002	1.822	.679	.007	
Socio-economic status (neighbourhood)	-.319	.449	.477	.014	.734	.985	
School exclusions	.189	.338	.576	.687	.408	.092	
Grade	-.830	.195	<.001	-.704	.336	.036	
Liking school	-.297	.184	.105	-.559	.307	.069	
Bonding with teachers	.139	.192	.470	.437	.299	.143	
Bonding with friends	-.178	.177	.314	-.063	.292	.828	
Previous substance use	1.261	.299	<.001	1.620	.524	.002	

#### 4.5. Discussion

Adolescent substance use is a global health concern (Hall et al., 2016). Although this phenomenon and its possible protective factors have been widely studied in cross-sectional projects, it is still necessary to conduct new research in this field using a holistic approach. For that reason, the current study, based on Bronfenbrenner's Ecological Theory (1979), aimed to explore a model focused on different factors longitudinally linked with adolescent substance use, including individual, school, family and neighbourhood domains.

According to our first hypothesis, we expected boys, older students and participants with low academic performance to score high on substance use. Although soft alcohol use (beer and wine) was more prevalent among boys at wave 1, girls were more likely to report intoxication and strong alcohol and tobacco use at wave 2. This is contrary to previous research where boys reported higher level of substance use (Halladay et al., 2020; Lee et al., 2021), although Moreno et al. (2016) found that licit substance use was more prevalent among female students. Yet, our findings are in agreement with the current trend to reduce sex differences in substance use (Kraus et al., 2018), related to an increase in social choices made by females (Rahav et al., 2006).

In line with Zych et al. (2020), intoxication and alcohol use are more likely as age increases. A plausible explanation is that there is a crucial developmental change from Grade 1 to Grade 2, in which the vast majority of students acquire the proper characteristics of adolescence. Congruent with previous research (Meda et al., 2017; Heradstveit et al., 2017), low academic performance predicted more intoxication and tobacco and alcohol use, both cross-sectionally and one year later. In addition, school exclusions were cross-sectionally related to more intoxication and licit substance. Thus, adolescents with poor school performance should be a target population in drug use prevention strategies.

Secondly, we hypothesised that substance use would be more prevalent among students with lower scores in liking school, bonding with teachers and bonding with peers. Consistent with previous literature (Daily et al., 2020; King et al., 2020), liking school and bonding with teachers have been identified as protective factors against substances use, especially licit substances, which are the most commonly used substances at this age. Perhaps the positive feelings towards teachers as attachment figures or the perception of schools as useful prevent adolescents from getting involved in antisocial behaviours including alcohol and tobacco use. Nonetheless, there was no evidence of a relationship between bonding with teachers and substance use one year later. Teachers change from one school year to another and students can establish different types of relationships with different teachers. In general, our findings support the idea of promoting desirable student-teacher relationships as an effective component of substance use prevention programmes (Wenzel et al., 2009).

According to the previous studies, higher levels of school friendship and peer support were found to be related to lower levels of substance use (Forster et al., 2015; Rodzlan et al., 2021), but there is a gap in knowledge regarding the relation between

substance use and bonding with classmates. Our results showed that participants who scored higher in bonding with classmates were less likely to report intoxication and illicit substance use. This is congruent with previous findings that linked substance use and unhealthy relationships with classmates that involved problems such as bullying (Gaete et al., 2017; Pengpid & Peltzer, 2019) or cyberbullying (Choi et al., 2019; Sharp et al., 2019). However, as happened with teachers, bonding with classmates did not have a prospective impact on substance use, which could be caused by possible changes in the relationships among classmates over time. These results support Social Bond Theory (Hirschi, 1969), given that liking school can be related to more involvement and bonding with teachers and classmates can increase attachment. It entails a protective factor against substance use as it decreases the likelihood of being exposed to delinquent behaviour.

Based on scientific literature (Gerra et al., 2020; Petruzelka et al., 2020), according to our third hypothesis, we expected substance use to be higher among students living in families with lower socio-economic status. Nevertheless, in our sample, participants who reported high family socio-economic status tended to use more alcohol cross-sectionally and reported more intoxication, tobacco and cannabis use one year later. The availability of money to purchase alcohol and other substances could explain the relation between high family socio-economic status and substance use. The discrepancy between our findings and previous research could be due to differences in the studied substances or in the target population. Gerra et al. (2020) only studied the use of illicit drugs, while our results link high family socio-economic status with a wide range of substances and intoxication. Petruzelka et al. (2020) focused on a sample from a structurally disadvantaged region, whereas our sample involves general population.

In relation to the fourth hypothesis and in line with scientific literature (Lee et al., 2018; Tucker et al., 2013), low neighbourhood socio-economic status was a predictor of

soft alcohol and illicit substance use, as well as intoxication at wave 1. Some studies found that low income in some neighbourhoods is related to more illegal activities including drug dealing (Chang et al., 2016). In consequence, there is a broader availability and easier access to substances in these contexts. Moreover, the lack of leisure activities has been identified as a risk factor to drug use (Levy, 2008), which can be more common in disadvantaged neighbourhoods. Drug prevention programmes in these contexts should include components such as fostering employment or increasing the range of leisure activities as possible elements of success in prevention strategies. Nevertheless, the effect of neighbourhood socio-economic status on substance use was nonsignificant at the 1-year follow-up. The impact of the neighbourhood on adolescence could not be as stable as the impact of families. Family is a closer context and its impact more stable over time, while adolescents can do different activities or establish diverse relationships outside their neighbourhoods as they grow up. From a socio-ecological perspective, it supports the idea that closer contexts have a stronger and more stable influence on people's behaviour. According to our outcomes, individual factors (academic performance or school exclusions) as well as family SES (close context) remain stable or even become more important over time. However, the impact of distant domains, like neighbourhood SES or bonding with teachers, disappeared from wave 1 to wave 2.

The biggest strength of the current study is that it provides a wide range of ecological factors associated with the use of different substances in early adolescence. Given that we used a longitudinal design, chronological relations among variables can be established. Also, a large and diverse sample was studied. Therefore, the results are probably generalizable to the population and similar contexts. However, some limitations should be taken into account. First, although significant associations were found between substance use and many of the factors, the effect size was weak in some cases. Second,

socio-economic status was measured considering the subjective perception of participants, similarly to previous studies (Kim & Han, 2020). These results come from a Spanish sample, so they may not be generalisable to other cultures or nationalities. Future research could study these variables further from a longitudinal perspective including later adolescence or even adulthood in order to obtain a more complex and comprehensive perspective. Other school variables could also be related to substance use, as well as new forms of online problem behaviours such as buying drugs online (Oksanen et al., 2021). Problem behaviours tend to form patterns (Nasaescu et al., 2020), and they should be studied from a holistic perspective. In addition, studies considering each single illicit substance independently from an ecological perspective could be useful in the future.

Even with some limitations, the current study has implications for policy and practice. Substance use prevention programmes should include families, given that they are the most consistent context impacting adolescent substance use over time. Our study found evidence on the importance of school context including bonding to teachers and classmates as protective factors against substance use. Previous studies found that school climate policy documents are not always well designed (Llorent et al., 2021). Based on our findings, educational administrations and schools should improve the promotion of a positive school climate, in which students perceive the utility of school and the support of teachers, also promoting bonding to classmates. Moreover, these results have important implications for research, as they showed a differential impact of neighbourhood and family socio-economic status on substance use. Future studies could further explore these associations using more accurate measures for socio-economic status, such as family income or unemployment rates in the neighbourhood.

#### 4.6. References

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**CHAPTER 5: STUDY 3. THE  
INFLUENCE OF DIFFERENT  
DIMENSIONS OF THE PARENT-  
CHILD RELATIONSHIP AS  
LONGITUDINAL PREDICTORS  
OF SUBSTANCE USE IN LATE  
ADOLESCENCE. THE  
MEDIATING ROLE OF SELF-  
CONTROL**

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**Rodríguez-Ruiz, J., Zych, I., Ribeaud, D., Steinhoff, A., Eisner, M., Quednow, B., Shanahan, L. (2023).**

**The influence of different dimensions of the parent-child relationship in childhood as longitudinal predictors of substance use in late adolescence. The mediating role of self-control. *International Journal of Mental Health and Addiction.***

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## **5.1. Abstract**

This study examined longitudinal links between several dimensions of parent-child relationship and adolescent substance use, and tested the role of self-control in mediating these. Data came from the Zurich Project on the Social Development from Childhood to Adulthood. Validated questionnaires were used to measure parent-child domains at age 11, self-control at age 13, and substance use at ages 13, 15, 17, and 20. Low positive parenting and parental supervision, as well as aversive parenting, correlated with substance use. Linear regression model revealed that aversive parenting, low child disclosure, low positive parenting, and low parental involvement at age 11 predicted substance use at different stages of adolescence. These associations were mediated by low self-control at age 13. Involving parents and increasing their knowledge about desirable parental practices and ways to help their children to develop adequate self-control could be an effective element in substance use prevention strategies.

**Keywords:** substance use, parent-child relationship, self-control, adolescence

## 5.2. Introduction

Substance use is a major international health concern. Alcohol and drug use cause approximately 3,000,000 and 500,000 deaths every year, respectively (World Health Organization, 2021). Substance use onset usually occurs in adolescence (Poudel & Gautam, 2017), which is known to be a critical period for brain development, including elevated activation of reward regions and greater plasticity compared to adulthood (Spear, 2013). Hence, substance use has been proposed to be even more harmful during adolescence than at any later stage in life (Silins et al., 2014; Sun et al., 2022). Scientific research shows that substance use in adolescence increased the likelihood of early pregnancy, drug dependence, and criminal involvement (Odgers et al., 2008), as well as problematic substance use, physical aggression, and poorer wellbeing in adulthood (Shanahan et al., 2021).

Individual characteristics such as high self-management or self-control have been identified as protective factors against adolescent substance use (Leinberg & Lehmann, 2020; Rodríguez-Ruiz et al., 2021). Similarly, contextual factors such as positive parenting may also protect against adolescent substance use (Trucco, 2020). Although different studies have described risk and protective factors for substance use, little is known about the processes that mediate these associations. Here, we test whether parenting in childhood is associated with self-control, and whether self-control, in turn, predicts later substance use during adolescence and early adulthood.

### *5.2.1. Dimensions of parent-child relationship and substance use*

Social capital theory (Putnam, 2000) states that social capital consists of a network of interpersonal relationships, which have a beneficial impact on individuals involved in

these networks. Social capital can contribute to positive development and can act as a protective factor against risky behaviours. A systematic review on family social capital conducted by Carrillo et al. (2017) highlighted the importance of family functioning on children's health. This is not surprising taking into account that family context is the first and strongest environment that impacts development (Berk, 2009).

Following the social capital theory, Ferguson and Xie (2012) discovered that adult support is a protective factor against substance use in a sample of homeless youths attending secondary education. Baggio et al. (2016) found that permissive parental values regarding substance use predicted more substance use. Higher levels of substance use were also found in emerging adults (aged 18–25) who experienced more parental psychological control and scored lower on perceived social capital in a study by Yang et al. (2021). Moreover, authoritative and indulgent parenting styles were identified as protective factors against alcohol use (Garcia et al., 2020) and other illicit substance use (Calafat et al., 2014). On the other hand, authoritarian and neglectful parenting styles were associated with more substance use (Tur-Porcar et al., 2019; Vidourek et al., 2018).

Cablova et al. (2016) reported significant associations among increased frequency of alcohol use and low levels of strict rules, family communication, parental control, warmth, and affection. Haugland et al. (2019) found higher levels of cannabis use in adolescents who had conflicts with their parents and low parental monitoring and emotional support. Moreover, low parental supervision, involvement, rules, and positive parenting in adolescence were risk factors for marijuana use (King et al., 2015; Merianos et al., 2020). In sum, most of the previous studies found that parental warmth, monitoring, involvement, and positive parenting are protective factors for substance use, whereas lack of rules and conflicts between parents and children increase the likelihood of adolescent substance use. However, the cross-sectional nature of these studies does not make it

possible to establish chronological relations between parenting practices and substance use in their offspring. In addition, a relevant variable to take into account is monitoring, given that most of the studies only measure parental control, while this is a more complex variable that blends elements of child behaviour (disclosure) as well as elements of parental behaviour (control). Therefore, it is necessary to carry out studies that split the construct “parental monitoring” into two separate variables: child disclosure and parental control (Stattin & Kerr, 2000).

Some longitudinal studies also explored the relation between parenting styles and substance use. Alcohol use is longitudinally predicted by perceived neglectful parenting (Martínez-Loredo et al., 2015) and low levels of positive parenting (Boden et al., 2021). A meta-analysis of 131 longitudinal studies focused on parenting in adolescence associated with later alcohol use found that parental monitoring, parental support, parental involvement, and parent-child relationship quality acted as prospective protective factors against alcohol use (Yap et al., 2017). Although these results report empirical evidence about the long-term effects of parenting on alcohol use, there is still a need for research on this effect at early stages of development and considering other substances.

Valente et al. (2019) investigated the prospective impact of parenting styles on substance use. While neglectful style was a risk factor, authoritative and authoritarian parenting were longitudinal protective factors against the use of several substances. They concluded that parental control (the shared element between authoritative and authoritarian styles) was the key protective factor against adolescent substance use. Adolescent substance use has also been longitudinally linked to neglectful parenting (Berge et al., 2016) and low parental control (Shek et al., 2020) at age 12. Low child disclosure (Marceau et al., 2020) and lability in child disclosure (Marceau & Jackson,

2017) are longitudinal risk factors for substance use. Thus, most of the longitudinal studies carried out to date tested the role of different parenting styles or parental practices in childhood as protective or risk factor for substance use at early adolescence. However, studies about the prospective impact of parenting in childhood on later adolescence and adult substance use are scarce. In addition, there is a lack of consideration of individual characteristics explaining the mediating link between parenting and substance use.

### *5.2.2. Dimensions of parent-child relationship, self-control, and substance use*

According to the self-control theory of crime (Gottfredson & Hirschi, 1990), criminal and other problem behaviours, such as substance use, are caused by a lack of self-control. According to this theory, inappropriate parental practices sow the seeds of low levels of self-control in their offspring. A meta-analysis by Li et al. (2019), including 191 studies carried out in different countries, concluded that positive parenting is essential in the development of adequate self-control during adolescence. Thus, if low levels of self-control can predict substance use and parental practices relate to self-control, it could be fruitful to empirically test a model where dimensions of parent-child relationship predict substance use, mediated by self-control.

Empirical studies have tested the self-control theory of crime regarding substance use, and demonstrated that low self-control predicts consumption of alcohol (Yun et al., 2016), cannabis (Ford & Blumenstein, 2013), and cocaine (Schaefer et al., 2015), as well as use of other illicit substances (Grindal et al., 2019). Even though the impact of self-control on substance use has been reported in several studies, as well as the importance of favourable parenting in the acquisition of self-control, there is a paucity of research



exploring the prospective impact of dimensions of parent-child relationship on substance use via self-control as a possible mediator.

Some cross-sectional studies have approached models that included the mediating effect of self-control in the link between parenting and substance use. Self-control has been suggested to mediate the relation among substance use and ineffective parenting (Kabiri et al., 2020), maternal support (Vazsonyi et al., 2016), or parent-child conflict (Tarantino et al., 2015). Thus, these studies suggest a mediating effect of self-control in the association of adverse parenting and substance use. However, the cross-sectional design of these studies does not allow to establish chronological links among these variables. Therefore, it is still necessary to test the relation between parenting and substance use mediated by self-control through longitudinal research as the number of longitudinal studies focused on this link is still limited. Koning et al. (2014) studied the impact of parenting rules about alcohol use at age 13 on adolescent self-control at age 14 and alcohol use at 15 years in a sample of Dutch students. Stricter rules related to alcohol use at age 13 predicted higher levels of self-control 1 year later, which in turn was related to less alcohol use at age 15. Therefore, the prospective link between alcohol-specific parenting and substance use mediated by self-control was discovered by Koning et al. (2014), but it is still necessary to explore this relation including diverse dimensions of parent-child relationship and substances, as well as test if the effect of dimensions of parent-child relationship on substance use via self-control persists during late adolescence and early adulthood.

### *5.2.3. The current study*

There is vast evidence about the prospective impact of parenting on substance use. However, there is a lack of information regarding the effects of different dimensions of parent-child relationship on substance use at different stages of adolescence and early adulthood. Low self-control has been identified as a risk factor for substance use and it is known that adverse dimensions of parent-child relationship can be related to low levels of self-control in adolescents. To the best of our knowledge, there are no studies to date exploring the longitudinal impact of dimensions of parent-child relationship in childhood on substance use in adolescence and early adulthood and a possible mediating role of self-control in general population. Therefore, the aims of the current study were (i) to explore a model of the prospective impact of different dimensions of parent-child relationship in childhood (namely parental involvement, positive parenting, parental supervision, child disclosure, authoritarianism, and aversive parenting) on substance use and (ii) to analyse if these relations are mediated by low levels of self-control.

Based on the social capital theory, we hypothesized that lower parental involvement, positive parenting, parental supervision, and child disclosure, as well as higher authoritarianism and aversive parenting in childhood, are predictors of more substance use later in adolescence and early adulthood. Based on the self-control theory of crime, the relation between the above mentioned dimensions of parent-child relationship and substance use was expected to be mediated by low levels of self-control.

### 5.3. Method

#### 5.3.1. Participants

Data for this research study come from the *The Zurich Project on the Social Development from Childhood to Adulthood* (z-proso) that included an original target sample of 1675 children. Our analytic sample includes those participants who answered more than 66% of the items of the *Alabama Parenting Questionnaire* at wave 4 (age 11) of data collection. Thus, the current study included 1147 participants (49.1% female) with a mean age of 11.3 years ( $SD = 0.37$ ), followed up for 9 years. In 45% of the sample, both parents were born abroad; in the other 55%, at least one parent was born in Switzerland. Of these 1147 participants, 1011 ( $M_{age} = 13.7$ ;  $SD_{age} = 0.4$ ) were assessed at wave 5, 1080 ( $M_{age} = 15.4$ ;  $SD_{age} = 0.4$ ) at wave 6, 987 ( $M_{age} = 17.4$ ;  $SD_{age} = 0.4$ ) at wave 7, and 914 ( $M_{age} = 20.6$ ;  $SD_{age} = 0.4$ ) at wave 8. Among the participants who could not be followed up, children of non-native speakers and immigrants are over-represented (Eisner et al., 2019).

#### 5.3.2. Instruments

Dimensions of parent–child relationship were measured at age 11 using an adaptation of the *Alabama Parenting Questionnaire* (APQ; Shelton et al., 1996;  $\Omega = 0.81$ ) made by z-proso researchers, showing good reliability. This instrument includes 24 items divided into 7 dimensions: *involvement* (6 items; e.g., “Your parents talk to you about your friends or about the other students in your class.”;  $\Omega = 0.82$ ), *positive parenting* (2 items; e.g., “Your parents reward you for doing something well”;  $\Omega = 0.78$ ), *parental supervision* (2 items; e.g., “If you go out in your free time, your parents ask you where you are going”;  $\Omega = 0.96$ ), *child disclosure* (2 items; e.g., “You leave your house without telling your parents where you are going”;  $\Omega = 0.81$ ), *authoritarianism* (3 items; e.g.,

“Your parents are very strict with you when you don’t do exactly as they say”;  $\Omega = 0.65$ ), and *aversive parenting and violence* (6 items; e.g., “Your parents slap you”;  $\Omega = 0.77$ ). Participants answered on a 4-point Likert scale from 1 (*never*) to 4 (*often/always*).

An adapted version of the self-control scale ( $\Omega = 0.81$ ) by Grasmick et al. (1993) was administered at age 13 to measure self-control. It was measured by 10 items such as “I often act on the spur of the moment without stopping to think” or “I lose my temper pretty quickly”. The response options ranged from 1 (*false*) to 4 (*true*).

*Substance use* was measured at age 13 ( $\Omega = 0.99$ ), age 15 ( $\Omega = 0.80$ ), age 17 ( $\Omega = 0.75$ ), and age 20 ( $\Omega = 0.90$ ). At age 13, the substances included were soft alcohol (beer and wine), liquors (vodka, gin, etc.), tobacco, and cannabis. At ages 15 and 17, the substances studied were soft alcohol (beer and wine), liquors (vodka, gin, etc.), tobacco, cannabis, ecstasy (3,4-methylenedioxymethamphetamine [MDMA]), cocaine, amphetamine/ methamphetamine, and LSD/psilocybin. A wider range of substances was measured at age 20: soft alcohol (beer and wine), liquors (vodka, gin, etc.), tobacco, cannabis, stimulants (cocaine, amphetamine/methamphetamine, etc.), ecstasy, and similar hallucinogens, as well as nonmedical use of opioids, tranquilizers, and anabolic steroids. The response options, according to the consumption in the last 12 months, were 1 (*never*), 2 (*once*), 3 (*2–5 times*), 4 (*monthly*), 5 (*weekly*), and 6 (*daily*).

Three *socio-demographic* variables were included: *sex* (1 = male, 2 =female), *parental migration background* (1 = at least one parent born in Switzerland, 2 = both parents born abroad), and *socio-economic status* measured using the International Socio-Economic Index (*ISEI*, Ganzeboom et al., 1992).

### *5.3.3. Procedure*

Z-proso is an ongoing longitudinal prospective study focused on social development, including the life-course development of violence and crime, together with other variables such as mental health or substance use (Ribeaud et al., 2022). First data collection was conducted in 2004 including students from 56 primary schools randomly selected in Zurich, the largest city in Switzerland. Until 2018, eight waves of data collection have been carried out with a high rate of participation (Ribeaud et al., 2022).

Participants filled in paper-and-pencil questionnaires in their classrooms until age 17 and a computer-based survey in a laboratory at age 20, during approximately 90 min. All participants provided written informed consent before taking part in the data collection, and parental consents were signed when the participants were under 15 years of age. Participants received compensation for their time (from \$30 at age 13, to \$75 at age 20). The study was approved by the regional ethics committee.

### *5.3.4. Data analyses*

First, the variable substance use at each wave was calculated as a total score considering the frequency of use of the different substances. Second, Spearman correlations were performed to test unique associations among substance use at age 13; substance use at age 15; substance use at age 17; substance use at age 20; parental involvement, positive parenting, parental supervision, child disclosure, authoritarianism, and aversive parenting at age 11; and self-control at age 13. Previous substance use was coded as a dichotomous variable as follows: 0 = no past substance use, 1 = the participant reported substance at least once in the past.

After that, linear regression analyses were run to find if dimensions of parent-child relationship at age 11 and low self-control at age 13 predicted substance use at ages 13, 15, 17, and 20. The independent variables were parental involvement, positive parenting, parental supervision, child disclosure, authoritarianism, and aversive parenting at age 11 and low self-control at age 13, as well as sex, parental migration background, and socio-economic status (SES). The dependent variables were substance use at ages 13, 15, 17, and 20. The analyses were carried out using software PASW statistics version 25. Instrument's reliability was tested by calculating McDonald's omega for each scale using FACTOR software (Lorenzo-Seva & Ferrando, 2006).

To explore the mediating role of self-control in the link between dimensions of parent-child relationship and substance use, mediation analyses were performed using the PROCESS macro (Hayes, 2013). Specifically, model 4 was run, in which the independent variables (X) were dimensions of parent-child relationship at age 11 significantly associated with substance use in linear regression analyses, the dependent variables (Y) were substance use at each wave, and the mediating variable (M) was self-control at age 13.

## **5.4. Results**

### *5.4.1. Prospective correlations among substance use, parental practices, and self-control*

As can be seen in Table 1, aversive parenting at age 11 significantly correlated with substance use at age 13 ( $r = 0.11, p < 0.01$ ), age 15 ( $r = 0.09, p < 0.01$ ), age 17 ( $r = 0.09, p < 0.01$ ), and age 20 ( $r = 0.13, p < 0.01$ ). Low child disclosure at age 11 negatively

correlated with substance use at age 13 ( $r = -0.23, p < 0.01$ ), 15 ( $r = -0.24, p < 0.01$ ), 17 ( $r = -0.26, p < 0.01$ ), and 20 ( $r = -0.23, p < 0.01$ ). Low self-control at age 13 was also related to substance use at age 13 ( $r = 0.36, p < 0.01$ ), 15 ( $r = 0.38, p < 0.01$ ), 17 ( $r = 0.29, p < 0.01$ ), and 20 ( $r = 0.30, p < 0.01$ ). Authoritarianism correlated with substance use at age 17 ( $r = 0.07, p < 0.05$ ) and low positive parenting predicted substance use at age 15 ( $r = -0.06, p < 0.05$ ) and 17 ( $r = -0.07, p < 0.05$ ). There was also a negative link between parental supervision and substance use at age 13 ( $r = -0.13, p < 0.01$ ) and 15 ( $r = -0.06, p < 0.05$ ).

Table 1. Spearman correlations among substance use at each wave, parental practices and self-control

	1	2	3	4	5	6	7	8	9	10
1.Substance use W5										
2.Substance use W6	.51**									
3.Substance use W7	.39**	.66**								
4.Substance use W8	.33**	.54**	.72**							
5.Parental involvement	-.05	.02	.06	.04						
6.Positive parenting	-.02	-.06*	-.07*	-.06	.32**					
7. Parental supervision	-.13**	-.06*	-.01	.01	.26**	.08*				
8. Child disclosure	-.23**	-.24**	-.26**	-.23**	.15**	.13**	.19**			
9. Authoritarianism	.03	.04	.07*	.06	-.08**	-.11**	.13**	-.15**		
10. Aversive parenting	.11**	.09**	.09**	.13**	-.15**	-.16**	.01	-.22**	.42**	
11.Low self-control	.36**	.38**	.29**	.30**	-.14**	-.10**	-.19**	-.28**	.06	.13**

\* p < .05, \*\* p < .01



#### 5.4.2. Longitudinal predictors of substance use

The prospective relation of different dimensions of parent-child relationship at age 11 and self-control at age 13 with substance use later in adolescence and early adulthood is shown in Table 2. Substance use at age 13 and age 20 was predicted by low child disclosure ( $B = -0.16, p < 0.01$  at age 13;  $B = -0.10, p < 0.01$  at age 20), low self-control ( $B = 0.42, p < 0.01$  at age 13;  $B = 0.19, p < 0.01$  at age 20), and being male ( $B = -0.16, p < 0.01$  at age 13;  $B = -0.09, p < 0.01$  at age 20). Substance use at age 15 was higher among adolescents who reported low child disclosure ( $B = -0.08, p = 0.03$ ), low positive parenting ( $B = -0.10, p < 0.01$ ), and low self-control ( $B = 0.34, p < 0.01$ ), as well as more parental involvement ( $B = 0.11, p = 0.02$ ) and higher SES ( $B = 0.01, p = 0.05$ ). Children who reported low child disclosure ( $B = -0.12, p < 0.01$ ), low self-control ( $B = 0.28, p < 0.01$ ), and higher levels of parental involvement ( $B = 0.12, p = 0.03$ ), together with having non-migrant background ( $B = -0.13, p < 0.01$ ), were more prone to use substances at age 17. Higher aversive parenting at age 11 also predicted more substance use at age 13 ( $B = 0.16, p < 0.01$ ). Another predictor of substance use at ages 15 ( $B = 0.45, p < 0.01$ ), 17 ( $B = 0.65, p < 0.01$ ), and 20 ( $B = 0.46, p < 0.01$ ) was previous substance use.

Table 2. *Associations among dimensions of parent-child relationship at age 11 and self-control at age 13 and substance use at age 13, 15, 17 and 20*

	Age 13 (W5)		Age 15 (W6)		Age 17 (W7)		Age 20 (W8)	
	B (SE)	<i>p</i>	B (SE)	<i>p</i>	B (SE)	<i>p</i>	B (SE)	<i>p</i>
Parental involvement	.08 (.05)	.12	.11 (.05)	.02	.12 (.06)	.03	.08 (.04)	.04
Positive parenting	<.01 (.04)	.90	-.10 (.04)	<.01	-.06 (.04)	.14	-.02 (.03)	.57
Parental supervision	-.01 (.04)	.72	-.01 (.04)	.78	.04 (.04)	.37	.03 (.03)	.39
Child disclosure	-.16 (.04)	<.01	-.08 (.04)	.03	-.12 (.04)	<.01	-.10 (.03)	<.01
Authoritarianism	-.06 (.03)	.07	<.01 (.03)	.87	.02 (.04)	.64	<-.01 (.03)	.89
Aversive parenting	.16 (.06)	<.01	.04 (.05)	.45	<.01 (.06)	.97	.06 (.04)	.13
Low self-control	.42 (.04)	<.01	.34 (.04)	<.01	.28 (.05)	<.01	.19 (.04)	<.01
Female	-.16 (.04)	<.01	<-.01 (.04)	.84	-.07 (.04)	.09	-.09 (.03)	<.01
Parents' migrant background	-.03 (.05)	.48	-.05 (.04)	.24	-.13 (.05)	.01	-.06 (.04)	.09
SES	<-.01 (.01)	.40	<.01 (.01)	.05	<.01 (.01)	.08	<-.01 (.01)	.34
Previous substance use			.45 (.04)	<.01	.65 (.06)	<.01	.46 (.06)	<.01

5.4.3. *The mediating effect of self-control on the link between dimensions of parent-child relationship and substance use*

As shown in Fig. 1, aversive parenting and low score in child disclosure at age 11 predicted more substance use at age 13 and age 20 both directly and indirectly (via low self-control). Substance use at age 15 was predicted by high parental involvement, low child disclosure, and low positive parenting at age 11. These relations were direct and also mediated by low self-control at age 11 (Fig. 2). As can be seen in Fig. 3 and Fig. 4, high parental involvement and low child disclosure increased the likelihood of substance use at age 17 and 20 both directly and indirectly (via low self-control).

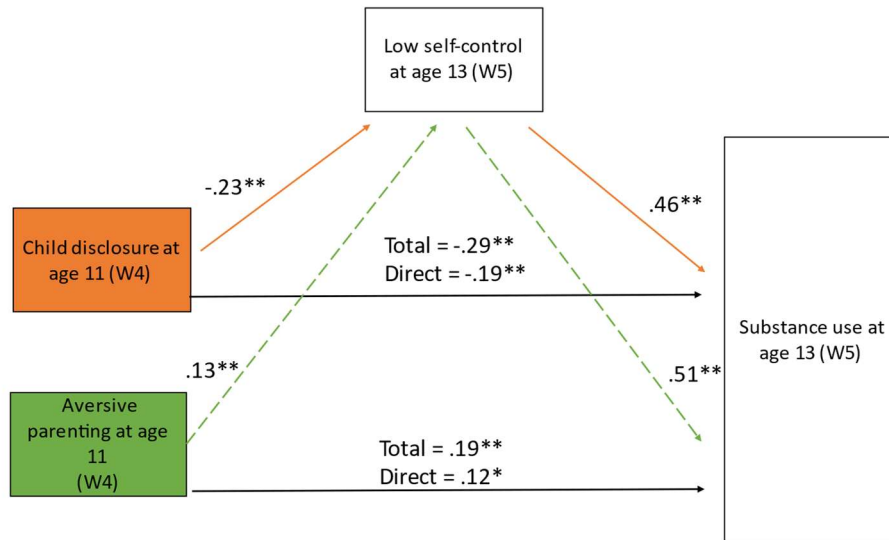


FIGURE 1. Mediation model of prospective effects of parental variables at W4 and low self-control (mediating variable) at W5 on substance use at W5.

Note: \* $p < .05$ ; \*\* $p < .01$ . Indirect effect of dimensions of dimensions of parent-child relationship via low self-control: Child disclosure ( $\beta = -.11$ ;  $SE = .02$ ; 95%  $CI = [-.14, -.08]$ ) Aversive parenting ( $\beta = .07$ ;  $SE = .02$ ; 95%  $CI = [.03, .10]$ )

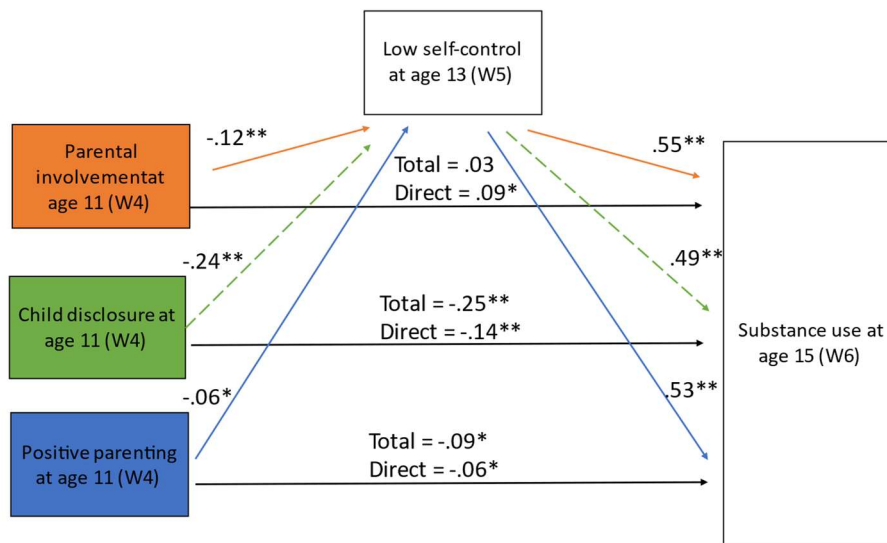


FIGURE 2. Mediation model of prospective effects of parental variables at W4 and low self-control (mediating variable) at W5 on substance use at W6.

Note:  $*p < .05$ ;  $**p < .01$ . Indirect effect of dimensions of parent-child relationship via low self-control: Parental involvement ( $\beta = -.07$ ;  $SE = .02$ ;  $95\% CI = [-.11, -.03]$ ), Child disclosure ( $\beta = -.12$ ;  $SE = .02$ ;  $95\% CI = [-.15, -.09]$ ), Positive parenting ( $\beta = -.03$ ;  $SE = .02$ ;  $95\% CI = [-.06, -.01]$ )

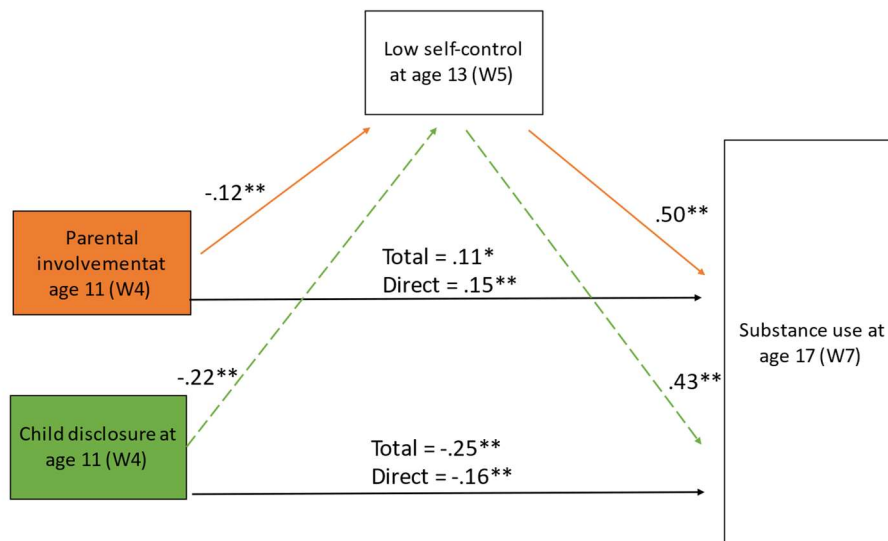


FIGURE 3. Mediation model of prospective effects of parental variables at W4 and low self-control (mediating variable) at W5 on substance use at W7.

Note: \* $p < .05$ ; \*\* $p < .01$ . Indirect effect of dimensions of parent-child relationship factors via low self-control: Parenting involvement ( $\beta = -.06$ ;  $SE = .02$ ; 95%  $CI = [-.10, -.03]$ ), Child disclosure ( $\beta = -.10$ ;  $SE = .02$ ; 95%  $CI = [-.13, -.07]$ )

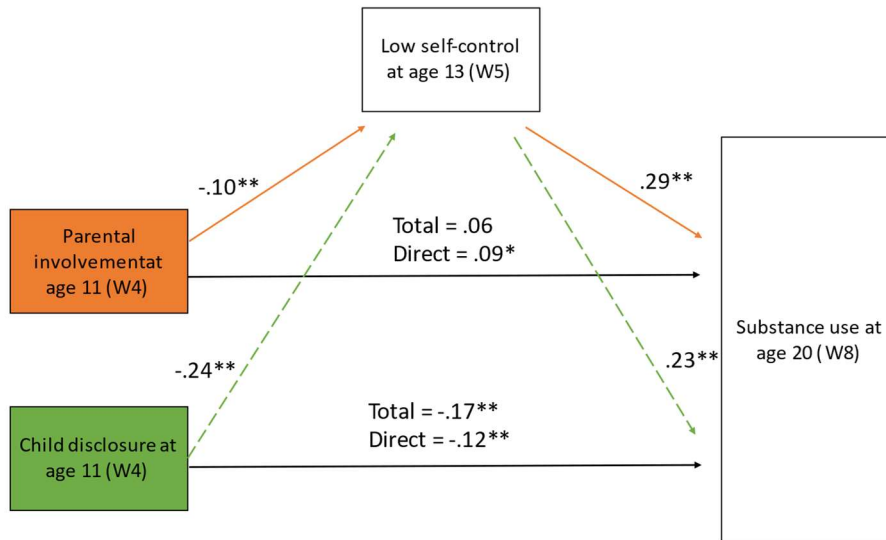


FIGURE 4. Mediation model of prospective effects of parental variables at W4 and low self-control (mediating variable) at W5 on substance use at W8.

Note:  $*p < .05$ ;  $**p < .01$ . Indirect effect of dimensions of parent-child relationship via low self-control: Parenting involvement ( $\beta = -.03$ ;  $SE = .01$ ; 95% CI =  $[-.05, -.01]$ ), Child disclosure ( $\beta = -.06$ ;  $SE = .01$ ; 95% CI =  $[-.08, -.04]$ ), Aversive parenting ( $\beta = -.03$ ;  $SE = .01$ ; 95% CI =  $[-.05, .01]$ )

## 5.4. Discussion

Scientific literature has found robust links between different dimensions of parent-child relationship and adolescent substance use (Yap et al., 2017), as well as between substance use and low level of self-control (Grindal et al., 2019; Yun et al., 2016). Nevertheless, little is known about the prospective impact of dimensions of parent-child relationship and self-control in childhood on substance use later in adolescence and early adulthood. The main objective of the current study was to explore a model focused on the prospective impact of different dimensions of parent-child relationship in childhood (namely involvement, positive parenting, parental supervision, child disclosure, authoritarianism, and aversive parenting) on subsequent substance use mediated by self-control.

Our first hypothesis based on the social capital theory (Putnam, 2000) stated that desirable parental practices would provide adolescents with a social capital that would decrease the odds of substance use. In line with scientific literature (Boden et al., 2021; King et al., 2015; Merianos et al., 2020), positive parenting was a protective factor against substance use in middle adolescence. Feeling valued by parents during childhood could be related to a higher social capital in adolescents, which in turn could prevent them from substance use. Low child disclosure was the most persistent predictor through time, with an impact on substance use up to adulthood. This suggests the necessity of making parents aware of the importance of building healthy and open relationships promoting communication (Yap et al., 2017). Surprisingly and in contrast with previous studies (King et al., 2015; Merianos et al., 2020; Yap et al., 2017), higher parental involvement was a risk factor for substance use in our sample. It is possible that this parental involvement occurs in families where substance use is a common behaviour, which makes adolescents perceive substance use as a desirable behaviour. This is congruent with the

results by Baggio et al. (2016), who suggested lower social capital is associated not only with higher substance use in terms of lack of social resources, but also with the positive attitudes to substance use in the surrounding context. More research is needed to confirm this. In addition, in line with previous studies, the strongest predictor of substance use was substance use in the past (Zych et al., 2020).

Based on self-control theory of crime (Gottfredson & Hirschi, 1990), our second hypothesis stated that low level of self-control would be a risk factor for substance use. Consistent with this hypothesis, low self-control resulted to be a consistent predictor of substance use through all waves measured from early adolescence to adulthood. This finding is in line with cross-sectional studies that related low self-control and substance use (Ford & Blumenstein, 2013; Grindal et al., 2019; Schaefer et al., 2015; Yun et al., 2016). Moreover, we explored to what extent self-control mediated the link between parental practices and substance use. Mediation analyses showed that self-control mediated this association. Yet, a study by Koning et al. (2014) found that the longitudinal effect of parental actions related to alcohol use in their offspring was mediated by self-control. However, to the best of our knowledge, there are no published studies to date that explore the mediating effect of self-control in the link between diverse dimensions of parent-child relationship and the consumption of a wide range of substances from childhood to adulthood.

The current study has important strengths, but also some limitations. The biggest strength is its longitudinal design, providing a prospective insight from childhood to adulthood. Although chronological links among dimensions of parent-child relationship, self-control, and substances were found, it should be considered that causal associations cannot be established. Furthermore, we used a wide sample with a high retention rate, which gives a broad overview of the phenomenon in diverse participants. Even though



the sample was broadly representative of Zürich population, these results may not be generalizable to other countries or cultures. However, this limitation can be overcome given the heterogeneity of the sample, with more than 50% of the parents born abroad in more than 80 different countries. Data were collected using self-reports. The validity of self-reports to measure different problem behaviours has been confirmed (Gomes et al., 2018), albeit it can entail different response biases, such as social desirability. Future studies could use other objective methods to measure substance use (e.g., hair analyses; Steinhoff et al., 2022) and explore whether substance use can longitudinally reduce levels of self-control or even if substance use by adolescents has an impact on parental practices. This would provide a more complex knowledge about the interrelation among these variables. Cross-national research comparing diverse samples from different countries and cultures is also needed to test to what extent these findings could be generalized.

Even with some limitations, these results have important implications for policy and practice. Substance use prevention programs in adolescence should not only be focused on the target population (adolescents), but they also should include parents. Involving parents and increasing their knowledge about desirable parental practices and ways to help their children in the developing of adequate self-control could be an effective element in substance use prevention.

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## **CHAPTER 6: DISCUSSION**

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Substance use is a challenging public health concern worldwide (Lo et al., 2020). Substance use entails a negative impact on human functioning, including physical (National Institute on Drug Abuse, 2020), psychological (Murphy et al., 2012) and social (Poudel and Gautam, 2017) adverse consequences. Although this negative impact occurs at all ages, it can be even more harmful in adolescence, given the crucial developmental particularities of this period (Volkow et al., 2019). Oddly, substance use onset usually takes place in adolescence (Johnston et al., 2022; Moreno et al., 2020). Reducing substance use in youth population is currently a global health priority (Degenhardt et al., 2016) For these reasons, it is essential to know how substance use evolves during adolescence, as well as identify risk and protective factors.

Many research projects report longitudinal patterns of substance use in adolescence, but the number of studies exploring specific longitudinal profiles taking into account within-individual changes in frequency of use is still low. Moreover, these studies usually focus on adolescent samples, being necessary to explore substance use in preadolescence.

Yet, scientific literature has explored diverse individual and contextual risk and protective factors related to substance use. Nevertheless, the vast majority of studies to date are based on cross-sectional designs and focused on one or a few specific factors, which prevents from discover chronological relations among variables and obtaining a wide overview of the phenomenon based on diverse factors. Thus, more longitudinal research including different individual and contextual dimensions related to substance use in adolescence is needed.

The current doctoral dissertation aimed to address these gaps in knowledge by exploring within-individual longitudinal patterns of substance use in preadolescents and adolescents. Moreover, in order to have a holistic comprehension of the issue, the

longitudinal impact of various individual and contextual factors on substance use at different stages of adolescence was explored.

### **Longitudinal profiles of substance use**

Scientific research regarding longitudinal development of substance use reports clear evidence about its increase over time (Best et al., 2018; Martínez-Fernández et al., 2018). Moreover, studies exploring latent classes of substance use agree in a general trend: non-user is the most prevalent group, followed by a group that increases their use over time and, finally, the least prevalent group of individuals who decrease their substance use over time (Oliva et al., 2008; Taylor et al., 2017). However, these studies focused on adolescence and did not take into account substance use in preadolescent stages. This encouraged us to explore specific longitudinal profiles of substance use in a sample aged 9-17 years.

Congruently with previous studies, the most prevalent group in our sample was non-user (68.1%). Notwithstanding the high percentage of non-users, this finding is alarming considering that a third part of 9-17 years old students are substance users. Taking into account the general trend over time, profiles that increased their substance use from one year to another (new user, extreme new user and ascending user) were almost three times more prevalent when compared with the profiles that decreased their substance use overtime (experiencer, extreme descending user, descending user). This result is comparable with the prevalence found by Oliva et al. (2008): first, low users; second, ascending users; finally, early experimentation. The lowest age in the sample by Oliva et al. (2008) was 13, whereas our study included participants from 9 years old. It is

therefore possible that prospective changes in a frequency of substance use are independent of the age.

According to the Gateway Theory stated by Kandel et al. (1975), substance use progress over time in a way that individuals start using weaker substances (alcohol, tobacco), which drives to the use of hard substances, such as cocaine or cannabis. Empirical research has tested this theory (Kirby and Barry, 2012; Nkansah-Amankra and Minelli, 2016; Sánchez-Niubó et al., 2020), but the number of longitudinal studies is still low. Our results provide longitudinal support to this theory. It is especially remarkable in stable occasional users and ascending users, the two most prevalent profiles reporting substance use at both times of data collection. In the case of stable occasional users, the prevalence of alcohol and tobacco use remains relatively stable across waves, but the prevalence of cannabis users increases by 5 and the use of other drugs starts to be prevalent at wave 2, when it was unreported at wave 1. Among ascending users, the percentage of cannabis users was almost ten times higher at wave 2 in comparison to wave 1.

### **Social and emotional competences and substance use**

The CASEL (2020) model of social and emotional competencies includes a set of five competencies (self-awareness, self-management, social awareness, relationship skills and responsible decision-making) to be acquired and applied in diverse contexts. This is a holistic model that considers the collaboration among school, family and the whole community as essential agents in social and emotional learning. Although the role of emotional intelligence as a protective factor against substance use has been reported (García del Castillo et al., 2013; Kun and Demetrovics, 2010), there is a dearth of research

analysing the link between substance use and social and emotional competencies based on the CASEL (2020) model.

In our sample, the longitudinal profile chronic user (frequent substance use at both times) was predicted by a low score in self-management. This is in line with Estévez et al. (2017), who related alcohol abuse with low emotional regulation. So, a poor ability to regulate own emotions and behaviour seems to be linked to hazardous substance use. Social awareness negatively predicted the profile experiencer (occasional substance use at time 1, but no use at time 2). A previous study by Parolin et al. (2017) also found that participants with substance addiction reported low social knowledge. Thus, low levels of social awareness would be a risk factor not only for substance abuse, but also for experimentation. Perhaps, people who struggle to understand the dynamics of different social settings are less prone to reject risky behaviours.

In addition, adolescents who scored lower on responsible decision making had higher odds of belonging to the profile ascending user (occasional substance use at time 1 and frequent use at time 2). This is congruent with previous cross-sectional research (Alameda et al., 2012; Clay & Parker, 2018) and supports the idea that substance users are less likely to consider the potential negative outcomes of their actions and tend to seek immediate reward (Vélez et al., 2010). Although some cross-sectional studies pointed out that substance use is related to low levels of emotional awareness (Estévez et al., 2017) and self-awareness (Hodder et al., 2016; Parolin et al., 2017), our analyses did not report longitudinal significant relation between substance use and self-awareness. More research with larger samples exploring the longitudinal association between substance use and self-awareness is needed, given that our model excluded from the regression analysis those profiles which did not have enough number of participants (extreme new user, extreme descending user and descending user).

## **Empathy and substance use**

Scientific evidence generally supports the idea that empathy is a protective factor against substance use. In this way, appropriate levels of empathy have been found to protect young people against tobacco and inhalants use (Pérez de la Barrera, 2012), as well as alcohol and cannabis use (Schmits & Glowacz, 2018). However, results among studies are contradictory when they analyse separately both dimensions of empathy (cognitive empathy and affective empathy) in relation to substance use. Ferrari et al. (2014) found lower scores in affective empathy among substance addicted in comparison with non-addicted, while differences in cognitive empathy were insignificant between both groups. On the other hand, Dolder et al. (2016) identified that levels of affective empathy significantly increased, while cognitive empathy significantly decreased after using LSD. Hysek et al. (2014) also showed that affective empathy was significantly higher after using MDMA, but changes in cognitive empathy were not significant between users and non-users.

Similarly to Ferrari et al. (2014), in our study, cognitive empathy was not related to substance use, whereas affective empathy was. Specifically, individuals with lower levels of empathy were more prone to be experiencers. The use of substances by these students could be a tool to be included in the group. This finding is contrary to previous experimental studies (Dolder et al., 2016; Hysek et al., 2014) reporting an increase in cognitive empathy in substance users. The main difference may be that these studies measured empathy right before the administration of the drug (a specific moment). In contrast we assessed empathy and substance use in a daily life instead of considering a specific moment.



In any case, more longitudinal research is needed using validated instruments and representative samples in order to shed light on the relation between adolescent substance use and empathy taking into account the bidimensional nature of the construct.

### **The Self-Control Theory of Crime: parenting, self-control and substance use**

According with the Self-Control Theory of Crime (Gottfredson & Hirschi, 1990), inappropriate parental practices prevent children from developing adequate level of self-control. This lack of self-control results in different problematic behaviour, such as substance use. Empirical studies report robust evidence about the prospective impact of negative parental practices on substance use (Yap et al., 2017). Also, undesirable parenting has been related to a poor development of self-control (Li et al., 2019). However, to the best of our knowledge, there are not empirical longitudinal studies examining the prospective impact of parental practices in childhood on later substance use in adolescence, testing the possible mediating role of self-control. Some cross-sectional studies that approached this model have been conducted (Kabiri et al., 2020; Tarantino et al., 2015; Vazsonyi et al., 2016), but they are insufficient to establish chronological relations among variables. A longitudinal study by Koning et al. (2014) found that high parental rules about alcohol use and the quality of parent-child communication about alcohol predicted high self-control one year later, which, in turn, was a longitudinal protective factor against alcohol use. Nevertheless, they only measured parental practices related to alcohol use, not parental practices in general. In addition, parental variables in that study were measured in adolescence. For that reason, we aimed to explore the prospective impact of different dimensions of parent-child relationship in childhood on substance use later in adolescence, analysing the possible mediating role of self-control in this relation.

Based on the Social Capital Theory (Putnam, 2000), we hypothesised that desirable parental practices in childhood would be a protective factor against substance use in adolescence. This was partially confirmed. Congruent with previous research, we found that participants who scored higher on positive parenting in childhood were less likely to use substance in middle adolescence (Boden et al., 2021; King et al., 2015; Merianos et al., 2020). On the other hand, and contrary to previous studies, parental involvement in childhood was a risk factor for adolescent substance use in our sample (King et al., 2015; Merianos et al., 2020; Yap et al., 2017). Perhaps, this parental involvement was reported regarding parents who use substances in their daily lives, transmitting the idea to their offspring that substance use is a normal behaviour.

Another key parenting variable related to substance use is parental supervision. Stattin and Kerr (2020) highlighted that parental supervision is a bidimensional construct including not only parental monitoring but also child revelation. Numerous studies demonstrated that parental supervision is a protective factor against substance use (Cablova et al., 2016; Shek et al., 2020; Valente et al., 2019), but these studies only measured parental monitoring, excluding the element of child disclosure proposed by Stattin and Kerr (2020). Our findings showed that low levels of child disclosure in childhood is the most persistent predictor of substance use at different stages of adolescence and even in early adulthood. Marceau et al. (2020) also found that low child disclosure was related to more substance use, but they only studied a sample of early adolescents. It should be emphasised that the most persistent dimension of parent-child relationship predicting substance use is not a parental practice itself, but children's behaviour. Notwithstanding, this is an alert informing about the importance of promoting communication with children, as well as building healthy and reliable relationships between parents and children (Yap et al., 2017).

Moreover, in line with scientific literature we found that inappropriate parental practices were related to low self-control (Li et al., 2019) and low self-control was related to more substance use (Grindal et al., 2019; Schaefer et al., 2015; Yun et al., 2016). Indeed, our model showed that low self-control is the strongest predictor (excluding substance use in the past) of substance use in adolescence and early adulthood. Given these results and based on the Self-Control Theory of Crime (Gottfredson & Hirschi, 1990), mediation analyses were conducted in order to check if self-control mediated the association between different dimensions of the parent-child relationship and substance use. Our findings confirmed that all the links between substance use and dimensions of the parent-child relationship were mediated by low levels of self-control. Our models showed that even parental variables without an important impact on substance use (parental involvement at age 11 on substance use at 15 and 20), had an impact on substance use via low levels of self-control. These outcomes are worthy for scientific literature since they provide empirical support to the Self-Control Theory of Crime (Gottfredson & Hirschi, 1990) in relation to substance use.

### **School-related factors and substance use**

Several dimensions related to school act as protective factors against substance use in adolescence (Fletcher et al., 2008). In this way, substance use has been linked to poor academic performance (Centers for Disease Control and Prevention, 2020). Our results showed that lower grades (as a measure of academic performance) were related to higher odds of using alcohol, tobacco, cannabis and also increased the odds of intoxication. This is congruent with previous research (Gaete & Araya, 2017; Heradsveit et al., 2017; Meda et al., 2017; Oelsner et al., 2011) and should warn educators about increasing substance use prevention efforts in students with poor academic performance.

Prevention at this stage, could prevent from future problems in other areas, such as workplace. Another predictor of substance use in our study was the number of school exclusions due to misconduct. Yet, empirical research had reported evidence about the overlap among different types of antisocial behaviours (Nasaescu et al., 2020).

Nonetheless, the impact of school related dimensions on adolescents is beyond academic factors and students' behaviour itself. School is a crucial context of development, where emotional links are established with peers, with teachers and even with the school itself as an institution. The Social Bond Theory (Hirschi, 1969) states that antisocial behaviour can be avoided through the development of social bonds with different agents in our environment. On the basis of this theory, we aimed to analyse if adolescent substance use could be prevented through the development of bonds with teachers, peers and school. According to our findings, disliking school is related to more alcohol and tobacco use and it is also a longitudinal predictor of intoxication. A low feeling of belonging (Syed et al., 2021) to school can explain the development of antisocial behaviours, such as substance use, and even the engagement in hazardous habits like intoxication. It could be a mechanism to evade from the reality.

In our sample, bonding with teachers was cross-sectionally linked with lower levels of alcohol and illicit substance use, whereas bonding with classmates acted as a cross-sectional protective factor against illicit substance use and intoxication. However, this significant associations disappeared over time. This partially supports the Social Bond Theory (Hirschi, 1969), by demonstrating that bonds with teachers and classmates prevent adolescents from substance use. The extinction of these significant relations over time could be due to the change of teachers and classmates from one year to another during Secondary School in Spain. Consequently, adolescents can establish different relationships and different emotional links with diverse teachers and friends in different

school years. More longitudinal research is needed to further study the impact of these bonds on substance use over time. Somehow, these results lead to believe that fostering a desirable school climate and promoting healthy relationships between teachers and students, as well as among classmates could be a powerful protective factor against substance use.

### **Socio-economic status and substance use**

High socio-economic status has been identified as a protective factor that increases the engagement in healthy behaviours (De Hoog et al., 2020). There is robust scientific evidence pointing out that socio-economic status is closely linked to substance use (Spooner & Hetherington, 2004). Socio-economic status is a broad concept that includes a wide variety of elements, such as economic income, education, occupation, place of residence or cultural background (American Psychological Association, 2015). Empirical research usually considers one or a few elements in the measurement of socio-economic status. While low neighbourhood socio-economic status was systematically found to be a risk factor for substance use (Lee et al., 2018; Shih et al., 2017), there are discrepancies among studies regarding the impact of family socio-economic status on adolescent substance use. Moreno et al. (2020) or Petruzelka et al. (2020) related high family socio-economic status with more substance use, whereas Leventhal et al. (2015) or Andrabi et al. (2017) found that low family socio-economic status was a risk factor for substance use. These findings make sense from the perspective of the Ecological Theory (Bronfenbrenner, 1979), which assumes that the diverse contexts surrounding people have a differential impact on individual's behaviour. Notwithstanding, the number of studies exploring the differential prospective impact of family and neighbourhood socio-economic status on adolescent substance use in a single study is still low.

In our sample, congruently with previous research, high family socio-economic status was related to more likelihood of alcohol use (Moreno et al., 2020; Petruzelka et al., 2020). It is more, this association broadened to other substances over time, becoming a longitudinal predictor of using tobacco, cannabis and other illicit substances. A plausible explanation is that an easier access to money increases the possibilities to purchase different type of substances. On the other hand, and in line with other studies, participants living in a low socio-economic status neighbourhood were more prone to use alcohol, tobacco, illicit drugs and reported higher likelihood of intoxication (Lee et al., 2018; Shih et al., 2017). It can be due to the lack of leisure activities in these contexts (Levy, 2008), which could drive to antisocial or unhealthy behaviours; or the higher frequency of drug dealing in low-income neighbourhoods (Chang et al., 2016). However, neighbourhood socio-economic status did not show a significant impact on substance use one year later.

These findings confirm our hypothesis presuming that high family socio-economic status, but low neighbourhood socio-economic status would be risk factors for substance use. In addition, our results provide support to the Ecological Theory (Bronfenbrenner, 1979) by proving that closer contexts (in this case, family) have a more stable impact on behaviour over time when compared with broader contexts (neighbourhood).

### **Strengths, weaknesses and implications**

The biggest strength of the current doctoral dissertation is the longitudinal design used in the three studies, which made possible to establish chronological relations among variables. This is especially remarkable in the Study 3, given that it includes five waves

of data collection, providing evidence from childhood to early adulthood, including different stages of adolescence. Another important strength is the high number of participants in each sample: almost 900 in Study 1, almost 700 in Study 2 and more than 900 in study 3. These large samples, together with the high diversity among participants, could overcome the limitation that in 2 out of 3 studies the sample was selected by convenience. So, these results may be generalisable to other contexts.

Despite the above-mentioned strengths, this doctoral dissertation also has some weaknesses. The most important weak point could be that data were collected using self-reports. Although the appropriateness of self-reports to assess problem behaviours has been tested (Gomes et al., 2018), these instruments of data collection can lead to several response biases, such as social desirability bias. Additionally, socio-economic status in Study 2 was measured as a subjective variable (self-perceived socio-economic status). Subjective socio-economic status has been confirmed as a meaningful measure of socio-economic status (Präg, 2020). However, future studies could include objective measures of socio-economic status when analysing its longitudinal impact on substance use.

Even with some weaknesses, this doctoral dissertation has important implications for research, policy and practice. Regarding implications for research, findings from these studies provide empirical support to five popular theories in developmental psychology: the Gateway Theory (Kandel, 1975 et al.), the Social Capital Theory (Putnam, 2000), the Self-Control Theory of Crime (Gottfredson & Hirschi, 1990), the Social Bond Theory (Hirschi, 1969) and the Ecological Theory (Bronfenbrenner, 1979). In relation to implications for policy, our results showed that an adequate development of social and emotional competencies, empathy and self-control, as well as a positive school climate are protective factors against substance use. Therefore, the inclusion of these components in the school curriculum could be a key element to prevent or decrease substance use.

Moreover, based on our results, fostering employment in low-income neighbourhoods and promoting healthy leisure activities in these contexts could reduce substance use. Finally, implications for practice should also be taken into account. We found that substance use in the past was a strong predictor of substance use in the future. Prevention programmes are usually addressed to adolescents, but our results report prevalence of substance use since late childhood. Thus, conducting prevention programmes at early stages could decrease substance use or, at least, delay the age of onset.





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# APPENDIX

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## Appendix: Impact Factor Report

<b>Study 1</b>	<b>Rodríguez-Ruiz, J., Zych, I., Llorent, V. J., &amp; Marín-López, I. (2021). A longitudinal study of preadolescent and adolescent substance use: within-individual patterns and protective factors. <i>International Journal of Clinical and Health Psychology, 21</i>, 100251. <a href="https://doi.org/10.1016/j.ijchp.2021.100251">https://doi.org/10.1016/j.ijchp.2021.100251</a></b>
<b>Impact factor JCR (2021)</b>	5.900
<b>Quartile and ranking by category</b>	Q1 (20/131) Psychology, Clinical
<b>Indexation</b>	Social Sciences Citation Index SCOPUS PubMed Central PsycInfo, IBECs (Índice Bibliográfico Español de Ciencias de la Salud) Psicodoc.

<b>Study 2</b>	<b>Rodríguez-Ruiz, J., Zych, I., Llorent, V. J., Marín-López, I., Espejo-Siles, R., Nasaescu, E. (2023). A longitudinal study of protective factors against substance use in early adolescence. An ecological approach. <i>International Journal of Drug Policy</i>, 112, 103946. <a href="https://doi.org/10.1016/j.drugpo.2022.103946">https://doi.org/10.1016/j.drugpo.2022.103946</a></b>
<b>Impact factor JCR (2021)</b>	5.931
<b>Quartile and ranking by category</b>	Q1 (5/37) Substance Abuse
<b>Indexation</b>	ASSIA Sociological Abstracts Social Services Abstracts International Bibliography of the Social Sciences PubMed/Medline Cumulative Index to Nursing and Allied Health Literature Addiction Abstracts Criminal Justice Abstracts Embase Elsevier BIOBASE Scopus

<b>Study 3</b>	<b>Rodríguez-Ruiz, J., Zych, I., Ribeaud, D., Steinhoff, A., Eisner, M., Quednow, B., Shanahan, L. (2023). The influence of different dimensions of the parent-child relationship in childhood as longitudinal predictors of substance use in late adolescence. The mediating role of self-control. <i>International Journal of Mental Health and Addiction</i>. <a href="https://doi.org/10.1007/s11469-023-01036-8">https://doi.org/10.1007/s11469-023-01036-8</a></b>
<b>Impact factor JCR (2021)</b>	11.555
<b>Quartile and ranking by category</b>	Q1 (8/143) Psychiatry
<b>Indexation</b>	AGRICOLA BFI List Baidu CLOCKSS CNKI CNPIEC Current Contents / Social & Behavioral Sciences Current Contents/Clinical Medicine Dimensions EBSCO Academic Search EBSCO Book Review Digest Plus EBSCO Discovery Service EBSCO OmniFile EBSCO STM Source EBSCO Social Sciences Abstracts EMCare Google Scholar Japanese Science and Technology Agency (JST) Journal Citation Reports/Science Edition Journal Citation Reports/Social Sciences Edition Naver Norwegian Register for Scientific Journals and Series OCLC WorldCat Discovery Service Portico ProQuest-ExLibris Primo ProQuest-ExLibris Summon PsycINFO SCImago SCOPUS Science Citation Index Expanded (SCIE) Semantic Scholar Social Science Citation Index TD Net Discovery Service UGC-CARE List (India) Wanfang