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APLICANDO A MODELAGEM DE EQUAÇÕES ESTRUTURAIS AO CAMPO DA PREVENÇÃO AO USO DE DROGAS: ANÁLISES RESULTANTES DE UM ENSAIO CONTROLADO RANDOMIZADO PARA AVALIAÇÃO DO PROGRAMA DE PREVENÇÃO AO USO DE DROGAS #TAMOJUNTO"

Tese apresentada à Universidade Federal de São Paulo para obtenção do Título de Doutor em Ciências.

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Orientadora: Profª Drª Zila van der Meer Sanchez

Co-orientador: Profº Drº Hugo Cogo-Moreira

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Sumário

Lista de abreviaturas e siglas

DALYs	Disability Adjusted Life Years
CEBRID	Centro Brasileiro de Informações sobre Drogas Psicotrópicas
PeNSE	Pesquisa Nacional da Saúde do Escolar
OMS	Organização Mundial da Saúde
OPAS	Organização Pan-americana de Saúde
NIDA	National Institute on Drug Abuse
PROERD	Programa Educacional de Resistência às Drogas
UNODC	Escritório das Nações Unidas para Drogas e Crime
SPR	Society for Prevention Research
SEM	Structural Equation Modeling
CFA	Confirmatory Factor Analysis
LCA	Latent Class Analysis
LTA	Latent Transitional Analysis
EU-Dap	European Drug Addiction Prevention Trial
UNIFESP	Universidade Federal de São Paulo
UFSC	Universidade Federal de Santa Catarina
ABEP	Associação Brasileira de Empresas de Pesquisa
AIC	Akaike Information Criterion
BIC	Bayesian Information Criterion
SSABIC	Sample Size-Adjusted Bayesian Information Criterion
VLMR	Vuong Lo Mendell Rubin test
CFI	Chi-Squared Comparative Fit Index
TLI	Tucker–Lewis Index

RMSEA	Root–Mean–Square Error of Approximation
WRMR	Weighted Root Mean Square Residual
TCLE	Termo de Consentimento Livre e Esclarecido

Resumo

Introdução: O uso de álcool e outras drogas é considerado um problema de saúde pública mundial, pois desencadeia uma série de comprometimentos à saúde da população. Com os adolescentes, estes prejuízos podem ser ainda mais graves, uma vez que o cérebro em desenvolvimento não se encontra preparado para lidar com o efeito do álcool e outras drogas. Considerando a importância de se testar ferramentas inovadoras para investigar de forma robusta os fatores de risco e proteção para o uso de drogas por adolescentes, bem como o efeito dos programas de prevenção na redução ou retardo deste consumo, esta tese teve como objetivo aplicar o conhecimento da modelagem de equações estruturais ao campo da prevenção ao uso de drogas. Metodologia: Foram utilizados os dados de um ensaio controlado randomizado por cluster, realizado nos anos de 2014/2015, com 6.391 estudantes, com idades entre 11 e 15 anos, de 72 escolas públicas, em 6 cidades brasileiras, para avaliar os efeitos do programa escolar governamental de prevenção ao uso de drogas #Tamojunto (*Unplugged*). As turmas do grupo intervenção receberam as 12 aulas do #Tamojunto, aplicadas por professores da própria escola, sob supervisão da equipe do Ministério da Saúde. O grupo controle não recebeu nenhum programa de prevenção do uso de álcool e outras drogas neste período. Os dados foram coletados através de questionário anônimo de autopreenchimento, em 3 momentos: antes da intervenção, 9 meses e 21 meses depois. Foram realizadas análises de dados, utilizando a técnica de modelagem de equações estruturais (Análise de Classe Latente, Análise de Transição Latente, Análise Fatorial Confirmatória, Mediação e Moderação), que resultaram em 6 artigos, divididos em dois eixos: 1. Análises dos preditores parentais (estilo parental e uso de álcool pelos pais) do padrão de uso de drogas e demais comportamentos de risco na adolescência e 2. Análises dos efeitos do programa escolar

de prevenção do uso de drogas #Tamojunto. Resultados: Os resultados mostraram que os estilos parentais e o uso de álcool pelos pais são preditores dos padrões de uso de drogas e de comportamentos de risco dos adolescentes. A intervenção não teve êxito na alteração dos padrões de uso de drogas na adolescência, e é improvável que o seu efeito seja moderado pelos estilos parentais. O efeito do programa é mediado pelas habilidades de tomada de decisão, mas na direção oposta à esperada. Conclusão: Desta forma, conclui-se que a modelagem de equações estruturais tem aplicabilidade no campo da prevenção ao uso de drogas, sendo uma ferramenta que permite aos pesquisadores responderem as suas perguntas de pesquisa de forma mais robusta e precisa, uma vez que leva em conta a complexidade dos dados. Além disso, podemos concluir que intervenções preventivas devem incluir no seu escopo componentes que visem ajudar os pais a adquirirem habilidades parentais, tais como monitoramento e suporte afetivo, bem como fazê-los refletirem sobre o impacto do seu consumo de álcool no comportamento dos seus filhos. Devido aos resultados nulos e negativos do Programa #Tamojunto no Brasil, sugere-se uma reavaliação da adaptação cultural do programa.

Palavras-chave: Prevenção Primária, Drogas Ilícitas, Consumo de bebidas alcoólicas, Adolescente, Pais, epidemiologia, ensaio controlado randomizado.

Abstract

Introduction: The use of alcohol and other drugs are considered a worldwide public health problem, as it triggers series of health problems for the population. Regarding adolescents, this damage can be even more serious, since their developing brain is not prepared to deal with the effects of alcohol and other drugs. Considering the importance of testing innovative tools to robustly investigate risk and protective factors for adolescent drug use, as well as the effect of prevention programs on reducing or delaying this consumption, this thesis aimed to apply knowledge from structural equations modeling to the field of drug use prevention. Methodology: Data from a cluster randomized controlled trial of 6,391 students, aged 11 to 15 years, from 72 public schools in 6 Brazilian cities were used to assess the effects of the government's drug prevention program #Tamojunto (Unplugged). Those in the intervention group received the 12 #Tamojunto lessons applied by trained teachers, under the supervision of the Brazilian Ministry of Health. The control group did not receive any drug prevention program during this period. Data were collected through an anonymous self-administered questionnaire, in 3 moments of time: before the intervention, 9 months and 21 months later. Data analyzes were performed using the structural equation modeling technique (Latent Class Analysis, Latent Transition Analysis, Confirmatory Factor Analysis, Mediation and Moderation) which resulted in 6 articles, divided into two axes: 1. Analysis of parental predictors (parenting style and parental alcohol use) of patterns of drug use and other risk behaviors in adolescence and 2. Analysis of the effects of the school-based prevention program #Tamojunto. Results: The results showed that parenting styles and parental alcohol use are predictors of adolescent drug use patterns and risk behaviors. The intervention was unsuccessful in changing adolescents' patterns of drug use; and its effect

is unlikely to be moderated by parenting styles. The effect of the program is mediated by decision-making skills, but in the opposite direction than expected. Conclusion: Thus, it is concluded that structural equations modeling has applicability in the field of drug use prevention, being a tool that allows researchers to answer their research questions in a more robust and precise way, since it takes into account the complexity of the data. In addition, we can also conclude that preventive interventions should include components that aim to help parents acquire parenting skills, such as monitoring and emotional support, as well as making them reflect on the impact of their alcohol consumption on their children's behavior. Due to the null and negative results of the #Tamojunto program in Brazil, the components of the Brazilian adaptation of the Unplugged prevention program should be reevaluated.

Keywords: primary prevention, illicit drugs, alcohol consumption, adolescent, parents, epidemiology, randomized controlled trial.

1. INTRODUÇÃO

1.1. Uso de drogas na adolescência

A preocupação mundial com os prejuízos relacionados ao uso de drogas na adolescência é visivelmente crescente (CATALANO et al., 2012; DEGENHARDT et al., 2016; HALL et al., 2016). O álcool e as outras drogas estão classificados entre os principais fatores de risco acidentais em adolescentes de 10-24, anos de acordo com a classificação por DALYs (*Disability Adjusted Life Years*), que mede o número de dias de vida perdidos devido à incapacitação e morte precoce (GORE et al., 2011). Dentre os países mais populosos do globo, o Brasil tem a segunda maior taxa de complicações decorrentes do consumo de álcool (REHM et al., 2001).

O consumo de bebidas alcoólicas e outras drogas por adolescentes está associado com uma série de prejuízos a curto prazo, tais como: violência interpessoal (BONOMO et al., 2001; SWAHN et al., 2004), *bullying* (VALDEBENITO; TTOFI; EISNER, 2015), comportamento sexual de risco (REIS et al., 2020; SANCHEZ; RIBEIRO; WAGNER, 2015), acidentes de trânsito (PECHANSKY; SZOBOT; SCIVOLETTO, 2004), ideação suicida (SELLERS; MCROY; O'BRIEN, 2019). A experimentação de drogas na adolescência também é descrita como fator preditor para insucesso escolar e problemas de saúde (HAWKINS; CATALANO; MILLER, 1992; HERADSTVEIT et al., 2017).

A literatura que demonstra os riscos do consumo precoce de drogas para o desenvolvimento a longo prazo dos adolescentes vem crescendo (HALL et al., 2016). O uso de drogas nesta faixa etária tende a ser muito prejudicial, uma vez que o sistema nervoso central ainda está em processo de amadurecimento (BAVA; TAPERT, 2010; BREYER; WINTERS, 2015). Isso pode ocasionar uma série de prejuízos cerebrais (WHITE; SWARTZWELDER, 2004), como *déficits* cognitivos (ANDREWS et al., 2008; LEES et al.,

2020; MEIER et al., 2012; NADER; SANCHEZ, 2018), prejuízos no ajustamento social e profissional (FERGUSSON; BODEN, 2008), aumento da vulnerabilidade para desenvolvimento de doenças psiquiátricas (JAMES; JAMES; THWAITES, 2013; WITTCHEN et al., 2007), além de uma maior predisposição para realizar uso abusivo/ problemático (BUCHMANN et al., 2009; KIM et al., 2017; LIANG; CHIKRITZHS, 2015; NEWTON-HOWES; BODEN, 2016; SANCHEZ et al., 2013), ou mesmo desenvolver dependência química no futuro (BONOMO et al., 2004; CHATTERJEE; DWIVEDI; SINGH, 2019; HINGSON; HEEREN; WINTER, 2006; LOPES et al., 2013).

Considerando os riscos que envolvem o uso de drogas por adolescentes, o consumo no Brasil é expressivo, principalmente no que se refere ao uso de álcool. De acordo com o último levantamento, realizado em 2010 pelo Centro Brasileiro de Informações sobre Drogas Psicotrópicas (CEBRID), sobre o consumo de drogas entre os estudantes brasileiros de 12 a 18 anos, 42,4% e 9,6% dos estudantes relataram já terem feito uso de álcool e tabaco, respectivamente. Em relação ao consumo de drogas ilícitas, 25,5% dos estudantes referiram terem experimentado pelo menos uma vez na vida. Este mesmo estudo evidenciou que as primeiras drogas consumidas são as drogas lícitas (álcool e tabaco), sendo que a idade média de início do consumo de álcool entre adolescentes é de 13 anos (IC95% 12,9 – 13,1) e de tabaco é de 13,3 anos (IC95% 13,2 - 13,4) (CARLINI et al., 2010). Dados mais recentes, provenientes da Pesquisa Nacional da Saúde do Escolar (PeNSE) realizada em 2015, mostraram que a experimentação de cigarro (nos últimos 30 dias) foi de 18,4%, entre os escolares do 9º ano do ensino fundamental. O indicador de experimentação de cigarro para os meninos (19,4%) foi superior, quando comparado às meninas (17,4%). Em relação à experimentação de álcool (uso na vida), 55,5% dos escolares do 9º ano do ensino fundamental responderam positivamente e 23,8% relataram fazerem consumo atual de bebida alcoólica (últimos 30 dias). Quanto à ocorrência de embriaguez, 21,4% dos escolares informaram já

terem sofrido algum episódio de embriaguez na vida. Em relação às drogas ilícitas, os dados mostram que 9,0% dos escolares do 9º ano do ensino fundamental já utilizaram pelo menos uma vez na vida (IBGE, 2016).

1.2. Fatores de risco e proteção ao uso de drogas na adolescência

Já existe um consenso geral de que não há uma única causa para explicar a etiologia do uso de drogas na adolescência, nem mesmo o desenvolvimento de um quadro de dependência química, pois trata-se de uma conjunção de fatores genéticos, psicológicos, sociais e ambientais (GALEA; NANDI; VLAHOV, 2004; SCHENKER; MINAYO, 2005).

Dentro deste contexto, as diretrizes de um programa de prevenção devem ser estruturadas dentro do objetivo de reduzir fatores de risco e aumentar fatores de proteção (CLEVELAND et al., 2008; NIDA, 2003). Fatores de risco são aquelas situações negativas que colocam os sujeitos em vulnerabilidade à experimentação e abuso de drogas. Por outro lado, fatores de proteção estão relacionados à redução do potencial de abuso e ao aumento da resistência à experimentação (HAWKINS; CATALANO; MILLER, 1992). Um estudo americano multicêntrico evidenciou que adolescentes sem fatores de risco têm menos de 10% de chance de iniciar o uso da substância aos 12 anos, enquanto que as crianças com dois ou mais fatores de risco tinham mais do que 50% de chance de iniciar o uso da substância nesta idade (KAPLOW et al., 2002). Não se pode perder de vista que um fator de risco não determina um comportamento, nem é a sua causa. O risco sugere maior vulnerabilidade, maior chance de estar exposto a determinado dano (WONGTONGKAM et al., 2014).

Existem vários fatores de risco e proteção para uso de substâncias descritos na literatura. Os fatores de risco e proteção funcionam como que uma balança em constante desequilíbrio, sendo que a prevenção e a promoção à saúde têm papel fundamental em mantê-la inclinada no sentido favorável aos fatores de proteção. Os principais fatores de risco e

proteção podem ser agrupados nas seguintes categorias: fatores interpessoais ou individuais, fatores familiares e fatores sociais. Dentre os fatores interpessoais, podem ser destacados os comportamentos antissociais e a baixa autoestima como fatores de risco e, por outro lado, habilidades sociais, emocionais e boa autoestima como fatores de proteção (CLEVELAND et al., 2008). No âmbito social, as crianças que demonstram comportamento inadequado em sala de aula, queda da performance escolar, capacidade empobrecida de lidar com os problemas e amizade com colegas problemáticos são consideradas em situação de risco. Entretanto, as crianças que demonstram vinculação com as atividades da comunidade e sucesso na performance escolar são consideradas mais protegidas do envolvimento com drogas (NIDA, 2003). No domínio familiar, os fatores de proteção mais conhecidos são a ligação positiva (acolhimento e suporte emocional) entre os membros da família, o estabelecimento e o monitoramento de regras claras e consistentes (BERGE et al., 2016; TANDOWSKI et al., 2015).

1.2.1. Estilos parentais: importante fator de risco e proteção para o uso de drogas na adolescência

Considerando a importância do ambiente familiar para a formação das crianças e adolescentes (SCHENKER; MINAYO, 2005), uma série de estudos mostram que a família tem um impacto significante no uso de drogas dos adolescentes (DISHION; MCMAHON, 1998; PRATTA; SANTOS, 2006).

Baumrind (1966) foi a pioneira em desenvolver um modelo tipológico, que pudesse classificar os estilos de relação dos pais com seus filhos, levando em conta tanto os aspectos comportamentais, quanto os afetivos envolvidos na criação. Com estes critérios, propôs o reconhecimento de três estilos preponderantes: autoritário, autoritativo e permissivo. De acordo com esta classificação, os pais autoritários são aqueles que adotam um estilo

educacional baseado no cumprimento de regras rígidas, restrição do diálogo e ênfase na disciplina através da afirmação do seu poder. Os pais autoritativos, assim como os pais autoritários, conferem grande relevância ao controle parental; entretanto, se diferem, uma vez que fazem isso através do diálogo, compartilhando com a criança o raciocínio por detrás da forma como eles agem. Denotam atitudes compreensivas, geradas através de apoio emocional e da bidirecionalidade na comunicação. O estilo parental permissivo caracteriza-se pela ausência de controle parental sobre os comportamentos dos filhos. Desta forma, não os influenciam de forma ativa e responsável, evitando a utilização do poder e da conduta punitiva.

Na década de 1980, Maccoby e Martin (1983) agregaram ao modelo descrito anteriormente a compreensão do estilo parental negligente. Além disso, introduziram um esquema quádruplo de classificação dos estilos parentais, que se tornou bastante utilizado, baseado na combinação de dois níveis: exigência (*demandingness*) e responsividade (*responsiveness*). Pais do tipo autoritário-autocrático denotam um padrão de elevada exigência e baixa responsividade. Exigem obediência às regras e oferecem ambientes pouco calorosos, de reduzida comunicação e habitual castigo físico. O estilo parental indulgente-permissivo caracteriza-se por padrões de baixa exigência e alta responsividade. Estes pais apresentam poucas regras, evitam punição e são extremamente tolerantes com as atitudes dos filhos, evitando condutas de controle. O estilo parental autoritativo-recíproco configura-se por elevada exigência e elevada responsividade, ou seja, há uma reciprocidade; os filhos devem responder às exigências dos pais, mas estes também aceitam a responsabilidade de responderem, o quanto possível, aos pontos de vista e razoáveis exigências dos filhos. Os progenitores com um estilo indiferente-não envolvido denotam baixa exigência e baixa responsividade. Estes pais são também chamados de negligentes e caracterizam-se por não se disponibilizarem para as responsabilidades e tarefas da parentalidade.

Alguns estudos internacionais demonstram que o estilo parental autoritativo (alto suporte e alto controle) está relacionado com melhores desfechos de uma forma geral (CHEN et al., 2019), e com menor consumo de álcool (BERGE et al., 2016; SHUCKSMITH; GLENDINNING; HENDRY, 1997; ZUQUETTO et al., 2019), assim como redução de consumo abusivo de álcool (SHAKYA; CHRISTAKIS; FOWLER, 2012) e menores chances de consumo pesado de álcool (HOFFMANN; BAHR, 2014) pelos adolescentes. Também foram encontradas evidências, apontando que filhos de pais autoritativos possuem menos envolvimento com tabaco (MILLER et al., 2011; SHAKYA; CHRISTAKIS; FOWLER, 2012) e outras drogas (ADALBJARNARDOTTIR; HAFSTEINSSON, 2001). Duas revisões publicadas recentemente, uma da literatura científica e outra sistemática, corroboram este dado, mostrando que o estilo parental autoritativo está associado aos melhores desfechos, em relação ao consumo de álcool e outras drogas na adolescência (BECOÑA et al., 2012; ČABLOVÁ; PAZDERKOVÁ; MIOVSKÝ, 2014).

Por outro lado, o estilo parental negligente (baixo suporte e baixo controle) é evidenciado, em muitos estudos, como estando associado a maiores taxas de consumo de drogas por adolescentes (ADALBJARNARDOTTIR; HAFSTEINSSON, 2001; BERGE et al., 2016; CHASSIN et al., 2005; MARTINEZ-LOREDO et al., 2016; SHUCKSMITH; GLENDINNING; HENDRY, 1997).

Se, por um lado, os estilos parentais autoritativo e negligente estão claramente descritos como protetores e de risco para o consumo de drogas na adolescência, respectivamente, os estilos parentais autoritário e indulgente apresentam efeitos divergentes e contraditórios na literatura científica.

Uma metanálise recente (PINQUART, 2017) identificou que o controle parental severo (característico do estilo parental autoritário) mostrou ter fortes associações com problemas de externalização, tal como o uso de drogas. Alvarenga e Piccinini (2001)

encontraram associação entre o estilo autoritário e crianças com problemas de comportamento da linha da externalização, tal como o uso de drogas, assim como um estudo português, que verificou correlação positiva entre o consumo de tabaco e pais autoritários (MAGALHÃES; FONTE, 2007). Hoffmann e Bahr (2014) também descrevem, em seu estudo, que o estilo autoritário aparece associado ao consumo de álcool. No entanto, dois estudos europeus mais recentes encontraram associação entre o estilo parental autoritário e menores níveis de consumo de substâncias entre os jovens (BECOÑA et al., 2013; CALAFAT et al., 2014). Um estudo argentino (PEÑA et al., 2017) encontrou associação protetora entre a dimensão de exigência (característica do estilo autoritário) materna e tabaco, álcool e uso de drogas ilícitas.

Em relação ao estilo indulgente ou permissivo, Ozer et al.(2011) e Visser et al. (2013) identificaram que este é mais protetivo para o início de consumo regular de álcool. Um estudo europeu multicêntrico (GARCÍA; GRACIA, 2014) identificou que o estilo parental indulgente parece ser tão bom quanto o autoritário, na proteção contra o abuso de substâncias. Por outro lado, outros dois estudos indicam que perceber os pais como indulgentes aumenta as chances do consumo de álcool, tabaco e drogas ilícitas (CEREZO; MÉNDEZ; ATO, 2013; MILLER et al., 2011).

No Brasil, possuímos apenas alguns estudos transversais, que buscaram analisar, no contexto nacional, qual a relação dos estilos parentais com o uso precoce de drogas por adolescentes. Benchaya et al (2011) verificaram que o modelo parental autoritativo esteve mais associado aos jovens não usuários de drogas, diferentemente dos demais modelos educativos (autoritário, indulgente ou negligente), que aumentavam três vezes a chance de o adolescente fazer uso de drogas. Dados similares foram encontrados por Tondowski et al. (2015), que constataram que filhos de pais negligentes ou indulgentes tinham maior chance de realizar uso frequente de tabaco, diferentemente do estilo parental autoritativo, associado à proteção ao uso de tabaco. Esses achados foram corroborados por estudo recente, que

também evidenciou que os estilos parentais não autoritativos estão associados ao aumento na prevalência de *binge drinking* (ZUQUETTO et al., 2019). Por outro lado, Paiva, Bastos e Ronzani (2012) encontraram associação somente entre o estilo parental materno e o uso de álcool, estando os filhos de mães autoritárias e autoritativas mais protegidos deste consumo.

No entanto, destaca-se que não há estudos longitudinais nacionais, publicados até o momento, que avaliem a associação da iniciação do uso de drogas na adolescência aos estilos parentais, e tampouco estudos que avaliem o efeito moderador dos estilos parentais no efeito de programas de prevenção ao uso de drogas para adolescentes.

1.3. Prevenção e promoção da saúde

Estratégias de prevenção da saúde são todas as medidas tomadas no sentido de oferecer à população a oportunidade de evitar o surgimento de problemas de saúde, através da antecipação de ações que venham a fortalecer o indivíduo para enfrentar situações de risco (CAMPOS; FIGLIE, 2010). Em outras palavras, a prevenção irá antecipar ações que fortaleçam o indivíduo, para enfrentar eventuais obstáculos, que possam provocar danos à sua saúde (PEREIRA et al., 2012). A ação de antecipação deve ser baseada nos conhecimentos acerca da história natural da doença, com o objetivo de reduzir a incidência e a prevalência ou eliminação dos fatores de risco e aumento dos fatores de proteção (SANCHEZ, 2014).

Existem duas classificações bem estabelecidas sobre os níveis de prevenção atingidos por um determinado programa ou atividade de prevenção. A primeira classificação foi proposta na década de 1970 e definiu três níveis de prevenção: primária, secundária e terciária (LEAVELL; CLARK, 1976). Este modelo sugere uma classificação tipológica, baseada na sequência de prevenir, curar e reabilitar. Dentro do campo da prevenção ao uso de drogas, podemos entender a prevenção primária como aquela que objetiva evitar a experimentação inicial de drogas e é destinada aos sujeitos que ainda não as experimentaram. Já a prevenção

secundária tem o intuito de evitar ou reduzir as chances que os sujeitos que fazem uso ocasional de drogas venham a ter problemas, ou mesmo desenvolvam dependência. A prevenção terciária procura reduzir os danos associados ao abuso de drogas dos usuários que já apresentam uso problemático (WHO, 2001).

Atualmente, existe outra classificação tipológica sendo mais utilizada para descrever os níveis de prevenção ao uso de drogas, baseada na diferenciação de grupos por nível de risco e exposição ao consumo: universal, seletiva e indicada (UNODC, 2015). Contudo, é importante ressaltar que esta classificação mais recente não exclui a anterior e elas podem ser entendidas como complementares. A prevenção universal é dirigida à população geral, sem qualquer estratificação de grupos por fatores de risco. Um exemplo são os programas de prevenção escolares, que são realizados com todos os alunos de uma escola ou de uma sala de aula, sem a preocupação de selecionar apenas alunos com maior vulnerabilidade para o consumo de drogas. A prevenção seletiva é voltada para populações com alguns fatores de risco já identificados para o uso de drogas, ou seja, destina-se aos sujeitos que têm mais chance de consumir drogas. Um exemplo seria um programa realizado em uma escola de uma região mais vulnerável socialmente, ou seja, cujo ambiente é mais permissivo ao uso de drogas, com alta criminalidade e tráfico de drogas. Por fim, a prevenção indicada engloba intervenções destinadas a sujeitos identificados como usuários de drogas, ou com comportamentos de risco relacionados, direta ou indiretamente, ao uso de substâncias, em programas que visem reduzir não só o consumo, mas também os riscos aos quais o sujeito se expõe, visando a melhora da qualidade de vida do sujeito e a reinserção social (SANCHEZ, 2014).

Desde a década de 80, mais do que se preocupar com os níveis de prevenção, profissionais da saúde coletiva têm focado em privilegiar o conceito mais amplo de promoção desta. Esse movimento de Promoção de Saúde como política preventiva teve como um dos seus marcos principais a Primeira Conferência Internacional sobre Promoção da Saúde, em

Ottawa (Canadá). Neste evento, organizado pela Organização Mundial da Saúde (OMS) e pela Organização Pan-americana de Saúde (OPAS), definiu-se a promoção à saúde como "[...] o processo de capacitação da comunidade para atuar na melhoria da sua qualidade de vida e saúde [...]". Essa conferência culminou na promulgação da Carta de Ottawa, documento no qual se defendeu a promoção da saúde como fator fundamental para a melhoria da qualidade de vida das populações. O referido documento salientou, ainda, a intersetorialidade desse processo, por entender que a promoção desta deve ser uma responsabilidade compartilhada por diversos setores sociais e não exclusiva do setor da saúde (OMS, 1986).

Podemos entender a promoção à saúde como uma forma de auxiliar os sujeitos a encontrarem formas de exercer mais controle sobre esta, capacitando a comunidade para atuar na melhoria de sua qualidade de vida e saúde. Promoção à saúde implica no fortalecimento da capacidade individual e coletiva de lidar com a multiplicidade dos determinantes e condicionantes de saúde, buscando redução de riscos ou vulnerabilidade e fortalecimentos da proteção integral, sem focar em doenças específicas, mas no estilo de vida como um todo (BUSS, 2000; CZERESNIA; FREITAS, 2009).

Em comparação com a prevenção, podemos dizer que a promoção em saúde tem definição bem mais ampla, uma vez que não se dirige a evitar doenças específicas, mas visa aumentar a saúde e o bem-estar dos sujeitos.

1.3.1. Prevenção e promoção ao uso de drogas na adolescência

Programas de prevenção têm sido implementados mundialmente, com a intenção de reduzir ou retardar o início do consumo de álcool e outras drogas entre adolescentes, visando diminuir o impacto mundial do abuso destas substâncias nos diversos setores econômicos e sociais (FOXCROFT; TSERTSVADZE, 2011).

O Escritório das Nações Unidas para Drogas e Crime (UNODC, 2015) destaca a prevenção como uma das chaves para o controle internacional do uso de drogas. Da mesma forma, os dados econômicos mostram que é muito mais eficiente investir na prevenção do uso de drogas, uma vez que os valores investidos retornam para a sociedade na forma de redução dos agravos à saúde e do custo social relacionado, tais como: menores custos ao sistema de saúde, diminuição dos custos referentes à previdência social, entre outros (CAMPOS; FIGLIE, 2010). Uma pesquisa americana de eficiência demonstrou que, para cada 1 dólar investido em prevenção, 10 dólares são poupados em tratamento no futuro, evidenciando que investir em prevenção vale muito a pena, do ponto de vista de políticas públicas (NIDA, 2003).

Nas últimas décadas, o campo da prevenção ao uso de drogas avançou muito em experiência e conhecimento. Por este motivo, hoje dispomos de informações e diretrizes baseadas em evidências sobre as formas mais adequadas de intervir preventivamente, de forma a reduzir as chances do início do consumo de drogas ou de retardar esse início.

O National Institute on Drug Abuse (NIDA, 2003), um dos principais núcleos de pesquisas mundiais na área de drogas, preocupou-se em sistematizar os princípios básicos, que devem alicerçar projetos eficazes de prevenção ao consumo de drogas, enumerados a seguir:

a) Aprimorar os fatores de proteção dos alunos e reduzir os fatores de risco;
b) Ter como objetivo focar todas as formas de abuso de drogas, incluindo o consumo de tabaco e de álcool;
c) Incluir estratégias para resistir ao oferecimento de drogas e aumentar a competência social (exemplo: na comunicação e relação com os pares, autoeficácia e assertividade);

d) Quando dirigidos aos adolescentes, incluir métodos interativos, tais como grupos de discussão de colegas, e não apenas oferecer informação no modelo de "aulas expositivas";

e) Incluir atividades com pais, gerando oportunidades para discutir na família o uso de drogas;

f) Ser de longo prazo (contínuo), com repetidas intervenções para reforçar as metas originais;

g) Os esforços de prevenção centrados na família têm maior impacto que as estratégias que se centram unicamente nos professores;

h) Quanto maior o nível de risco da população-alvo, o esforço preventivo deverá ser mais intensivo e começar antes;

i) Os programas de prevenção devem ser específicos para a idade dos sujeitos aos quais se dirigem e apropriados ao nível de desenvolvimento intelectual e emocional da população-alvo;

j) Trabalhar o ajuste familiar e treinar os pais no enfrentamento diário da educação dos filhos.

A prevenção ao uso de drogas é composta por 3 alicerces: políticas e leis, programas e suporte público e controle social. Falamos muito de programas de prevenção ao uso de drogas, mas não se pode perder de vista que as políticas públicas têm um papel fundamental na prevenção dos danos causados pelo abuso de drogas (BABOR, 2010; UNODC, 2015).

Importante destacar a iniciativa SAFER que, recentemente, foi divulgada pela Organização Mundial de Saúde promovendo uma estratégia global para reduzir danos causados pelo uso de álcool, destacando áreas de ação voltadas a políticas públicas baseadas em evidência científica, tais como: fortalecer as restrições à disponibilidade de bebidas alcoólicas, aplicação de medidas contrárias a beber e dirigir, facilitar o acesso a *screening*,

intervenções breve e tratamentos, impor proibições de restrições à publicidade, patrocínio e promoção de bebidas alcoólicas e aumento dos preços do álcool através de impostos especiais de consumo (MONTEIRO, 2020).

1.3.2. Programas escolares de prevenção ao uso de drogas

Os programas que são aplicados nas escolas têm sido identificados como uma das mais eficazes ferramentas na prevenção ao uso de drogas na atualidade (HANLEY et al., 2010). Com frequência, o contexto escolar serve de sede para o desenvolvimento desses programas, uma vez que lá se encontra o grupo com maior risco de consumir drogas (adolescentes), bem como existe uma maior facilidade para execução e menores gastos financeiros envolvidos (NIDA, 2003). Pela sua inserção social comunitária, o âmbito escolar permite uma interface entre os outros setores que compõem a prevenção ao uso de drogas, como ações a serem desenvolvidas com os pais, famílias e dispositivos comunitários (UHL; IVES, 2010).

É importante destacar que não é qualquer atividade escolar isolada que aborde o tema das drogas que pode ser compreendida como um programa de prevenção ao uso de drogas. Conceitualmente, um programa é um conjunto organizado de atividades destinadas a alcançar determinados objetivos. Programas são uma série de ações planejadas e sistemáticas, destinadas a resolver algum problema. Assim, um conjunto aleatório de ações ou atividades não se caracteriza como programa. Programas escolares para prevenção do uso de drogas precisam estar inseridos no currículo, podendo compreender intervenções educacionais e psicossociais, que tenham como objetivo reduzir o risco do consumo de álcool e outras drogas em crianças e adolescentes (ROYSE; THYER; PADGETT, 2015).

De acordo com o Manual internacional para prevenção do uso de drogas em escolas, da UNODC (2004), as estratégias preventivas nesta área devem abarcar três componentes principais: as estratégias de redução de demanda, redução da oferta e redução das

consequências negativas decorrentes do uso de drogas. As estratégicas de redução de demanda objetivam reduzir o desejo e a disposição para a obtenção e uso de drogas, além de prevenir, reduzir e retardar seu consumo. As estratégias de redução da oferta visam interromper a produção e o fornecimento de drogas ilícitas, bem como limitar seu acesso, sua disponibilidade, a posse e a venda, e são comumente praticadas pelo poder público. As estratégias para reduzir as consequências negativas do uso de drogas visam reduzir o impacto do seu uso e das atividades relacionadas em indivíduos e comunidades, quando este uso já acontece.

Historicamente, os programas de prevenção realizados em escolas buscavam impedir o uso de drogas, fornecendo prioritariamente informações sobre os seus efeitos nocivos (MIDFORD, 2010). Nos anos 60, as primeiras ações preventivas ao uso de drogas eram embasadas na teoria do modelo racional ou informativo, que tinha como princípio norteador a transmissão de informações sobre as drogas e os efeitos nocivos do consumo (BECOÑA, 2002).

Até a década de 80, existiam seis modelos básicos de programas de prevenção ao uso indevido de drogas nas escolas: o modelo do amedrontamento, que enfatizava informações negativas do uso de drogas; o modelo do conhecimento científico, que oferecia informações sobre drogas de modo imparcial; o modelo de educação afetiva, que estimulava o desenvolvimento de habilidades emocionais; o modelo de estilo de vida saudável, que educava para uma vida de hábitos mais saudáveis; o modelo da pressão positiva do grupo, que treinava os adolescentes com liderança nata para desenvolver ações preventivas e o modelo de oferecimento de alternativas, que buscava o desenvolvimento de atividades de lazer, prazer e crescimento pessoal no ambiente escolar (CARLINI-COTRIM; PINSKY, 1989).

Entretanto, após esta classificação, uma nova geração de programas de prevenção começou a aparecer nas escolas, baseados na teoria da aprendizagem social (BANDURA,

1977). O pressuposto principal desta teoria é que os jovens são muito suscetíveis a influências sociais para iniciarem o consumo de drogas. Estes programas foram teoricamente e metodologicamente mais rigorosos e, pela primeira vez, demonstram mudanças nos comportamentos relacionados ao uso de drogas (TOBLER et al., 2000).

Posteriormente, pensando na possibilidade de equipar os jovens para resistirem ao uso de drogas, foram desenvolvidos programas de prevenção, baseados em treinamentos de habilidades de vida. Estudos comprovaram que estes programas baseados em treinamento de habilidades para adolescentes parecem ser efetivos em prevenir uso de drogas nos estágios inicias de consumo (FAGGIANO et al., 2008b).

Considerando o caráter multifatorial do envolvimento dos jovens com o uso de drogas, programas de prevenção também destinados aos pais e à comunidade começaram a ser propostos. De acordo com uma revisão sistemática, que avaliou efeitos dos programas de prevenção ao uso de drogas, os efeitos das intervenções de prevenção baseadas na família são pequenos, mas geralmente consistentes e persistentes, também para médio e longo prazo (FOXCROFT; TSERTSVADZE, 2011; PETRIE; BUNN; BYRNE, 2006). A prevenção tende a ser mais eficaz quanto mais âmbitos da vida do indivíduo ela conseguir contemplar em sua estrutura básica: individual, familiar e comunitária (NIDA, 2003).

Após diversos avanços teóricos e práticos do campo da prevenção nas últimas décadas, os modelos de programas preventivos atuais podem ser divididos em dez categorias, de acordo com a teoria central que alicerça sua estrutura (SANCHEZ, 2014):

1. Informação: oferece conhecimento sobre as consequências e o risco de usar drogas;
2. Tomada de decisões: trabalha o processo para tomar decisões racionais sobre o consumo de drogas;
3. Compromisso: trabalha a adoção de um compromisso pessoal de não usar drogas;

4. Classificação de valores: examina a relação entre os próprios valores e as consequências da conduta. Procura demonstrar que os valores pessoais sensatos são incompatíveis com o uso de drogas;
5. Estabelecimento de metas: ensina habilidades para a situação e como ater-se aos objetivos, encorajando a adoção de uma orientação de sucesso;
6. Manejo de estresse: ensina habilidades de enfrentamento para conduzir situações de estresse, especialmente em situações psicologicamente difíceis;
7. Autoestima: desenvolve sentimentos individuais de autoconfiança e valia;
8. Treinamento em habilidades de resistência: treina para a resistência à pressão assertivamente e às influências dos colegas, irmãos, pais, adultos e meios de comunicação, para que consumam drogas;
9. Treinamento em habilidades para a vida: desenvolve amplo conjunto de habilidades sociais e pessoais, incluindo habilidades de comunicação, de relações humanas e resolução de conflitos interpessoais;
10. Crenças normativas: estabelece normas conservadoras a respeito do uso, corrigindo as percepções errôneas da prevalência e acessibilidade às substâncias de abuso e estabelecendo normas conservadoras.

Em geral, os programas preventivos são baseados em apenas um dos princípios/modelos, o que tende a limitar sua capacidade de atingir os participantes em suas distintas qualidades e perfis psicossociais. Neste sentido, estratégias e técnicas de prevenção, quando aplicadas de forma isolada, não demonstram ser particularmente eficazes na prevenção do álcool, tabaco e outras drogas (NIDA, 2003).

De acordo com as diretrizes internacionais para a prevenção (UNODC, 2018), programas de prevenção associados a resultados positivos devem ter estas características:

a) Métodos interativos;

b) Sessões semanais estruturadas (10-15);

c) Sessões de reforço durante vários anos;

d) Implementado por facilitadores bem treinados;

e) Aprender e praticar várias habilidades pessoais e sociais (*coping*, tomada de decisões, técnicas de resistência);

f) Modificar percepções de risco de substâncias, enfatizar as consequências imediatas e relevantes;

g) Desmantelar conceitos errôneos sobre normas e expectativas sobre o uso de substâncias.

Por outro lado, este mesmo documento (UNODC, 2018) descreve as características que os programas de prevenção que apresentam resultados negativos ou neutros costumam ter:

a) Uso de métodos não interativos, como palestras, como uma estratégia básica de aplicação do programa;

b) Disseminação de informações, despertando medo;

c) São baseados em sessões de diálogo desestruturadas;

d) Concentram-se apenas na construção da autoestima e educação emocional;

e) Abordam somente a tomada de decisão moral/ética ou de valores;

f) Incluem a participação de ex-usuários de drogas com depoimentos.

É importante considerarmos as diferenças etárias durante o processo de seleção de um programa de prevenção ao uso de drogas.

Para crianças com idades entre 8 e 11 anos, os objetivos de um programa de prevenção ao uso de drogas devem ser: desenvolver habilidades de comunicação, expressão de sentimentos, empatia pelos sentimentos dos outros, escolha e avaliação das consequências envolvidas, seguir orientações de segurança e pedir ajuda para os adultos, em caso de

necessidade. Já para os adolescentes que possuem idades entre 12 e 14 anos, os programas de prevenção devem buscar desenvolver habilidades de comunicação eficaz, com uma gama maior de pessoas, identificação de problemas e situações de risco, tomada de decisão baseada em valores pessoais bem definidos, assertividade para questões relacionadas ao uso de drogas, identificação e manejo de sentimentos, além de habilidade para lidar com a pressão dos amigos. Por fim, para os adolescentes do ensino médio (15 a 17 anos), os programas de prevenção devem desenvolver nos estudantes habilidades de comunicação construtiva (com os pais, amigos e professores), habilidades de dar e receber cuidado numa variedade de situações relacionadas à saúde, traçar metas de curto e longo prazo, demonstrar habilidades de lidar com situações de conflito, agressão, estresse e gestão do tempo, autoafirmação pessoal e lidar com a influência dos amigos e habilidades de lidar com mudanças, perdas e sofrimento (UNODC, 2004).

Pode-se concluir que, apesar de ainda haver contradições sobre a eficácia de programas de prevenção ao uso de drogas, destinados a crianças e adolescentes, já existem evidências de programas escolares que realmente reduzem ou retardam o início do consumo de drogas (STRØM et al., 2014). Dentre os modelos de prevenção bem-sucedidos, estão os que consideram as influências sociais para o início do consumo, sendo baseados na promoção de saúde, trabalhando no sentido da redução de fatores de risco e aumento de fatores de proteção. Dentre eles, os mais estudados têm sido os modelos de habilidades para a vida, que oferecem recursos emocionais, comportamentais e sociais, para que os jovens lidem com as situações simples e complexas do cotidiano (CUIJPERS, 2002; FOXCROFT; TSERTSVADZE, 2011; GRIFFIN; BOTVIN, 2010).

1.3.3. Programa escolar de prevenção ao uso de drogas *Unplugged* e o processo de adaptação para contexto brasileiro, sendo renomeado de #Tamojunto.

O *Unplugged* é um programa de prevenção para adolescentes entre 12 e 14 anos, que visa retardar o início e suspender a progressão do consumo de drogas. Foi desenhado para ser aplicado por professores em sala de aula, em 12 sessões de uma hora, ministradas semanalmente, durante um semestre letivo. Sua estrutura, baseada em evidências científicas, abarca os seguintes eixos temáticos: habilidades sociais, habilidades pessoais, conhecimento e crenças normativas. Durante as sessões, as habilidades para a vida trabalhadas neste programa compreendem o desenvolvimento de pensamento crítico, tomada de decisões, solução de problemas, pensamento criativo, comunicação eficaz, habilidade interpessoal, autopercepção, empatia e manejo de emoções (VAN DER KREEFT et al., 2009).

O programa baseia-se no "Modelo Influência Social Global" (SUSSMAN et al., 2004a), cuja abordagem implica em construir, junto com os adolescentes, habilidades específicas para que eles aprendam a manejar as influências sociais, desconstruindo crenças normativas, sustentando-se em reflexões sobre os contextos de uso e conhecimento sobre drogas e suas consequências à saúde. Os métodos interativos utilizados nesses programas estão focados no aperfeiçoamento de habilidades de vida, visando fortalecer o sujeito e sua relação com as redes sociais, aspecto considerado fator de proteção ao uso abusivo de drogas.

Sua eficácia na redução do consumo foi primeiramente identificada em um amplo estudo multicêntrico, em oito países europeus (FAGGIANO et al., 2008b), evidenciando reduções significativas nos relatos de episódios de embriaguez e de uso frequente de maconha. Posteriormente, em um estudo menor na República Tcheca (GABRHELIK et al., 2012), o programa mostrou ter efeito na redução do uso de tabaco (fumo diário e pesado) e maconha (qualquer uso e uso frequente) e outras drogas.

O Brasil não tem histórico de implementação de programas de prevenção de uso de drogas baseados em evidências nas escolas (PEREIRA; PAES; SANCHEZ, 2016). O programa PROERD (Programa Educacional de Resistência às Drogas e à Violência) é o

programa educacional mais difundido no Brasil (SHAMBLEN et al., 2014), apesar do fato de que a eficácia do PROERD não foi avaliada e que evidências internacionais sugerem que o DARE não tem efeitos a longo prazo sobre o uso de drogas (LYNAM et al., 1999).

Em 2011, com o objetivo de reduzir uma suposta epidemia de crack e enfrentar a falta de programas de prevenção baseados em evidências nas escolas brasileiras, o governo brasileiro instituiu o "Plano Integrado de Combate ao Risco e Outras Drogas", que focou na redução do consumo já estabelecido e das futuras demandas de drogas da população, priorizando, assim, o uso de drogas nas agendas das políticas sociais e de saúde pública (Decreto 7.637, 8 de dezembro de 2011). A partir disso, buscando seguir as diretrizes internacionais, a Coordenação Geral de Saúde Mental, Álcool e outras drogas, do Ministério da Saúde, em parceria com o Escritório das Nações Unidas para Drogas e Crime (UNODC), decidiu investir na adaptação transcultural de três programas baseados em evidências, de efetividade internacional comprovada, para ampliar a gama de recursos no enfrentamento do abuso de drogas no Brasil e, posteriormente, permitir a substituição de currículos ineficazes ou iatrogênicos por currículos que resultem na redução do consumo de drogas entre estudantes brasileiros. Os programas adaptados e implementados no contexto brasileiro são: *Unplugged*, chamado #Tamojunto no Brasil, para adolescentes de 10 a 14 anos em escolas do ensino fundamental; *Good Game Behaviors* (Elos, no Brasil), para crianças entre 6 e 10 anos nas escolas primárias (SCHNEIDER et al., 2016) e o *Strengthening Families Program* (Famílias Fortes, no Brasil), com foco nas famílias atendidas no sistema público de saúde (MIRANDA; MURTA, 2016).

As avaliações da fidelidade, aceitabilidade e viabilidade do programa *Unplugged* no contexto brasileiro foram promissoras. As 12 lições do programa foram ensinadas em 94% das salas de aula. No entanto, o número de atividades por lição teve que ser reduzido e o cronograma de ensino padrão teve que ser reestruturado, para garantir que o conteúdo

acadêmico regular ainda pudesse ser ensinado. Além disso, os professores relataram ter que excluir algumas atividades, para fornecer o conteúdo adequado da lição em suas aulas de 50 minutos. A maioria dos professores e alunos teve percepções positivas sobre o programa e relatou mudanças percebidas no ambiente da sala de aula (MEDEIROS et al., 2016).

A mesma tendência positiva foi encontrada em um ensaio controlado não-randomizado, que foi conduzido para analisar os resultados preliminares do *Unplugged* no Brasil, entre 2185 adolescentes, em 62 turmas de oito escolas públicas, em três cidades brasileiras. Os resultados evidenciaram que o grupo controle mostrou maior uso de maconha, álcool e inalantes no último ano, bem como o aumento do beber em *binge* (ou seja, o consumo de 5 ou mais bebidas alcoólicas) no mês anterior, em comparação com o grupo de intervenção. Esses achados sugerem que o programa tem potencial para desacelerar o aumento esperado do uso de drogas durante a adolescência (SANCHEZ et al., 2016).

Dentre os 3 programas, apenas o *Unplugged* foi submetido a um estudo de efetividade, realizado entre 2014 e 2015, através de um ensaio controlado randomizado (ECR) em 6 cidades, que faziam parte do sistema nacional de prevenção. Os resultados de curto prazo deste RCT foram publicados e mostraram um efeito iatrogênico para a iniciação do álcool no seguimento de 9 meses, concomitante a um efeito protetor no atraso do primeiro uso de inalantes (SANCHEZ et al., 2017). Após 21 meses da coleta no tempo inicial, um novo acompanhamento foi realizado, para entender a manutenção deste efeito ao longo de um intervalo de tempo mais longo, questão fundamental para as políticas em saúde pública, e a tendência iatrogência para a iniciação ao uso de álcool se manteve (SANCHEZ et al., 2019b). Os adolescentes do grupo intervenção tiveram um risco 30% maior (IC95% 1,13-1,49) aos 9 meses (SANCHEZ et al., 2017), e um risco 13% maior (IC95% 1,01-1,27) aos 21 meses de seguimento, de consumirem álcool pela primeira vez, comparados aos adolescentes do grupo controle (SANCHEZ et al., 2018). A principal explicação para esses resultados inesperados

está relacionada às adaptações culturais realizadas para os componentes do álcool. As mudanças realizadas na lição 3 “Escolhas - Álcool, Risco e Proteção” excluíram os componentes originais do programa europeu, que reforçavam o não uso de álcool pelos adolescentes, e os substituíram por uma abordagem reflexiva, relacionada à prevenção da intoxicação por álcool, com ênfase na redução de danos (MADRUGA; CORDEIRO, 2018).

1.4. Avaliação de programas de prevenção ao uso de drogas

Programas escolares de prevenção têm sido implementados mundialmente, com a intenção de reduzir ou retardar o início do consumo de álcool e outras drogas entre adolescentes (STRØM et al., 2014), visando diminuir o impacto mundial do abuso destas substâncias nos diversos setores econômicos e sociais. Entretanto, nem todo programa de prevenção ao uso de drogas possui realmente a capacidade de reduzir ou retardar o consumo destas substâncias. A maior parte dos programas de prevenção nunca foi avaliada em relação à sua efetividade ou, ainda pior, quando avaliados, não demonstram efetividade na redução ou retardo do consumo (FAGGIANO et al., 2005). Alguns programas, além de não reduzirem ou retardarem o início do uso de drogas por adolescentes, aumentam as chances de que este uso ocorra. Em alguns casos, os programas são inócuos e, em outros, são iatrogênicos, ou seja, o próprio programa estimula o uso de drogas (LEE et al., 2016; WERCH; OWEN, 2002).

Em uma revisão sistemática, publicada em 2002, dentre 152 artigos publicados com resultados de ensaios (controlados ou não controlados), 17 apresentaram efeito iatrogênico e 43 apresentaram desfechos negativos, tais como: expectativas mais positivas sobre usar drogas; redução na autoeficácia para evitar o uso de drogas; aumento da oferta de drogas; aumento da probabilidade de uso de cigarros, álcool e drogas; e aumento do uso abusivo de álcool e de problemas relacionados ao uso de álcool (WERCH; OWEN, 2002). Outra revisão mais recente, realizada em 2016, evidenciou que, de 40 programas escolares para o uso de

álcool, apenas sete demonstraram evidência de sucesso, um não encontrou evidência de efeito, 30 foram inconclusivos e dois encontraram resultados iatrogênicos (LEE et al., 2016).

Para evitar gastos públicos desnecessários e tempo de aula investido em programas que não oferecem resultados adequados, existe hoje um movimento pelo desenvolvimento e implantação de programas de prevenção baseados em evidências científicas, que tenham demonstrado reduzir ou retardar o consumo de drogas, através de ensaios controlados randomizados (PENTZ, 2003). É importante lembrar que, mesmo os programas que já possuem alguma evidência de efetividade, precisam ser reavaliados no contexto novo em que forem inseridos. Como exemplo, podemos citar as avaliações transculturais de programas de prevenção trazidos de outros países, como Europa ou Estados Unidos, e que, mesmo com evidências de efeito nos locais de origem, precisam ser avaliados, considerando as peculiaridades do contexto brasileiro (BARRERA; CASTRO, 2006; OLIVEIRA; ARAUJO, 2005), pois nem sempre o efeito obtido é aquele encontrado no programa original (SANCHEZ et al., 2017). Quando não realizamos estas avaliações de efeito em diferentes culturas, estamos arriscando investir em programas ineficientes, ou mesmo que acarretem em algum dano para a população (GEWIN; HOFFMAN, 2016).

A avaliação de um programa de prevenção tem como objetivo fornecer dados válidos e confiáveis, que ajudem a responder a uma variedade de questionamentos de profissionais de muitas áreas, interessados em saber se os serviços que eles provêm estão efetivamente ajudando as pessoas. Assim sendo, a avaliação de um programa é uma ferramenta de gerenciamento, que deve ser utilizada para estruturar a tomada de decisões, com base em evidências e não na perspectiva subjetiva (WHOLEY; HATRY; NEWCOMER, 2010).

Considerando a relevância desse processo avaliativo – que os programas de prevenção escolares necessitam passar para comprovação da sua real efetividade –, as escolas precisam se preocupar em realizar, impreterivelmente, dois grandes tipos de avaliação: avaliação de

processo e avaliação de resultados. A avaliação de processo é utilizada para monitorar e documentar a etapa de implementação do programa de prevenção, tendo como objetivo verificar se a intervenção foi executada como previsto e identificar se o desenho e o desempenho podem ser melhorados, bem como a aceitabilidade dos envolvidos (MELO; RODRIGUES; CONCEIÇÃO, 2015). Auxilia na análise da relação entre elementos específicos do processo de implementação do programa e a maneira como eles poderão afetar o impacto ou os resultados da intervenção. Este tipo de investigação avaliativa transita pelos processos de implementação e fornece respostas às questões relativas, sobre o como e o porquê de as intervenções terem sido bem-sucedidas ou não (SAUNDERS; EVANS; JOSHI, 2005).

A avaliação de processo analisa dados sobre a qualidade da implantação de programas, podendo influenciar o desfecho e a generalização dos resultados destes. O monitoramento do processo pode ser visto como uma forma de garantir a qualidade do protocolo que está sendo implementado. Aspectos a serem monitorados na avaliação do processo: aderência ao protocolo ou fidelidade (como, por exemplo, se cada atividade foi executada conforme o planejado); aderência da população-alvo; aceitabilidade e viabilidade da intervenção proposta. A avalição de processo é realizada através de métodos mistos de pesquisa, tais como: formulários de fidelidade, entrevistas semiestruturadas, grupos focais e questionários de satisfação (WHOLEY; HATRY; NEWCOMER, 2010).

Outra etapa imprescindível da avaliação de um programa de prevenção é a avaliação de resultado, uma vez que somente ela responde ao principal questionamento levantado nesses casos: o programa funciona? O programa produziu as mudanças desejadas? Deste modo, a avaliação de resultados busca uma relação de causalidade entre as mudanças no desfecho e a intervenção implementada. No caso de um programa de prevenção ao uso de drogas, esta avaliação procura saber se o programa em questão produziu efeitos no consumo de drogas dos

adolescentes, como por exemplo, se retardou o primeiro uso, diminuiu ou cessou o consumo, ou diminuiu os problemas associados ao uso de drogas (ROSSI; LIPSEY; FREEMAN, 2004).

O ensaio controlado randomizado é considerado o padrão-ouro para avaliação de resultados de programas de prevenção, pois é o melhor desenho de estudo epidemiológico para estabelecer inferência causal. Em outras palavras, este tipo de estudo permite afirmar, com maior certeza, que os efeitos verificados são atribuídos, de fato, à intervenção. Entretanto, para que esta conclusão seja possível, é preciso ter um grupo de comparação em relação ao grupo que recebeu a intervenção preventiva, chamado de grupo controle. Estes grupos, intervenção e controle, precisam ser randomizados, para garantir a ausência de vieses de seleção na amostragem. Os dois grupos, tanto o que recebe a intervenção, como o que não recebe, são seguidos no tempo, para a avaliação dos desfechos de interesse. Através do ECR, podemos realizar tanto estudos de eficácia, que avaliem condições ideais de implementação, quanto estudos de efetividade, que consideram as condições reais de aplicação. Sugere-se que a avaliação de resultados deva continuar por um prazo maior, através de estudos de seguimento, avaliando esses mesmos elementos, a fim de comprovar se os resultados obtidos se mantêm ao longo do tempo (SOLOMON; CAVANAUGH; DRAINE, 2009).

A avaliação de resultados pode ser dividida em três subtipos (ROYSE; THYER; PADGETT, 2015):

a) Eficácia: avalia a intervenção no contexto ideal, onde toda a população investigada recebe o programa de forma completa. A avaliação é conduzida com alto grau de controle do que está sendo ofertado e, nas análises, são incluídos apenas os sujeitos que aderiram ao estudo;
b) Efetividade: avalia a intervenção no contexto real, é o resultado do programa quando implantado no mundo real, seguindo as condições possíveis. Nesta

situação, consideram-se na análise todos os sujeitos incluídos no estudo, mesmo aqueles cuja adesão não tenha sido completa;

c) Eficiência ou custo-efetividade: avalia os custos das atividades do programa por unidade de efetividade.

A Sociedade de Pesquisa em Prevenção (*Society for Prevention Research - SPR*) estabelece um conjunto de normas e padrões para caracterização dos programas preventivos eficazes e efetivos. De acordo com estas normas, um programa preventivo eficaz deve ser testado em pelo menos dois ensaios rigorosos, que utilizam amostras definidas de populações específicas. Além disso, deve utilizar medidas e procedimentos sólidos de coleta de dados e analisá-los com abordagens estatísticas rigorosas; apresentar efeitos positivos consistentes (sem graves efeitos iatrogênicos) e relatar ao menos um estudo de seguimento que demonstre a eficácia do programa (FLAY et al., 2005). Portanto, é inquestionável a necessidade de avaliar os programas de prevenção de forma adequada, para que seja possível concluir que, de fato, contribuam para a melhoria do desfecho desejado e, com isso, trazendo os benefícios esperados para a população-alvo.

1.5. A importância dos moderadores e mediadores na avaliação da efetividade de programas

Em relação à avaliação dos resultados, é importante analisar a efetividade do programa, através de ensaio controlado randomizado, assim como realizar a análise dos moderadores, que podem estar impactando no efeito do programa. Desta forma, uma boa avaliação de efetividade pode fornecer evidências sobre os efeitos do programa em diferentes grupos preestabelecidos. Os estudos sobre os moderadores de uma intervenção são úteis para responder aos pesquisadores e gestores o seguinte questionamento: Para quem este programa é efetivo? Procurando, assim, compreender como uma variável pode afetar a direção e/ou a

força da relação entre a variável independente e a dependente. Em outras palavras, a variável moderadora pode afetar o sentido da relação entre o programa preventivo e os resultados, aumentando, reduzindo ou alterando o efeito da intervenção preventiva (HAYES, 2013; VIEIRA, 2009).

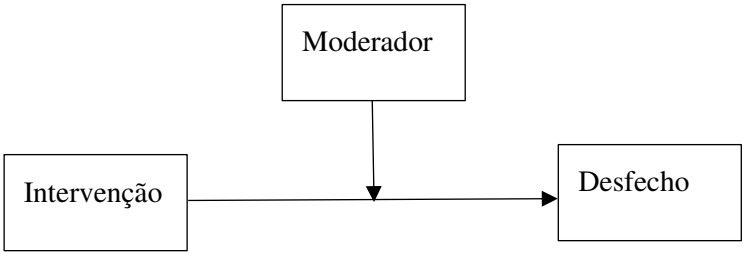

Figura1: Diagrama conceitual da análise de moderação.

Boa parte das pesquisas que utilizam análises de moderadores para avaliar o efeito de intervenções preventivas selecionam as variáveis moderadoras, com base na análise dos fatores etiológicos relacionados ao uso e abuso de drogas, ou seja, os fatores de risco e proteção (CARIA et al., 2011; MIOVSKÝ et al., 2015). Sendo o ambiente familiar um dos domínios mais influentes desta cadeia multifacetada do consumo de drogas entre adolescentes (STAFSTRÖM, 2014), os estilos parentais apresentam-se como uma das variáveis mais estudadas (BECOÑA et al., 2012; GARCÍA; GRACIA, 2009).

Embora se observe uma produção elevada de estudos internacionais que analisam a influência dos estilos parentais no consumo de drogas entre adolescentes, poucas são as pesquisas que analisam a influência dos fatores familiares em estudos de avaliação de efetividade de programas preventivos. Os cuidadores com menores índices de educação foram mais responsivos à intervenção, assim como as famílias que possuíam dois responsáveis pela educação dos filhos (GARDNER et al., 2009). Apesar das fortes evidências da atuação dos estilos parentais como fatores de risco e proteção para o consumo de drogas, não foi

identificado nenhum estudo que analisou sua influência como moderadores do efeito de programas preventivos.

Outra análise importante é a de mediação, uma vez que é necessário entender os mecanismos prováveis subjacentes ao sucesso e ao fracasso dos programas. Assim, podemos identificar se o programa afetou as variáveis mediadoras que foram alvo da intervenção, conforme proposto em seu modelo lógico (MACKINNON; FAIRCHILD; FRITZ, 2007). No caso do Programa de Prevenção ao Uso de Drogas #Tamojunto, espera-se que o treinamento em habilidades de tomada de decisão seja um dos mediadores do efeito do programa, como proposto pelos desenvolvedores do *Unplugged* (VADRUCCI et al., 2016; VAN DER KREEFT et al., 2009). Intervenções preventivas nesse período da vida podem ser extremamente úteis, pois os adolescentes são particularmente vulneráveis à tomada de decisões arriscadas, associadas a comportamentos violentos e uso de drogas (KELLEY; SCHOCHET; LANDRY, 2004), porque as regiões de seus cérebros necessárias para a tomada de decisão estão ainda em desenvolvimento (SPEAR, 2018). Considerando que os adolescentes iniciais estão no meio de um processo maturacional relacionado ao desenvolvimento de muitos aspectos do funcionamento executivo (CHRISTIE; VINER, 2005; STEINBERG, 2007), o modelo logístico do programa espera proporcionar mudanças de curto prazo nas habilidades de tomada de decisão. Esta deve funcionar como mediadora dos efeitos da intervenção (CUIJPERS, 2002; ONRUST et al., 2016), por dois caminhos: atividades do programa de prevenção que modificam os mediadores (CHEN, 1990) e os mediadores que afetam as medidas de resultados (MACKINNON et al., 2002).

Um método epidemiológico recentemente desenvolvido por Robins and Greenland, (1992), e posteriormente elaborado por Preacher et al. (2007), para a realização das análises de mediação é a abordagem de desfechos potenciais. Nos modelos tradicionais de mediação, o efeito indireto é um produto de duas inclinações: uma da exposição ao mediador (a) e outra

do mediador ao desfecho (b). Já o método de desfechos potenciais decompõe efeitos indiretos e diretos, permitindo a interação entre exposição e mediador na previsão do resultado (PEARL, 2001; VANDERWEELE; VANSTEELANDT, 2009).

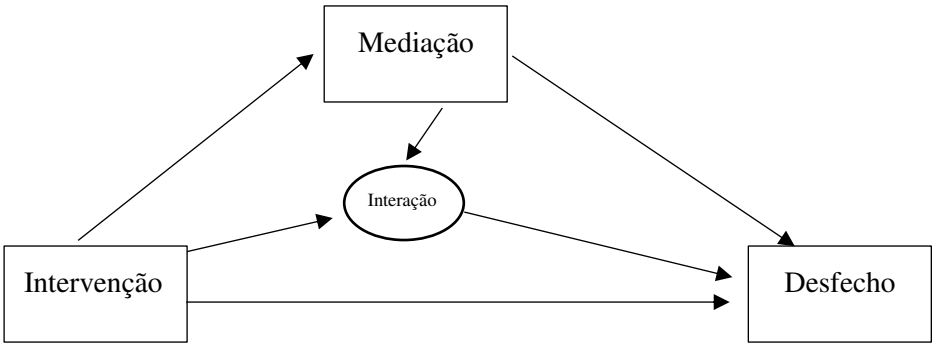

Figura 2: Diagrama conceitual da análise de mediação.

1.6. A importância da modelagem por equações estruturais no contexto da prevenção ao uso de drogas

Modelagem por equações estruturais (*Structural Equation Modeling - SEM*) é o nome dado para um conjunto grande de técnicas de modelagem estatísticas, que têm sido bastante utilizadas em análises que estudam o comportamento humano (HOX; BECHGER, 2014). A SEM é um método que foi desenvolvido para avaliar as associações entre variáveis de uma forma mais complexa, permitindo compreender as correlações entre duas ou mais variáveis, observáveis através da criação de uma variável latente (WANG; WANG, 2019). O interesse principal da SEM é representar constructos teóricos, através de fatores ou variáveis latentes, que ajudem a especificar a natureza e a força das relações hipotetizadas no modelo teórico (HOYLE, 1995; MARUYAMA, 1998). Através da criação de variáveis latentes, a *SEM* realiza ajustamentos para fatores de confusão e considera possíveis erros de mensuração dentro de um modelo de interações entre as variáveis propostas, o que é potencialmente útil na análise de dados longitudinais da avaliação de programas (STEINMAN;

SCHULENBERG, 2003). Outra característica desta técnica estatística é que ela consegue medir o efeito indireto de variáveis explicativas nos desfechos, mediados ou moderados por uma ou mais variáveis intermediárias, através de uma série de regressões lineares, que realizam estimações simultâneas (LITTLE, 2013).

Embora o método de modelagem de equações estruturais possa, em alguma medida, parecer semelhante ao método de regressão linear convencional, existem vantagens que distinguem a modelagem de equações estruturais das abordagens lineares clássicas, tais como: 1. Revelar relações ocultas entre as variáveis, que não podem ser medidas diretamente; 2. Possíveis erros observados nas medições das variáveis são levados em consideração, bem como a relação entre os erros; 3. É um método muito útil para analisar modelos altamente complexos, com múltiplas variáveis, podendo revelar relações diretas e indiretas entre variáveis num único modelo (WANG; WANG, 2019).

Uma das análises mais populares dentro no universo da modelagem de equações estruturais é a Análise Confirmatória Fatorial (*Confirmatory Factor Analysis – CFA*). A CFA é um modelo de medição ou mensuração, utilizado para testar a precisão do modelo conceitual, isso porque mede o quão bem um construto teórico e as variáveis latentes ou fatores, estão sendo representados/mensurados pelas variáveis observáveis ou indicadores. Através desse processo, os pesquisadores são capazes de determinar o número de variáveis latentes que melhor representam os construtos de interesse e o padrão de relacionamentos (ou seja, cargas fatoriais) entre os itens e as variáveis latentes (CIVELEK, 2018). Desta forma, a CFA pode ajudar os pesquisadores a determinar se devem se concentrar na pontuação total de uma medida ou em suas subescalas, compostas por itens específicos dessa escala. A CFA também fornece métodos superiores de avaliação das propriedades psicométricas (por exemplo, confiabilidade) de uma escala, em comparação com os métodos tradicionais, como, por exemplo, o *alfa de Cronbach*. Por essas razões, os pesquisadores são fortemente

incentivados a usar o CFA, ao desenvolver e validar novas escalas. Outro benefício prático do CFA é que podemos estimar uma única pontuação geral, a partir de muitas variáveis observadas. Essa abordagem subverte os erros de medição, como o viés do experimentador e a imprecisão do instrumento, para fornecer uma estimativa mais precisa do construto subjacente (BROWN, 2006; URBINA, 2004). Em síntese, podemos dizer que a CFA apresenta as seguintes vantagens em relação aos métodos tradicionais: 1) considera quanto cada variável observável contribui para a característica latente (através das cargas fatoriais); 2) lida com os valores ausentes da amostra, de modo a permitir o uso de dados incompletos; 3) utiliza as variáveis em sua unidade natural de medida, e a não normalidade pode ser tratada com o estimador robusto de máxima verossimilhança (MLR), sem a necessidade de transformar os dados; 4) ao usar mais de três variáveis observadas, permite avaliar a qualidade do ajuste do modelo hipotético (através dos fit índices) (PERES et al., 2018).

Outro tipo de análise do grupo da SEM é a Análise de Classe Latente (*Latent Class Analysis* – LCA). A LCA é uma técnica de análise transversal, que usa uma variável latente subjacente para descrever a relação entre um conjunto de itens observados. A LCA postula que existe uma variável categórica não observada, subjacente aos dados observados, que divide uma população em classes/padrões latentes distintos e exclusivos. Assim, indivíduos com um padrão mais similar de comportamento podem ser agrupados, formando o que se chama de classes latentes (COLLINS; LANZA, 2009).

Atualmente, a LCA é uma das técnicas mais modernas, utilizada para identificar subgrupos com os mesmos padrões de resposta, dentro de determinada população. O grande avanço da LCA é a utilização de uma metodologia de análise centrada na pessoa, em contraste com as técnicas de análise de dados anteriores, que eram centradas nas variáveis (LANZA; RHOADES, 2013), onde, para cada resultado observado, uma regressão é construída e, consequentemente, pode ocorrer um aumento nas taxas de falsas descobertas (SIMMONS;

NELSON; SIMONSOHN, 2011). Desta forma, oferece uma vantagem em relação a outros métodos, uma vez que as associações simples entre as variáveis avaliadas falham em capturar a complexidade envolvida nos fenômenos humanos (LANZA; COOPER, 2016).

No campo da prevenção ao uso de drogas, a LCA permite analisar o uso simultâneo de diferentes tipos de substâncias, acessando os diferentes padrões de uso e buscando os fatores de risco associados a cada padrão específico (Cho et al., 2015). Nos estudos internacionais realizados na área de álcool e outras drogas, já é bastante frequente a utilização do método de classes latentes nas análises estatísticas. O uso de drogas é frequentemente estudado com o modelo de classe latente, devido à alta correlação observada entre as diferentes drogas utilizadas, configurando a heterogeneidade do comportamento de uso de drogas na adolescência (EVANS-POLCE; LANZA; MAGGS, 2016). Uma revisão sistemática recente sobre as classes latentes e o uso de drogas listou 23 estudos internacionais (nenhum brasileiro) usando essa abordagem (TOMCZYK; ISENSEE; HANEWINKEL, 2016).

Outra técnica de análise que compõe as modelagens por equações estruturais é a Análise de Transição Latente (*Latent Transitional Analyis* –LTA), que pode ser compreendida como uma extensão longitudinal da análise de classe latente, já que envolve múltiplas classes latentes ao longo do tempo. Esta metodologia é utilizada para identificar e descrever o número ideal de classes que representam a população em estudo, acompanhando a sua transição ao longo de um determinado período. As classes são desenvolvidas com o intuito de representar um subgrupo de indivíduos, caracterizados por um padrão de respostas em comum, ao longo do tempo. Desta forma, a LTA é um tipo de análise longitudinal, que identifica classes latentes (ou seja, grupos ou perfis) e prediz as probabilidades de movimento entre subpopulações latentes (LANZA; PATRICK; MAGGS, 2010).

A LTA oferece ferramentas poderosas para estimar as probabilidades de transição de cada perfil de uso de drogas para outro, ao longo do tempo (LANZA; PATRICK; MAGGS, 2010), o que é útil ao testar efeitos de intervenção (VELICER; MARTIN; COLLINS, 1996). Essa abordagem centrada em padrões oferece conclusões mais qualificadas sobre os efeitos de uma intervenção, em comparação com as análises tradicionais, onde cada comportamento (uso de drogas) é analisado separadamente. Evita falsas descobertas (STEINMAN; SCHULENBERG, 2003) e fornece maior poder estatístico para testar a efetividade geral do programa, porque avalia mudanças nos padrões de comportamento que estão subjacentes aos indicadores observados, em comparação com as análises tradicionais, que realizam múltiplas comparações para múltiplos desfechos (BALDWIN, 2015; TAYLOR et al., 2000). Apesar dessas vantagens, apenas alguns poucos estudos aplicaram LTA para avaliar programas de prevenção (GRAHAM et al., 1991; SPOTH et al., 1996).

Observa-se que, no Brasil, o uso da SEM ainda é recente, especialmente no campo da prevenção ao uso de drogas. Considerando as diferenças socioculturais entre os países que influenciam o panorama do consumo de drogas da adolescência (GEWIN; HOFFMAN, 2016; SANCHEZ et al., 2011), é necessário que estas técnicas estatísticas sejam também incorporadas nas análises realizadas no contexto brasileiro.

1.6. Justificativa

Prevenir ou retardar o uso de drogas por adolescentes vêm sendo uma preocupação internacional no campo da saúde coletiva, uma vez que os prejuízos individuais e sociais envolvidos são comprovadamente impactantes. Neste contexto, algumas das principais estratégias para o desenvolvimento de políticas preventivas eficazes são identificar os fatores de risco e proteção envolvidos neste fenômeno e testar intervenções que possam, de fato, contribuir para a sua prevenção. Tendo a família como um dos fatores de maior relevância para

a formação do indivíduo, é importante buscar compreender a inter-relação entre o uso precoce de drogas pelos adolescentes e os comportamentos parentais, analisando, assim, quais comportamentos parentais estão associados ao risco e quais estão relacionados à proteção para o uso de drogas dos filhos. Apesar de estudos internacionais já terem produzido alguns materiais sobre esta temática, ainda existe a necessidade de estudos longitudinais bem delineados, com análises estatísticas robustas, para aquisição de dados mais fidedignos nesta área do conhecimento. Além de estudar os fatores de risco e proteção, avaliar o efeito de intervenções é outro eixo relevante dentro de uma política eficaz de prevenção ao uso de drogas. Considerando a escassez de programas de prevenção comprovadamente eficazes para a população brasileira, faz-se necessário adaptar e realizar a avaliação de programas baseados em evidências, como o #Tamojunto.

A relevância destas análises no contexto brasileiro é ainda maior, uma vez que são raros os estudos longitudinais bem delineados, que utilizem técnicas de análise modernas e robustas – como a modelagem por equações estruturais –, que busquem dar conta da complexidade deste fenômeno de forma adequada. Assim sendo, nos propomos a avaliar a associação entre os comportamentos parentais (estilos parentais e uso de álcool) e o uso de drogas na realidade brasileira, bem como entender melhor o efeito e os mediadores envolvidos na efetividade do Programa #Tamojunto.

2. OBJETIVOS

2.1. Objetivo Geral

- Compreender as utilidades do uso da modelagem de equações estruturais no campo da prevenção ao uso de drogas, a partir de dois eixos: 1. Análises dos preditores parentais (estilo parental e uso de álcool pelos pais) do padrão de uso de drogas e demais comportamentos de risco na adolescência e 2. Análises dos efeitos do Programa Escolar de Prevenção ao Uso de Drogas #Tamojunto.

2.2. Objetivos Específicos

Eixo 1: Análises dos preditores parentais (estilo parental e uso de álcool pelos pais) do padrão de uso de drogas e demais comportamentos de risco na adolescência:

- Investigar se existe associação entre os estilos parentais e os padrões latentes de uso de drogas no início da adolescência, quando controlados por fatores sociodemográficos.

- Investigar se o uso de álcool pelos pais e os estilos parentais, no tempo inicial, predizem os padrões latentes de uso drogas pelos adolescentes brasileiros, aos 9 e 21 meses de seguimento, quando controlados por fatores sociodemográficos e pelo grupo de randomização.

- Investigar se o uso de álcool pelos pais, os estilos parentais e o status de moradia parental, no tempo inicial, predizem padrões de comportamentos de risco (uso de drogas, prática de violência escolar e sexo desprotegido), aos 21 meses de seguimento, quando controlados por fatores sociodemográficos e pelo grupo de randomização.

Eixo 2: Análises dos efeitos do Programa Escolar de Prevenção do Uso de Drogas #Tamojunto:

- Avaliar a efetividade do Programa Escolar de Prevenção ao Uso de Drogas #Tamojunto nas transições dos padrões latentes de uso de drogas entre os adolescentes brasileiros, aos 9 e 21 meses de seguimento.

- Avaliar, através de análise fatorial confirmatória, se as dimensões de estilo parental, no tempo inicial, funcionam como fator preditivo do uso de drogas e moderador do efeito do programa aos 21 meses de seguimento;

- Avaliar se o efeito do programa no uso de drogas e prática de violência aos 21 meses de seguimento, é mediado pela habilidade de tomada de decisão, aos 9 meses de seguimento.

3. METODOLOGIA

Esta pesquisa está vinculada ao projeto "Avaliação de resultados do Programa Escolar de Prevenção ao Uso de Drogas #Tamojunto (*Unplugged*): um ensaio controlado randomizado em 6 cidades brasileiras", financiado pelo Ministério da Saúde. Trata-se de um ensaio controlado, randomizado paralelo por cluster, com dois braços, realizado com 6.391 estudantes, com idades entre 11-15 anos, em 72 escolas públicas, em 6 cidades brasileiras (São Paulo-SP, São Bernardo do Campo-SP, Distrito Federal-DF, Florianópolis-SC, Tubarão-SC e Fortaleza-CE), para avaliar os efeitos do Programa Escolar de Prevenção ao Uso de Drogas #Tamojunto (*Unplugged*).

A presente tese teve como proposta analisar os dados resultantes desta pesquisa, prioritariamente no que se refere à aplicação de uma técnica analítica sofisticada (modelagem de equações estruturais), para a compressão dos preditores parentais do uso e do efeito do Programa de Prevenção #Tamojunto nos adolescentes brasileiros, podendo, assim, contribuir para a ampliação dos conhecimentos acerca deste tema.

3.1. Intervenção

As escolas do grupo experimental receberam 12 aulas da intervenção do Programa #Tamojunto (*Unplugged),* por 12 semanas consecutivas, e o grupo controle não recebeu nenhuma intervenção. O Programa #Tamojunto (*Unplugged*) foi aplicado aos alunos em sala de aula por professores treinados. As 12 aulas foram guiadas pelo manual do aluno e do professor e tiveram, em média, 50 minutos de duração. A cada aula, foram realizadas de 3 a 5 atividades, abordando habilidades de vida (**Anexo 1**). O desenho da intervenção foi descrito por (KREEFT et al., 2009). O *Unplugged* é composto por 4 aulas sobre atitudes e conhecimentos sobre drogas, 4 aulas sobre habilidades sociais e interpessoais e 4 unidades

sobre habilidades pessoais (VADRUCCI et al., 2016). O manual do professor oferece informações sobre os procedimentos de cada aula, objetivos, materiais necessários, dicas e atividades a serem cumpridas. O manual do aluno oferece atividades que serão aplicadas pelo professor em cada aula. Ambos os manuais são de acesso livre e podem ser encontrados em diversos idiomas no site www.eudap.net. No Brasil, os materiais em inglês foram traduzidos para o português, com adaptação de expressões idiomáticas e substituição das informações sobre heroína por informações sobre crack, devido ao fato de não haver relatos de uso de heroína por adolescentes nos Brasil desde a década de 80 (CARLINI et al., 2010). Esta adaptação alterou o nome do programa de *Unplugged* para #Tamojunto (PEDROSO; ABREU; KINOSHITA, 2015).

Os professores que ministraram o programa foram capacitados em um treinamento de 16 horas, aplicado por multiplicadores formados pelos desenvolvedores europeus, os treinadores sêniores da *EU-Dap Intervention Planning Group* (GABRHELIK et al., 2012). Ao final de cada aula, os professores preencheram um questionário de fidelidade para controle da dose de programa ofertada em cada aula. Para a garantia da fidelidade, semanalmente, os professores eram supervisionados pelas multiplicadoras do Ministério da Saúde, que lhes ofertaram o treinamento inicial. Esta supervisão semanal foi feita por duas vias – e-mails e visitas presenciais – e teve como intenção confirmar o preenchimento regular do formulário de fidelidade, auxiliar na elaboração das aulas, verificar forma de aplicação das aulas e possíveis dificuldades encontradas pelos professores.

3.2. Amostra

A amostra desta pesquisa é composta por 6,658 educandos, com idades entre 11-15 anos, estudantes do 7º e 8° anos, de 72 escolas públicas de ensino fundamental das cidades de São Paulo-SP, São Bernardo do Campo-SP, Distrito Federal-DF, Florianópolis-SC, Tubarão-SC e

Fortaleza-CE. O grupo experimental é composto por 3,340 adolescentes, pertencentes a 130 classes, de 38 escolas, e o grupo controle por 3,318 adolescentes, de 131 classes, divididas em 34 escolas (**Figura 1**).

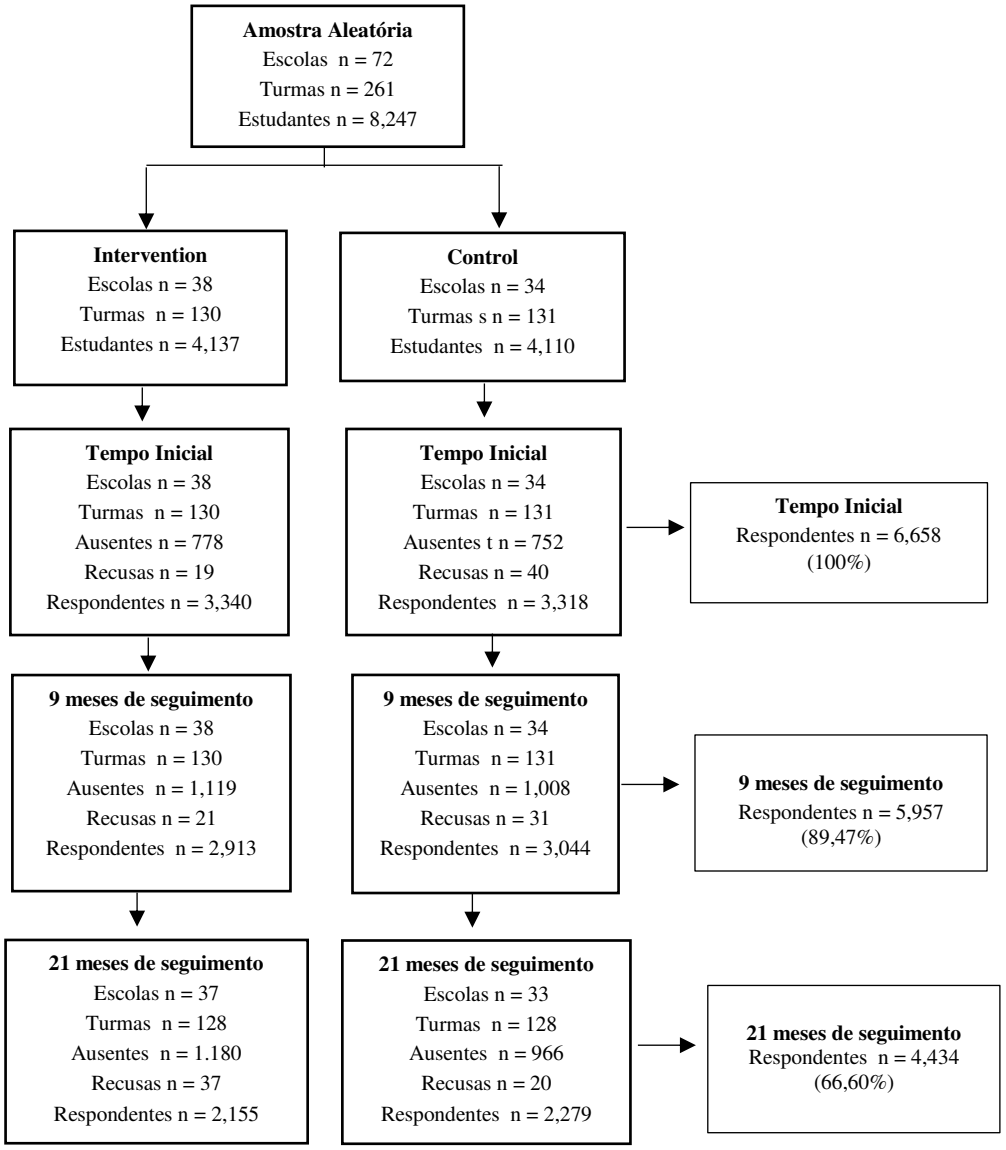

Figura 3: Fluxograma do Ensaio Controlado Randomizado para avaliação do Programa de Prevenção ao Uso de Drogas #Tamojunto.

Legenda: Ausentes = ausente da escola no momento da avaliação. /Recusas = sujeitos que se recusaram a participar da avaliação./ Respondentes = participantes que consentiram em participar e forneceram dados.

3.3. Coleta de dados do estudo

Os dados para avaliação dos padrões de consumo de drogas e potenciais fatores preditores, mediadores e moderadores foram coletados nos dois grupos (intervenção e controle), através de um questionário estruturado, anônimo e de autopreenchimento. Dados de tempo inicial foram coletados simultaneamente nas escolas controles e experimentais, duas semanas antes do início da implantação do programa. Foram realizados dois acompanhamentos com preenchimento do mesmo questionário pelos alunos, sendo o primeiro deles 9 meses e o segundo 21 meses após a coleta do tempo inicial. Desta maneira, este estudo possui três pontos de coleta: mês 0 (fevereiro 2014), mês 9 (novembro 2014) e mês 21 (novembro 2015).

Antes de administrar o questionário aos alunos, foi preenchido um código de sala e escola pelos pesquisadores envolvidos. Este código permitiu análises de *cluster* em dois níveis (escola e classe). Para garantir redução no viés de informação, os seguintes procedimentos de campo foram adotados: 1) anunciar aos estudantes de classe que receberiam um questionário sobre saúde e comportamentos, evitando relacionar o questionário à aplicação do programa de prevenção; 2) um ou dois investigadores treinados estiveram presentes na sala de aula durante todo o processo de preenchimento dos questionários pelos alunos e a presença de qualquer professor foi evitada; 3) os questionários foram depositados numa urna, para evitar contato entre os pesquisadores e os questionários preenchidos, garantindo ainda maior sigilo da informação; 4) em nenhum momento, os pesquisadores de campo perguntaram o nome dos alunos e deixaram sempre claro que o questionário é anônimo e que o código secreto criado para permitir a conexão dos três bancos de dados (0, 9 e 21) é apenas passível de decodificação pelo próprio aluno.

Para conexão dos questionários nos três tempos do estudo, os alunos preencheram um código secreto na primeira página do questionário, que envolve a geração de letras e números a partir das seguintes informações: nome, sobrenome, data de nascimento, nome da mãe, nome do pai e nome da avó materna. Desta maneira, cada código foi composto por 5 letras e 1 número,

e só poderia ser decodificado pelo próprio aluno. Esses códigos permitem que os pesquisadores pareiem os questionários individuais nos diferentes tempos do estudo e, ao mesmo tempo, protejam os participantes, oferecendo anonimato e confidencialidade essenciais a um estudo sobre comportamentos ilícitos (GALANTI et al., 2007).

Após a coleta, os questionários foram etiquetados com o número da escola e turma, para evitar extravios ou trocas durante o período de digitação. Após separação dos questionários deixados em branco (recusa), os dados foram inseridos em sistema personalizado de digitação, em modelo utilizado em estudos prévios do CEBRID. A plataforma criada em SQL permite acesso *online* de inúmeros digitadores simultaneamente, além de permitir controle em tempo real do trabalho de cada digitador e da qualidade da digitação, através de interface de conferência da digitação. Após inserção virtual dos dados, a coerência interna das respostas foi testada através de análises de consistência, no intuito de identificação de questionários incompletos ou mal preenchidos propositalmente.

3.4. Instrumentos e medidas

Os dados que foram utilizados nesta tese foram coletados por meio de instrumento (**Anexo 2**) desenvolvido e testado pela EU-DAP e utilizado nos estudos prévios de efetividade do *Unplugged* (FAGGIANO et al., 2008b). No Brasil, foi utilizada uma versão traduzida e adaptada para o português, com algumas perguntas substituídas por perguntas feitas a partir de dois questionários amplamente utilizados em diversos estudos entre estudantes no Brasil: o questionário da Organização Mundial da Saúde, utilizado pelo CEBRID (CARLINI et al., 2010) e o questionário da PENSE (Pesquisa Nacional de Saúde do Escolar), utilizado pelo Ministério da Saúde (IBGE, 2013). O questionário foi adaptado numa fase piloto do projeto (em 2013) e foi validado psicometricamente em uma parceria entre a Universidade Federal de São Paulo (UNIFESP) e a Universidade Federal de Santa Catarina (UFSC), em fase de publicação.

Foram avaliados como desfechos desta tese o uso de drogas nos últimos 12 meses (uso no ano - sim x não) e o uso de drogas nos últimos 30 dias (uso no mês - sim x não) das seguintes drogas: álcool, tabaco, maconha, inalantes, cocaína e crack. No caso do álcool, também foi avaliado o padrão *binge dinking* de consumo, considerado como o consumo de 5 ou mais doses em uma única ocasião. Os dados referentes ao uso de drogas no mês foram coletados por meio de cinco perguntas dicotômicas, que perguntavam se os adolescentes consumiram as drogas acima citadas no mês passado, como por exemplo, "De um mês para o outro, ou seja, nos últimos 30 dias, você bebeu bebidas alcoólicas?". Os dados referentes ao uso de drogas no ano foram coletados por meio de outras cinco perguntas dicotômicas, perguntando se consumiram as mesmas drogas acima citadas no último ano, como por exemplo: "De um ano para cá, ou seja, nos últimos 12 meses, você fumou maconha? "

Também foi avaliada como desfecho desta tese a prática de violência escolar, através de quatro perguntas sobre violência física, verbal, sexual e *bullying*, realizadas no último mês. Com perguntas do tipo: "Nos últimos 30 dias, você repreendeu, zombou, manipulou, intimidou ou provocou tanto algum colega de classe que ele foi ferido, irritado, ofendido ou humilhado?", para medir prática de bullying; e "Nos últimos 30 dias, você agrediu fisicamente algum colega, funcionário ou professor em sua escola?", para violência física. "Nos últimos 30 dias, você agrediu verbalmente algum colega, funcionário ou professor em sua escola?", para medir violência verbal; e "Nos últimos 30 dias, você agrediu verbalmente sexualmente colega, funcionário ou professor em sua escola?". Originalmente, os itens de resposta eram "nunca", "às vezes" e "sempre", que transformamos em respostas binárias (sim/não), agrupando as respostas "às vezes" e "sempre", para obter o grupo "sim", e a resposta "nunca" foi considerada "não".

O terceiro desfecho avaliado nesta tese foi comportamento de risco sexual na adolescência, sendo este medido através da pergunta: "Quando você faz sexo, você usa

preservativo? ” As respostas possíveis (nunca fiz sexo; sempre usei; às vezes usei; e nunca usei) foram dicotomias em não/sim, sendo que “nunca fiz sexo” e “sempre usei” foram agrupadas como “não”, e “às vezes usei” e “nunca usei” foram agrupados como “sim”.

Como variáveis explicativas, mediadoras e moderadoras, foram analisadas as variáveis de estilos parentais (negligente, autoritativo, autoritário e indulgente), o uso de álcool pelos pais e status de moradia parental e dados sociodemográficos (sexo, idade, e status socioeconômico).

Os dados referentes aos estilos parentais foram coletados através da escala de Exigência e Responsividade. Este instrumento foi utilizado para garantir a definição dos quatro estilos parentais (autoritário, autoritativo, negligente e indulgente), com base no modelo teórico de Maccoby e Martin (1983). O instrumento é constituído por duas escalas, que se referem às dimensões exigência e responsividade. As escalas são estruturadas por seis itens sobre a dimensão exigência e dez itens sobre a dimensão responsividade, avaliados por meio de um sistema de escala tipo Likert de três pontos, de maneira que, quanto mais próximo de três, maior a exigência e responsividade percebida. No contexto brasileiro, as escalas de responsividade e exigência foram traduzidas e adaptadas por Costa, Teixeira e Gomes (2000). As escalas apresentaram índices de consistência interna adequados (*alpha* entre 0,70 e 0,83). Os pais são classificados entre alta ou baixa exigência e alta ou baixa responsividade, sendo que os escores de exigência ou responsividade que coincidirem com a mediana são excluídos do cálculo. Os estilos parentais são definidos com base no seguinte esquema: alta exigência/alta responsividade: autoritativo; alta exigência/baixa responsividade: autoritário; baixa exigência/alta responsividade: indulgente e baixa exigência/baixa responsividade: negligente.

Os dados de uso de álcool pelos pais (episódios esporádicos de uso de álcool e episódios de embriaguez da mãe e do pai) foram coletados através de quatro perguntas dicotômicas (sim ou não). Especificamente, a pergunta feita foi: entre as pessoas da sua família quem: 1. bebe

álcool ocasionalmente; 2. fica bêbado. As respostas possíveis foram "pai/padrasto (sim ou não) e mãe/madrasta (sim ou não).

O *status* de moradia dos pais foi medido por meio de três perguntas dicotômicas (sim ou não), se o adolescente morava na mesma casa com dois pais, se morava na casa apenas com o pai ou se morava na casa somente com a mãe.

A avaliação da classe socioeconômica foi feita através da escala da ABEP (Associação Brasileira de Empresas de Pesquisa), que leva em consideração o grau de escolaridade do chefe de família e os bens e serviços utilizados, com score variando de 0 a 46, ou nas categorias de A a E. Pontuações mais altas indicam melhor posição socioeconômica e as classes socioeconômicas são classificadas de A (mais alta) a E (mais baixa) (ABEP, 2012).

3.5. Análise de dados

Com o intuito de responder aos objetivos propostos na presente tese, as análises estatísticas foram realizadas através da Modelagem por Equações Estruturais (*Strutural Equation Modeling – SEM*). Estas análises serão brevemente descritas abaixo e, ao final, resultaram na produção de seis artigos científicos.

No **artigo 1,** foi utilizada a Análise de Classe Latente (*latent class analysis - LCA*) para análises dos dados transversais do tempo inicial. A LCA foi utilizada com o intuito de encontrar diferentes grupos homogêneos de padrões de uso de drogas no tempo inicial do estudo (pré-intervenção). Para a formação das classes latentes, foram consideradas as variáveis observáveis de uso de álcool, *binge drinking*, cigarro, inalante e maconha (nos últimos 12 meses – sim ou não). Através desta análise, foi identificada a melhor solução, número de classes latentes, para descrever os padrões de uso de drogas dos adolescentes do estudo. Para avaliar o quão bem discriminadas as classes latentes ficaram, subjacentes à melhor solução, utilizamos o critério de "*goodness of fit statistics*": *Akaike information*

criterion (AIC); *Bayesian information criterion* (BIC); *Sample size-adjusted Bayesian information criterion* (SSABIC); *Vuong Lo Mendell Rubin test* (VLMR). Além dos índices estatísticos, a decisão sobre a melhor solução e seu número de classes latentes considerou também a parcimônia e interpretabilidade das classes, ou seja, aquela solução de classe que melhor reflete a distinção consistente dos perfis de uso de drogas em termos estatísticos e conceituais. Depois deste procedimento de identificar a melhor solução de classes latentes para a população do estudo, foi realizada uma regressão logística multinomial, para verificar se os estilos parentais (autoritativo, autoritário, permissivo e negligente) estavam associados às classes de uso de drogas no início da adolescência, controladas pelas covariáveis sociodemográficas (sexo, idade e status socioeconômico).

No **artigo 2,** a Análise de Classe Latente foi utilizada nos dados longitudinais, em três tempos, com o intuito de compreender se os estilos parentais (autoritativo, autoritário, permissivo e negligente) e o uso de álcool pelos pais (mãe e pai bebem - sim ou não -, mãe e pai ficam bêbados - sim ou não -), no tempo inicial do estudo, funcionam como preditores dos padrões de uso de drogas (nos últimos 12 meses) pelos filhos, após 9 e 21 meses de seguimento. Para tanto, o mesmo procedimento realizado no primeiro artigo, com relação a encontrar a melhor solução de classes latentes para descrever o padrão de uso de drogas dos adolescentes do estudo foi realizado. Entretanto, neste artigo, duas soluções de classes latentes foram analisadas, uma aos 9 meses e outra aos 21 meses de seguimento. Num segundo momento, foi conduzida uma regressão logística multinomial para verificar se as variáveis parentais do tempo inicial do estudo, tais como os estilos parentais e o uso de álcool pelos pais, possuem uma relação causal com as classes de uso de drogas aos 9 e 21 meses de seguimento, controladas pelas covariáveis sociodemográficas (sexo, idade e status socioeconômico) e grupo de randomização (controle e experimental).

No **artigo 3**, foi realizada uma Análise de Classe Latente, para testar se os estilos parentais (autoritativo, autoritário, permissivo e negligente), o uso de álcool pelos pais (uso de álcool esporádico e episódios de embriaguez, tanto pelo pai quanto pela mãe) e o status de moradia parental (se o adolescente vive somente com o mãe, vive com os dois pais ou somente com o pai) no tempo inicial predizem padrões latentes de comportamento de risco, tais como uso de drogas no último mês, sexo de risco e violência no último mês (aos 9 e 21 meses se seguimento). Para tanto, o mesmo procedimento realizado no primeiro e no segundo artigos, com relação a encontrar a melhor solução de classes latentes para descrever o padrão de comportamento de riscos dos adolescentes do estudo foi realizado. Num segundo momento, foi conduzida uma regressão logística multinomial, para verificar se as variáveis parentais do tempo inicial do estudo, tais como os estilos parentais e o uso de álcool pelos pais e status de moradia parental, possuem uma relação causal com as classes de uso de comportamento de risco aos 21 meses de seguimento, controladas pelas covariáveis sociodemográficas (sexo, idade e status socioeconômico) e grupo de randomização (controle e experimental).

No **artigo 4,** foi utilizada Análise de Transição Latente (*Latent Transitional Analyses - LTA*)**,** uma extensão longitudinal da análise de classe latente (LCA). Esta análise foi utilizada primeiramente para identificar padrões latentes de uso de drogas entre os estudantes que participaram do #Tamojunto nos três tempos do estudo (0, 9 e 21 meses). Para formação das classes latentes nos três tempos, foram consideradas as variáveis observáveis de uso de álcool, *binge drinking*, cigarro, inalante e maconha (nos últimos 12 meses – sim ou não). Posteriormente, foram caracterizadas as trajetórias dos padrões precoces de uso de drogas nos adolescentes ao longo do tempo, avaliando a probabilidade de mudança do comportamento observado anteriormente em 9 e 21 meses. Por fim, foram investigadas as probabilidades de transições entre estes padrões de uso de drogas ao longo dos 3 tempos do estudo, procurando compreender se a intervenção foi efetiva em modificar estes padrões de transição do uso de

drogas, controlando para as covariáveis sociodemográficas (sexo, idade e status socioeconômico).

No **artigo 5**, foi realizada uma Análise Fatorial Confirmatória, para estimar as duas dimensões comportamentais (responsividade e exigência) que compõem os estilos parentais. Os seguintes índices foram utilizados para avaliar o modelo: *chi-squared, comparative fit index (CFI), Tucker–Lewis Index (TLI), root–mean–square error of approximation (RMSEA),* e *weighted root mean square residual (WRMR).* Para testar se as dimensões parentais no tempo inicial funcionam como fator preditivo do uso de drogas (álcool, *binge drinking*, tabaco, inalantes, maconha nos últimos 12 meses - sim x não), foi realizada uma regressão logística. Além disso, foi realizada uma Análise de Moderação, na busca por compreender a influência das duas dimensões parentais como variáveis moderadoras do efeito do programa no uso de drogas (álcool, *binge drinking*, tabaco, inalantes, maconha nos últimos 12 meses - sim x não) aos 21 meses de seguimento. Em outras palavras, esta análise procura identificar se as dimensões parentais interagiram com o efeito do programa.

No **artigo 6**, foi realizada uma Análise de Mediação, para avaliar o efeito do programa no uso de drogas (somatória simples do uso de álcool, *binge drinking*, tabaco, inalantes e maconha nos últimos 12 meses - variando de 0 a 5) e no comportamento violento praticado (somatória simples de 4 das práticas de violência verbal, física, sexual e bullying - variando de 0 a 4), aos 21 meses de seguimento, através da habilidade de tomada de decisão, aos 9 meses de seguimento. Nós usamos o método de desfechos potenciais, previamente proposto por Robins and Greenland (1992), e posteriormente elaborado por Preacher et al. (2007), para avaliar os efeitos indiretos do #Tamojunto no uso de drogas e violência na adolescência, através da habilidade tomada de decisão.

3.6. Ética

Este estudo foi registrado no Ministério da Saúde Brasileiro no Registro Brasileiro de Ensaios Clínicos da Saúde Ensaios clínicos brasileiros (REBEC) sob o número RBR-4mnv5g. Este projeto foi aprovado pelo Comitê de Ética em Pesquisa da Universidade Federal de São Paulo (UNIFESP), sob protocolo #473.498 (Anexo 9). Consentimento para participar do estudo foi obtido com todos os diretores, professores e estudantes. Todos os estudantes participaram voluntariamente da pesquisa após leitura do consentimento informado, baseado no princípio da autonomia do adolescente sob o Estatuto da Criança e do Adolescente (Lei nº. 8969/1990). Para tanto, foi respeitado, em todos os momentos, os seguintes preceitos éticos: a voluntariedade, tendo o entrevistador apresentado de forma compreensível ao sujeito da pesquisa os objetivos da mesma e o Termo de Consentimento Livre e Esclarecido (TCLE) para sua concordância em participar do projeto, sendo o participante da pesquisa informado de que poderia desistir de participar da pesquisa a qualquer momento, sem prejuízo de seus benefícios de direito com cidadão comum ou qualquer impacto em suas relações com a escola ou família; e do anonimato já que os estudantes preencheram um código secreto no primeira página do questionário que garantia o anonimato e confidencialidade dos dados . Pelo fato de a intervenção ser inserida na escola como parte do currículo pelo governo federal, a participação nas aulas do programa não foi optativa. No entanto, a participação na pesquisa, caracterizada pela resposta aos questionários nos 3 tempos, não foi obrigatória.

4. RESULTADOS

4.1. Artigos publicados

Os resultados obtidos foram a produção de seis artigos científicos (**Tabela 1**). Estes artigos foram desenvolvidos para que se possa melhor compreender os fenômenos envolvidos no processo da prevenção do uso de drogas no contexto dos estudantes brasileiros, tanto em termos de preditores, como em termos de intervenção.

4.2. Síntese dos resultados encontrados em todos os artigos da tese

4.2.1 Resultados relacionados aos preditores parentais (estilo parental e uso de álcool pelos pais) do padrão de uso de drogas e demais comportamentos de risco na adolescência

Em relação aos padrões de uso de drogas dos adolescentes brasileiros, foi evidenciado que a solução de classe latente que proveu a melhor explicação para esta amostra, tanto aos 9 quanto aos 21 meses, foi a de três classes: "abstinentes/usuários leves", "usuários de álcool/bebedores em *binge* e "poliusuários de drogas". As proporções relativas das classes latentes foram relativamente estáveis nos dois seguimentos (9 e 21 meses). A classe de poliusuários de drogas foi consistentemente a menor (de 6,12% a 7,92%), a classe de usuários de álcool/bebedores em *binge* foi a segunda menor (de 29,42% a 21,42%) e a classe de abstinentes/usuários leves foi a maior (64,45% para 70,61%).

Em relação aos padrões de comportamento de risco (uso de drogas, prática de violência escolar e sexo de risco) dos adolescentes brasileiros, foi evidenciado que a solução de classes latentes que proveu a melhor explicação para esta amostra, aos 21 meses de seguimento, foi a de quatro classes. A classe de "comportamento de alto risco" foi consideravelmente a menor

classe (4,64%), seguida pelas classes de “alto uso de álcool e *bullying*” (17,49%) e “alto *bullying*” (17.90%), sendo “comportamentos de baixo risco” (59,97%) a maior delas.

Em relação aos estilos parentais e os padrões de uso de drogas, pode-se destacar que, quando realizada a análise transversal usando apenas os dados do tempo inicial, foi encontrado um gradiente de associação inversa entre os estilos parentais (autoritário, autoritário e indulgente, com o estilo negligente como referência) e as classes latentes de "usuários de álcool/bebedores em *binge*" (aOR = 0,36, IC95% = 0,27-0,47; aOR = 0,56, IC95% = 0,43-0,72; e aOR = 0,64, IC 95% = 0,51-0,80, respectivamente) e "poliusuários de drogas" (aOR = 0,09, IC 95% = 0,03-0,24; aOR = 0,23, IC 95% = 0,11-0,52; e aOR = 0,24, IC 95% = 0,08-0,74, respectivamente). Quando esta mesma hipótese foi testada num desenho longitudinal, foi encontrada significância estatística apenas no modelo de predição do estilo parental autoritativo e autoritário, em relação à classe latente de poliusuários de drogas, tanto no seguimento de 9 meses (aOR=0,47, 95%CI=[0.26; 0.86], e aOR=0,30, 95%CI=[0.12; 0.75], respectivamente), quanto no seguimento de 21 meses (aOR=0,62, 95%CI=[0.44; 0.89], e aOR=0,46, 95%CI=[0.31; 0.69], respectivamente).

Quando analisadas as dimensões que compõem os estilos parentais (responsividade e exigência), observou-se que a dimensão de exigência (presente em nível alto nos estilos autoritários e autoritativos) dos pais pode exercer uma função protetora para o uso de drogas pelos filhos. A dimensão da exigência mostrou estar associada a menores chances do beber em *binge* (OR = 0,88, [IC 95% = 0,80 a 0,96], uso de tabaco (OR = 0,76, [IC 95% = 0,64 a 0,89]) e uso de inalantes (OR = 0,81, [IC 95% = 0,72 a 0,91].

Tabela 1: Características gerais dos artigos produzidos nesta tese.

Artigo	Autores	Título	Períodico	Ano	Fator de Impacto	Anexo
Artigo 1	**Valente, Juliana Y.**; Cogo-Moreira, Hugo; Sanchez, Zila M.	*Gradient of association between parenting styles and patterns of drug use in adolescence: a latent class analysis*	*Drug and Alcohol Dependence*	2017	3.466	**Anexo 3**
Artigo 2	**Valente, Juliana Y.**; Cogo-Moreira, Hugo; Sanchez, Zila M.	*Predicting latent classes of drug use among adolescents through parental alcohol use and parental style: a longitudinal study*	*Social Psychiatry and Psychiatric Epidemiology*	2018	3.152	**Anexo 4**
Artigo 3	**Valente, Juliana Y.**; Martins, Silvia; Sanchez, Zila M	*Does parenting style and parenting alcohol use in early adolescence predict patterns of risk behaviors 21 months later?*	Submetido ao *Journal of Studies on Alcohol and Drugs*	2020	2.584	**Anexo 5**
Artigo 4	**Valente, Juliana Y.**; Cogo-Moreira, Hugo ; Swardfager, Walter ; Sanchez, Zila M. .	*A Latent Transition Analysis of a Cluster Randomized Controlled Trial for Drug Use Prevention*	Journal of Consulting and Clinical Psychology	2018	4.358	**Anexo 6**
Artigo 5	**Valente, Juliana Y.**; Cogo-Moreira, Hugo ; Sanchez, Zila M.	*Evaluating the effects of parenting styles dimensions on adolescent drug use: secondary analysis of #Tamojunto randomized controlled trial*	*European Child & Adolescent Psychiatry*	2019	3.74	**Anexo 7**
Artigo 6	**Valente, Juliana Y.**; Cogo-Moreira, Hugo ; Sanchez, Zila M.	*Decision-making skills as a mediator of the #Tamojunto school-based prevention program: indirect effects for drug use and school violence of a cluster-randomized trial.*	*Drug And Alcohol Dependence*	2019	3.466	**Anexo 8**

*No anexo 10 são listados os demais artigos que a bolsista produziu como colaboradora durante o período do seu doutorado.

Em relação aos estilos parentais e aos padrões de comportamento de risco dos adolescentes, mais uma vez foi encontrado que o estilo parental autoritativo pode atuar como um fator protetor para pertencer a todas as classes de comportamentos de risco: “alto *bullying*” (aOR = 0,64, IC 95% = [0,42; 0,98]), “alto uso de álcool e *bullying*” (aOR = 0,61, IC 95% = [0,46; 0,80]) e para o “comportamento de alto risco” (aOR = 0,41, IC 95% = [0,16; 0,10]). Já o estilo parental indulgente também mostrou ser um fator protetor de pertencer à classe latente de “alto *bullying*” (aOR=0.59, 95%CI=[0.40; 0.87]).

Com respeito ao uso de álcool pelos pais e ao padrão de uso de drogas dos filhos, foi encontrado que, tanto o uso de álcool esporádico pela mãe, quanto pelo pai, pode atuar como preditor do pertencimento à classe de “usuário de álcool/bebedores em *binge*”, tanto no seguimento de 9 meses (aOR=1.57, 95%CI=[1.20; 2.07], e aOR=1.59, 95%CI=[1.30; 1.95], respectivamente), quanto no seguimento de 21 meses (aOR=1.62, 95%CI=[1.01; 2.60], e aOR=1.36, 95%CI=[1.12; 1.65], respectivamente). O mesmo resultado foi encontrado para os episódios de embriaguez dos pais, os adolescentes que relataram que suas mães ou pais tiveram episódios de embriaguez eram mais propensos a pertencer à classe "usuários de álcool/bebedores em *binge*" (aOR = 1,74, IC 95% = [1,02; 2,98] e aOR = 1,59, IC 95% = [1,19; 2,16], respectivamente) no seguimento de 9 meses. Quando considerado um seguimento mais longo, 21 meses, apenas os adolescentes que relataram na linha de base que suas mães tiveram episódios de embriaguez eram mais propensos a pertencer à classe "usuários de álcool/bebedores em *binge*" (aOR = 2,10, IC 95% = [1,31; 3,35]). Desta forma, os episódios de embriaguez da mãe mostraram ser o mais consistente preditor do uso drogas pelos filhos, uma vez que se mostrou como preditor da possibilidade de pertencimento às duas classes de usuários de drogas, tanto no seguimento de 9, como no de 21 meses.

Com respeito ao uso de álcool pelos pais e o padrão de comportamento de risco, podemos dizer que os alunos que relataram que suas mães tiveram episódios de embriaguez

no início do estudo eram mais propensos a pertencer à classe "alto uso de álcool e *bullying*" e à classe de "comportamento de alto risco" (aOR = 3,73, IC 95% = [1,25; 11,11] e aOR = 4,98, IC 95% = [1,20; 20,76], respectivamente).

4.2.2. Resultados referentes à avaliação do efeito do Programa Escolar de Prevenção ao Uso de Drogas #Tamojunto

Sobre o efeito do programa nos padrões de uso de drogas dos adolescentes, uma análise de transição latente revelou três padrões distintos de comportamento de uso de drogas: "abstinentes/usuários leves" (81,54% no início do estudo, 70,61% após 21 meses), "usuários de álcool/bebedores em *binge*" (16,65% no início do estudo, 21,45% após 21 meses), e "poliusuários de drogas" (1,80% no início do estudo, 7,92% após 21 meses). Não foram encontradas diferenças nas probabilidades de transições entre esses padrões de uso de drogas ao longo do tempo entre os grupos de intervenção e controle. A trajetória mais provável foi a não transição entre os padrões de uso de drogas, independentemente de ter recebido a intervenção e dos padrões de uso de drogas medidos no tempo inicial do estudo.

Em relação às análises de moderação, concluiu-se que é improvável que o efeito da intervenção #Tamojunto para os desfechos de uso de drogas esteja condicionado às dimensões do estilo dos pais.

Encontramos um efeito significativo do Programa #Tamojunto no aumento do uso de drogas nas escolas após 21 meses, mediado pela diminuição da habilidade de tomada de decisão dos adolescentes (efeito indireto). Ao controlar todas as covariáveis, o Efeito Indireto Natural Total (TNIE) foi significativo apenas para o uso de drogas (TNIE = 0,003, IC 95% = 0,001; 0,007). Nos modelos ajustados, 37,5% do efeito da intervenção no uso de drogas foi mediado pelas habilidades de tomada de decisão.

5. DISCUSSÃO

A presente tese buscou aplicar o conhecimento já bem estabelecido da modelagem de equações estruturais ao campo da prevenção do uso de drogas, através da análise dos preditores parentais do uso de drogas e de outros comportamentos de risco (prática de violência e sexo desprotegido) dos adolescentes e da análise dos efeitos do Programa de Prevenção #Tamojunto. Em relação aos resultados da análise dos preditores do uso de drogas e de outros comportamentos de risco, podemos dizer que: 1. Tanto o uso de drogas, quanto os demais comportamentos de risco (sexo desprotegido e prática de violência) coocorrem e se agrupam em padrões latentes. 2. Os estilos parentais, especialmente a dimensão de exigência ou monitoramento característicos dos estilos autoritativo e autoritário, têm um papel importante no modelo de predição dos padrões de uso de drogas na adolescência inicial. No modelo de predição dos padrões de comportamentos de risco (uso de drogas, sexo desprotegido e prática de violência), destaca-se não só a dimensão da exigência, mas também a responsividade, característica dos estilos autoritativo e indulgente. 3. O consumo de álcool pelos pais também mostrou ser um importante preditor dos padrões de uso de drogas e dos padrões de comportamentos de risco, especialmente os episódios de embriaguez maternos. Em relação aos resultados da análise do efeito do Programa, podemos dizer que: 1. O Programa #Tamojunto não é efetivo em alterar os padrões de consumo de drogas dos adolescentes. 2. O efeito do programa no uso de drogas e na violência praticada é mediado pelas habilidades de tomada de decisão. 3. O efeito do programa não é moderado pelas dimensões de estilos parentais.

Os achados relacionados aos padrões latentes de uso de drogas foram consistentes com estudos anteriores realizados nos Estados Unidos e Austrália, que também encontraram as mesmas três classes latentes de uso de drogas adolescentes ("não usuários ou abstinentes/

usuários leves de drogas", "somente uso de álcool" e "usuários de drogas múltiplas") como o melhor modelo para descrever os padrões de uso de drogas entres os adolescentes (CHUNG et al., 2013; KELLY et al., 2015). Nas nossas análises, a grande maioria dos estudantes pertencia à classe de "abstinentes/usuários leves". Uma revisão sistemática mostrou que a classe de não usuários ou usuários leves tende a ser mais prevalente do que a classe de usuários de múltiplas drogas. As classes intermediárias geralmente caracterizam-se pelo uso isolado de algumas substâncias, como o "uso de álcool sozinho" (TOMCZYK; ISENSEE; HANEWINKEL, 2016).

Os resultados relacionados à melhor solução para as classes latentes de comportamento de risco confirmaram a tendência de coocorrência desses comportamentos (uso de drogas, *bullying* e sexo desprotegido) em adolescentes (COLEMAN et al., 2014; ZWEIG; LINDBERG; MCGINLEY, 2001). No entanto, este é o primeiro estudo que sabemos que agrupa esses três comportamentos em padrões latentes. Semelhante à pesquisa anterior, nosso estudo descobriu que a maioria dos adolescentes pertencia ao subgrupo de baixo risco e a minoria pertencia ao subgrupo de alto risco (AHMADI-MONTECALVO et al., 2019; ZWEIG; LINDBERG; MCGINLEY, 2001).

Os estilos parentais, especialmente a dimensão de exigência ou monitoramento característicos dos estilos autoritativo e autoritário, têm um papel importante no modelo de predição dos padrões de uso de drogas na adolescência inicial. Na análise que utilizou os dados transversais e na que utilizou dados longitudinais, ambas para verificar o efeito dos estilos parentais nos padrões latentes de uso de drogas, foi evidenciado que os estilos autoritativo e autoritário estão mais relacionados à proteção ao uso de drogas na adolescência inicial. Os pais dos dois estilos apresentam um elevado grau de exigência ou monitoramento. Na mesma linha deste resultado, a análise que avaliou o efeito das duas dimensões (como um traço contínuo latente) que compõem os estilos parentais (exigência e responsividade) na predição

do uso de cada droga separadamente encontrou que a exigência pode ser um fator protetor para o envolvimento com o uso de drogas (tabaco, beber em *binge* e inalantes). Desta forma, nossos resultados destacam a importância da dimensão da exigência dos pais, também entendida como monitoramento na prevenção do uso de drogas por adolescentes (SHIN et al., 2015). O monitoramento envolve um conjunto de comportamentos relacionados ao fato de os pais estarem atentos à vida dos seus filhos, sabendo sobre o uso do tempo livre deles e supervisionando as suas atividades e os amigos com quem se relacionam (DISHION; MCMAHON, 1998; RYAN; JORM; LUBMAN, 2010). Esse resultado está de acordo com estudos anteriores, realizados em outros países, que também reportaram que o monitoramento dos pais é um fator protetor para o uso de drogas na adolescência (YAP et al., 2017). Contudo, é importante que o monitoramento parental não seja realizado através de práticas severas, duras ou psicologicamente abusivas, uma vez que estas demonstraram estar fortemente associadas a problemas de externalização, tais como o uso de drogas e demais comportamentos de risco (PINQUART, 2017).

No modelo de predição dos comportamentos de risco (uso de drogas, sexo desprotegido e prática de violência), destaca-se a importância não só da dimensão parental da exigência, mas também da responsividade, característica dos estilos autoritativo e indulgente. Quando olhamos as classes de comportamento de risco, o estilo autoritativo dos pais, assim como no modelo de predição dos padrões de uso de drogas, mostra-se um importante fator de proteção, diminuindo as chances dos adolescentes de pertencerem a todas as classes de comportamento de risco. No entanto, quando olhamos isoladamente a classe latente de alta prática de *bullying*, verificamos que o estilo parental indulgente também aparece como fator de proteção. Em relação às descobertas relacionadas ao estilo autoritativo, podemos dizer que elas são consistentes com a literatura anterior, que mostrou que as combinações de apoio e supervisão dos pais, que caracterizam o estilo autoritativo, estão associadas a melhores

desfechos de um modo geral (CHEN et al., 2019) e atuam como fatores de proteção contra o uso de drogas por adolescentes (BERGE et al., 2016; ZUQUETTO et al., 2019), comportamento de *bullying* de adolescentes (GEORGIOU; STAVRINIDES; FOUSIANI, 2013; LEREYA; SAMARA; WOLKE, 2013; LUK et al., 2016) e comportamento de risco sexual de adolescentes (DE LOOZE et al., 2012; PITTMAN; CHASE-LANSDALE, 2001). Já o achado relacionado ao estilo parental indulgente atuar como um fator de proteção para o pertencimento à classe de alta prática de *bullying* contradiz a literatura tradicional anterior, que sugere que o estilo parental indulgente está relacionado a uma maior prática de *bullying* pelos adolescentes (LUK et al., 2016; MASUD et al., 2019). No entanto, estudos emergentes realizados na Espanha, em outros países europeus e na América Latina também mostraram que o estilo indulgente pode agir como um fator de proteção para a prática de *bullying* (CALAFAT et al., 2014; MARTÍNEZ et al., 2019). Estes resultados destacaram a importância da dimensão da responsividade na prevenção do *bullying*, uma vez que os estilos parentais indulgentes e autoritativos compartilham altos níveis de suporte e afeto parental como característica. A possível explicação para estes achados é que os pais com características de responsividade costumam dar muito suporte emocional aos seus filhos e, assim, os ajudam a superar seus problemas com o diálogo, ajudando a adquirir habilidade de enfrentamento mais adaptativas e menos agressivas (KOCHENDERFER-LADD; SKINNER, 2002).

Os resultados acerca dos estilos parentais enfatizam a necessidade de que programas de prevenção ao uso de drogas e demais comportamentos de risco incluam treinamento em habilidades parentais em seus currículos (VERMEULEN-SMIT; VERDURMEN; ENGELS, 2015). Programas de treinamento de pais podem ser necessários para estimular o envolvimento dos pais na criação de filhos, bem como capacitá-los a promover o diálogo e a exercitar habilidades de suporte e monitoramento, a fim de melhorar as relações familiares e evitar ou reduzir as práticas de bullying por parte dos adolescentes (SMITH et al., 2008). De

acordo com uma revisão sistemática, um foco central em todos os programas bem-sucedidos foi o monitoramento das atividades das crianças (KUNTSCHE; KUNTSCHE, 2016). Considerando que as intervenções parentais tendem a produzir efeitos pequenos a moderados no uso de substâncias na adolescência (SMIT et al., 2008), abordar comportamentos parentais demonstrados como fortes fatores de proteção ao uso de drogas na adolescência pode aumentar o efeito desses programas de prevenção. Os efeitos dos programas universais nas escolas podem ser aumentados com a adição de componentes parentais (NEWTON et al., 2017). A intervenção combinada adolescente-pais mostrou efeitos substanciais na prevenção do álcool (KONING et al., 2009; KOUTAKIS; STATTIN; KERR, 2008) e outras drogas (STORMSHAK et al., 2011).

Qualquer consumo de álcool pelos pais, seja esporádico ou abusivo, mostrou ser um preditor do pertencimento à classe de "usuários de álcool/bebedores em *binge*" pelos adolescentes. Estes resultados confirmam achados anteriores de que o uso de álcool pelos pais pode ser um fator de risco para o início precoce do uso deste (RYAN; JORM; LUBMAN, 2010). Desta forma, podemos pensar que o uso de álcool por adolescentes é parcialmente moldado pelo comportamento de beber dos pais, como a teoria da aprendizagem social sugere (BANDURA, 1977). Pais diretamente modelam o comportamento de beber de seus filhos adolescentes (VERMEULEN-SMIT et al., 2012), através da transmissão de expectativas positivas relacionadas ao uso de álcool (JONES; CORBIN; FROMME, 2001), estimulando opiniões positivas dos adolescentes sobre o consumo (HANDLEY; CHASSIN, 2013). Outra explicação possível é que os pais que bebem tendem a ser mais permissivos sobre o uso de álcool dos filhos (VAN DER ZWALUW et al., 2008), e podem acabar facilitando o acesso dos adolescentes à bebida (ALATI et al., 2005). Além disso, a suscetibilidade genética também pode desempenhar um papel importante na relação entre problemas de consumo dos pais e o uso de álcool por seus filhos adolescentes (KING et al., 2009).

Os episódios maternos de embriaguez mostraram ser um importante fator de risco, predizendo tanto a probabilidade de pertencer à classe de "poliusuários", quanto à classe de "usuários de álcool/bebedores em *binge*" nos dois seguimentos (9 e 21 meses). Os episódios de embriaguez maternos também se mostraram como um importante fator para os comportamentos de risco, prevendo a probabilidade de os adolescentes pertencerem às classes de "uso alto de álcool e alto *bullying*" e "comportamento de alto risco". Nossos resultados estão na mesma direção de estudos anteriores, que mostraram a mesma relação preditiva entre embriaguez materna e uso de álcool (CASSWELL; PLEDGER; PRATAP, 2002; VAN DER ZWALUW et al., 2008) e drogas por adolescentes (KILPATRICK et al., 2000). Há três explicações possíveis para esse efeito dos episódios de embriaguez da mãe no uso de drogas por adolescentes. Uma primeira explicação para estes achados pode se dar através de um entendimento biológico, através de um fator genético, enquanto a segunda explicação pode se dar pelo já conhecido papel das influências maternas no desenvolvimento infantil (KING et al., 2009). Segundo, o uso problemático de álcool materno pode promover uma percepção de baixo risco, associada ao uso de drogas (PATRICK et al., 2014), o que pode deixar o álcool mais acessível e permitir que seus filhos bebam mais cedo (MATTICK et al., 2018). Terceiro, ser exposto a episódios maternos de intoxicação perceptível pode trazer danos ao desenvolvimento emocional da criança, levando a um envolvimento prematuro no uso de drogas lícitas e ilícitas (BERG et al., 2016; KNUDSEN et al., 2015). Podemos ainda conjecturar que associado aos episódios de embriaguez materna possam existir comportamentos agressivos da mãe em relação aos seus filhos (GEBARA et al., 2017; ZILBERMAN; BLUME, 2005) o que por sua vez também pode desencadear o uso precoce de álcool e drogas por adolescentes (JAMES et al., 2018).

Estes achados relacionados ao uso de álcool pelos pais destacam a importância de abordagens de prevenção que promovam a conscientização dos pais sobre o papel

desempenhado como modelo para os filhos, e que o uso problemático de álcool pode ser um fator de risco para vários comportamentos de risco dos adolescentes, não apenas o início precoce do álcool. Assim sendo, os achados desta tese corroboram os princípios que devem alicerçar os programas eficazes de prevenção ao consumo de drogas, de acordo com o NIDA (2003), que falam da importância de incluir atividades com os pais, já que centrar os esforços de prevenção na família tende a trazer maior impacto.

Os achados relacionados ao efeito do Programa de Prevenção ao Uso de Drogas #Tamojunto mostraram que ele não é efetivo em alterar os padrões de consumo de drogas dos adolescentes. Esse resultado inesperado difere dos resultados positivos do programa *Unplugged,* na Europa (FAGGIANO et al., 2008a, 2010) – ressaltando que, nos estudos do *Unplugged,* não foi realizada esta mesma análise de transição de classes latentes. Considerando que nenhum dos outros estudos que avaliaram o efeito do programa evidenciaram efeito positivo preventivo ao uso de drogas (SANCHEZ et al., 2017, 2018), sugere-se que a implementação da intervenção e seus componentes devem ser reavaliados, antes da expansão como política pública. Uma possível explicação para estes achados está relacionada a falhas na adaptação cultural do programa e problemas na fidelidade da implementação (MADRUGA; CORDEIRO, 2018; MEDEIROS et al., 2016). Também é importante que seja dito que a estratégia de prevenção ideal seria uma combinação de programas curriculares desenvolvidos na escola, estratégias destinadas à família e a comunidade, com ênfase em alteração paulatina de crenças e práticas já enraizadas na sociedade, além de ampla revisão das políticas públicas de álcool, desde o controle de propagandas, aumento da taxação e restrição realmente controlada da venda para menores de idade (BABOR, 2010; MONTEIRO, 2020; UNODC, 2014). Ressaltando que o contexto social brasileiro também pode ter influenciado os efeitos negativos do programa em comparação com os achados europeus, uma vez que o Brasil é conhecido pelas suas fracas

políticas de prevenção ambiental, no que se refere a controle, tributação e promoção das vendas de bebidas alcoólicas a menores de idade (LARANJEIRA, 2007). Outro aspecto importante que poderia explicar as divergências nos resultados é a baixa qualidade das escolas públicas brasileiras, fato que pode ter comprometido o entendimento das atividades, tanto no que se refere a baixa alfabetização dos alunos quanto a precária formação dos professores (INEP, 2009; PISA, 2016), que não estavam familiarizados com as técnicas interativas utilizadas pelo programa e consideraram o conteúdo do treinamento oferecido para aplicação do programa insuficientes (MEDEIROS et al., 2016).

Considerando os achados relacionados à estabilidade dos padrões de transição do uso de drogas ao longo do tempo, uma possível abordagem alternativa seria considerar implementar programas seletivos, em oposição a um programa universal. As possíveis vantagens de programas seletivos têm sido discutidas recentemente, com vários estudos positivos, destacando efetividade (CONROD, 2016; SHETGIRI et al., 2011). Uma abordagem possível seria a identificação destes perfis de uso de drogas e a aplicação de abordagens seletivas direcionadas (OFFORD, 2000).

Nossos resultados relacionados à análise de mediação também contradizem os resultados esperados, propostos pelo modelo teórico do programa, que indicava que #Tamojunto poderia diminuir o uso de drogas, através do aumento das habilidades de tomada de decisão (FAGGIANO et al., 2008b). Esses achados também contrariam os resultados encontrados em estudos anteriores (MCNEAL et al., 2004; SLOBODA et al., 2009), que mostraram que os programas de prevenção podem ajudar os adolescentes a aprenderem a tomar melhores decisões sobre seus comportamentos, envolvendo-os num processo cognitivo de tomada de decisão (SUSSMAN et al., 2004b). Portanto, é importante destacar que as intervenções nem sempre impactam os mediadores conforme o esperado (na direção e, também, em termos de magnitude), trazendo consequências para os resultados do programa.

A adaptação cultural do programa fez mudanças importantes na lição "Álcool, Risco e Proteção", onde foram excluídas frases que enfatizavam a importância de se abster do uso de álcool e foram acrescentadas perguntas reflexivas sobre como evitar o abuso de álcool na adolescência (MADRUGA; CORDEIRO, 2018). Essa mudança pode ter reduzido a percepção de risco dos adolescentes, o que pode estar associado à diminuição das habilidades de tomada de decisão sobre o consumo de álcool. Outra explicação possível para esse resultado é que os conhecimentos e crenças anteriores dos adolescentes sobre o uso de drogas afetaram suas habilidades de tomada de decisão para usar drogas, conforme encontrado em um estudo anterior (SANCHEZ et al., 2019a). Esses resultados têm um impacto significativo na literatura de programa de prevenção, pois fornecem evidências da importância do conteúdo do programa no uso de drogas e nas crenças anteriores dos adolescentes, e não apenas no mecanismo e nos mediadores envolvidos.

Por fim, em relação aos achados relacionados à moderação do programa, podemos dizer que, apesar das descobertas negativas já conhecidas sobre o #Tamojunto como um programa universal para o uso de álcool e drogas (SANCHEZ et al., 2017, 2018), havia uma hipótese que acreditava na possibilidade de que, ao testar subgrupos ou moderadores específicos, fosse possível encontrar um efeito seletivo do programa. Essa hipótese foi baseada na ideia de que os alunos cujos pais apresentam alta exigência pudessem ser mais capazes de tirar proveito das aulas do programa de prevenção, pois estudos anteriores mostraram que os estilos parentais afetam o desempenho escolar (PINQUART, 2016) e as estratégias adaptativas de desempenho (AUNOLA; STATTIN; NURMI, 2000). No entanto, nossos resultados não comprovaram nossa hipótese. Embora muitos estudos demonstrem a importância das habilidades parentais no uso de drogas dos adolescentes, não encontramos outros estudos avaliando o papel moderador dos pais nos programas de prevenção ao uso de drogas dirigidos a adolescentes – apenas estudos que avaliaram o efeito moderador dos pais

nos programas de treinamento de habilidades parentais no uso de drogas por adolescentes (ÖZDEMIR; KOUTAKIS, 2016; VARVIL-WELD et al., 2014). É importante que mais estudos sejam implementados nessa área, uma vez que um maior conhecimento pode nos ajudar a entender a importância das habilidades parentais para os programas universais de prevenção ao uso de drogas.

Este estudo tem algumas limitações que devem ser consideradas. Primeiro, este apresenta perdas de dados ao longo dos seguimentos, levando à falta de informações sobre os estudantes não respondentes. Entretanto, vale ressaltar que a ausência de alguns dados é uma limitação esperada em estudos longitudinais, especialmente naqueles com longos períodos de acompanhamento (ARIZA et al., 2013; SHOPE et al., 1992). Para lidar com essa limitação, realizamos uma série de procedimentos para lidar com os dados perdidos, isso porque processos de imputação oferecem excelentes soluções para esses problemas de dados ausentes, estimando os valores ausentes (DONG; PENG, 2013). Entretanto, não podemos deixar de considerar que os dados ausentes sempre serão uma limitação na interpretação dos resultados, uma vez que estes resultam em perda de poder estatístico. Assim sendo, os resultados deste estudo devem sempre ser interpretados com cautela (JAKOBSEN et al., 2017). Além disso, sugere-se que estudos posteriores possam pensar em estratégias para minimizar essas perdas de dados através da sensibilização dos participantes e utilização e coleta via questionários on-line. Segundo, coletamos apenas as medidas fornecidas pelos adolescentes; assim, avaliamos apenas as percepções dos adolescentes sobre o estilo parental e o uso de álcool pelos pais. No entanto, é importante destacar que é prática comum usar as percepções dos adolescentes sobre comportamentos parentais em estudos de prevenção ao uso de drogas, uma vez que para o desfecho em questão o mais importante é de fato a percepção do adolescente a respeito dos pais (BERGE et al., 2016; GARCÍA; GRACIA, 2009). Terceiro, não coletamos dados sobre o uso de drogas ilícitas dos pais, pois poderia ser antiético pedir

aos adolescentes que relatassem o comportamento de seus pais. Finalmente, as associações deste estudo entre os preditores parentais e o uso de substâncias dos adolescentes não podem ser interpretadas exclusivamente como efeito unidirecional do comportamento dos pais nos comportamentos dos adolescentes, uma vez que as associações, na maioria dos casos, podem ser bidirecionais. Embora seja prática comum usar as percepções dos adolescentes sobre comportamentos parentais como variável explicativa do desfecho de uso de drogas pelos adolescentes, a possibilidade de que a percepção dos pais seja moldada pela droga usando o estilo de seus filhos também deve ser considerada.

Cabe acrescentar que considerando após a divulgação dos resultados nulos do efeito do #Tamojunto, apresentados nessa tese, somados aos resultados iatrogênicos para a iniciação do consumo de álcool, evidenciados em outros estudos oriundos do mesmo ECR que avaliou o efeito do #Tamojunto na prevenção ao uso de drogas dos adolescentes brasileiros (SANCHEZ et al., 2017, 2018), o Ministério da Saúde contratou consultoria externa para identificação de possíveis falhas no processo de adaptação cultural do programa. Verificou-se que ocorreram inadequações nas adaptações culturais feitas nos componentes sobre o álcool, a adaptação realizada na aula três, que trata do álcool e seus efeitos, retirou os componentes originais que reforçavam o não-uso de álcool por adolescentes e passou a enfatizar apenas componentes que visavam evitar a intoxicação alcoólica. Um exemplo do que foi alterado foi a exclusão de trechos do texto que diziam claramente que adolescentes não devem beber e a inclusão de atividade que discutia como beber sem ficar embriagado (MADRUGA; CORDEIRO, 2018). A partir desse feedback, nova adaptação do material foi feita, para que voltasse a refletir o conteúdo testado na Europa (FAGGIANO et al., 2008b) e, esta nova versão do programa, intitulada, #Tamojunto 2.0 vou reavaliada pela equipe de pesquisadores da UNIFEP. O novo ECR realizado em 2019 para avaliar a versão #Tamojunto2.0 encontrou resultados opostos ao efeito iatrogênico encontrado na avaliação do

#Tamojunto em sua primeira versão, já que evidenciou que o programa agora é capaz de retardar a iniciação precoce do uso do álcool. O resultado preventivo para a experimentação de álcool encontrado na avaliação da versão *#Tamojunto2.0*, reforça a principal hipótese levantada para explicar os resultados iatrogênicos encontrados na avaliação da primeira versão do #Tamojunto, que sugeria inadequação nas adaptações culturais feitas nos componentes sobre o álcool. Importante destacar que este processo sequencial denominado Feedback Loop que pressupõe a adaptação do programa, avaliação, readaptação e reavaliação, seguiu os padrões internacionais de implementação de programas de prevenção (EDDY et al., 2005). O processo contou com uma primeira etapa de identificação de necessidades, proposta de intervenções preventivas baseadas em evidências e rigorosa avaliação e monitoramento da sua implementação (UNODC, 2015).

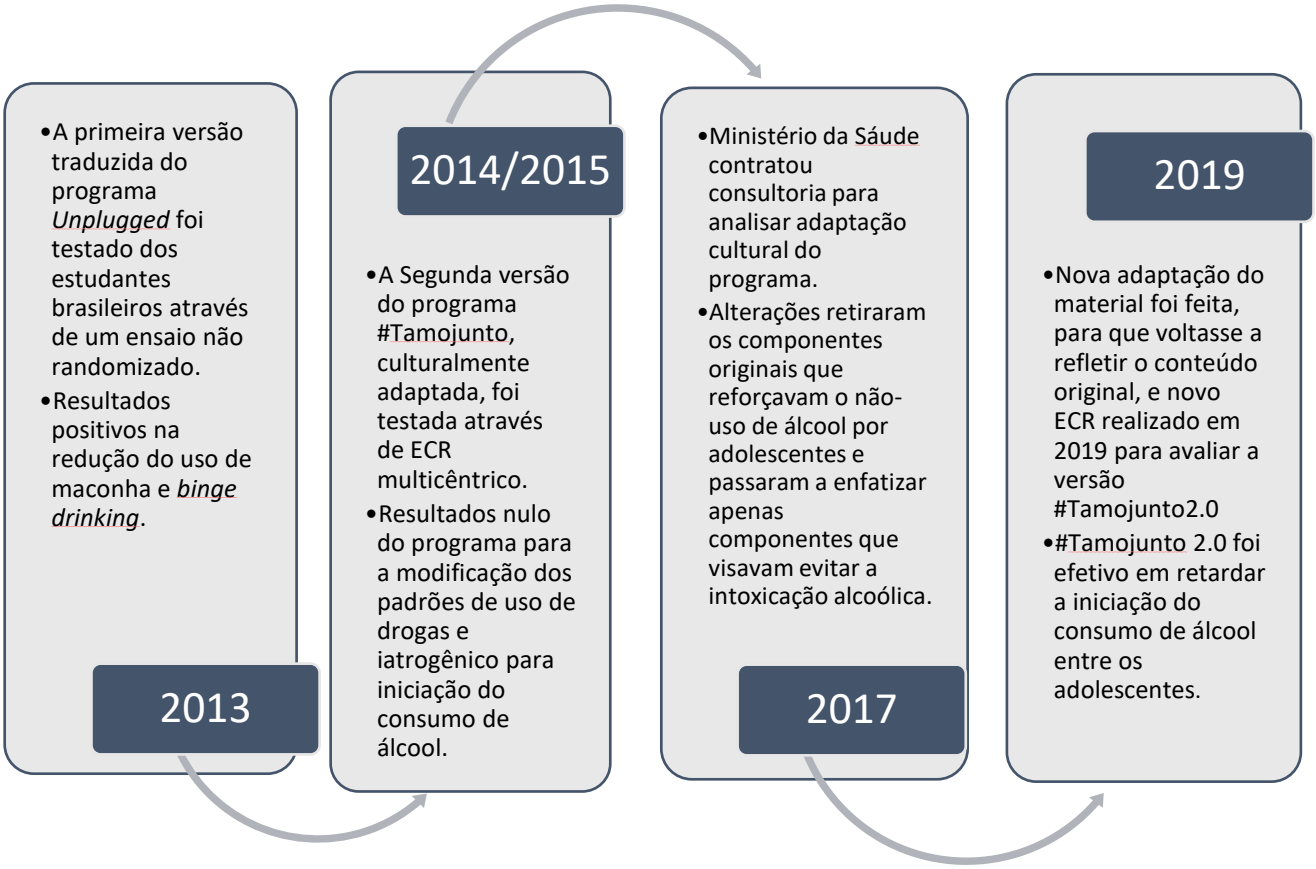

Figura 4: Linha do Tempo da Implementação do programa *Unplugged* no Brasil.

6. CONCLUSÃO

Esta tese teve como objetivo principal compreender as utilidades do uso da modelagem de equações estruturais no campo da prevenção ao uso de drogas, a partir de dois eixos: 1. Análises dos preditores parentais (estilo parental e uso de álcool pelos pais) do padrão de uso de drogas e demais comportamentos de risco na adolescência e 2. Análises dos efeitos do Programa Escolar de Prevenção ao Uso de Drogas #Tamojunto. Os resultados dos seis artigos, desenvolvidos a partir de análises que utilizaram a modelagem por equações estruturais, evidenciam que este conjunto de técnicas pode ser extremamente útil no campo da prevenção do uso de drogas, tanto para o eixo 1, análises de preditores do uso de drogas, como para o eixo 2, análises de efeito de programa. A SEM é uma ferramenta que permite aos pesquisadores responderem as suas perguntas de pesquisa de forma mais robusta e precisa, uma vez que leva em conta a complexidade dos dados. Logo, devemos encorajar que mais pesquisas sejam desenvolvidas na área da prevenção ao uso de drogas, que possam utilizar desta metodologia de análises para compreender seus dados.

Em relação aos objetivos secundários, agrupados dentro do eixo 1 (análise dos preditores parentais (estilo parental e uso de álcool pelos pais) do uso de drogas por adolescentes), podemos concluir que o comportamento dos pais é um importante preditor dos padrões de uso de drogas e demais comportamentos de risco por adolescentes. Primeiro, o estilo parental é um forte preditor para a prevenção do envolvimento em comportamentos de risco entre adolescentes, destacando a habilidade de monitoramento para prevenção ao uso de drogas e o suporte afetivo para prevenção da prática de bullying. Segundo, o uso ocasional de álcool pelos pais pode atuar como um preditor central do uso e do abuso de álcool por adolescentes. Além disso, a embriaguez materna está envolvida nos modelos preditivos de todos os padrões de uso de drogas, bem como dos comportamentos de risco. Desta forma,

habilidades parentais positivas, como supervisão e suporte, e uso de álcool por parte dos pais, dando atenção especial à influência de padrões problemáticos de consumo materno, devem ser alvo de programas de prevenção aos comportamentos de risco dos adolescentes, como uso de drogas, *bullying* e sexo desprotegido. O foco deve ser educar os pais a estarem mais conscientes de seu papel na prevenção do uso de drogas dos adolescentes. Além disso, os achados desta tese evidenciam que vários comportamentos de risco dos adolescentes estão inter-relacionados e tendem a coocorrer, indicando que a prevenção na comunidade e na escola precisam abordar concomitantemente os múltiplos comportamentos.

Em relação aos objetivos secundários, agrupados no eixo 2 (análise dos efeitos do Programa Escolar de Prevenção ao Uso de Drogas #Tamojunto), podemos concluir que a intervenção não teve êxito na mudança dos padrões de uso de drogas pelos adolescentes ao longo do tempo, mostrando que os componentes da adaptação brasileira do programa de prevenção devem ser reavaliados. Como esta é a primeira aplicação da análise de transição latente aos padrões de comportamento do uso de drogas em um estudo controlado randomizado para avaliar o efeito de uma intervenção preventiva, sugere-se que estudos futuros possam seguir explorando o impacto de intervenções nas transições dos padrões de uso de drogas. As probabilidades de transição nos padrões de uso de drogas foram relativamente incomuns ao longo do tempo, o que sugere que a população brasileira poderia se beneficiar de intervenções preventivas seletivas, somente para a população de risco.

Já quando investigamos o efeito mediador do programa via tomada de decisão, podemos concluir que este aparenta diminuir a capacidade dos adolescentes de tomarem melhores decisões e impactou no aumento do consumo de drogas aos 21 meses. Esses resultados sugerem que esse programa altera as habilidades de tomada de decisão, mas na direção oposta à proposta pelo modelo teórico do programa. A incapacidade do programa de aumentar o mediador das habilidades de tomada de decisão, conforme o esperado, pode ser

parcialmente responsável pelos resultados negativos do #Tamojunto. As lições do programa destinadas a afetar as habilidades de tomada de decisão devem ser revisadas.

Por fim, podemos finalizar dizendo que os achados desta tese contribuem para o aprimoramento da prevenção brasileira ao uso de drogas, uma vez que forneceram subsídios qualificados, tanto para o desenvolvimento de intervenções preventivas, como para a revisão de uma intervenção governamental aplicada pelo Ministério da Saúde nas escolas brasileiras. Desta forma, esta tese fez parte de um conjunto de ações sistemáticas que podem ser consideradas como pioneiras na prevenção do uso de drogas brasileira cujo principal objetivo foi fornecer subsídios para a disseminação de uma política de prevenção pública baseada em evidências.

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ANEXOS

Anexo 1: Descrição das 12 aulas do Programa *#Tamojunto 2.0*, com o título, atividades e metas.

AULA	TÍTULO	ATIVIDADES	METAS
1	Abertura do #Tamojunto2.0	Apresentação, trabalho em grupo gestão do contrato de convivência, tarefa de casa	Introdução ao Programa, estabelecimento de regras para as aulas, reflexão sobre o que se sabe sobre drogas
2	Qual é a minha galera?	Simulação de situações, discussão do jogo	Esclarecendo as influências e expectativas do grupo
3	Escolhas - Álcool, risco e proteção	Informações sobre diferentes fatores que influenciam o uso de drogas	Informações sobre diferentes fatores que influenciam o uso de drogas
4	O que você pensa da realidade?	Apresentação, discussão geral, trabalho em grupo, jogo	Fomentando a análise crítica das informações, reflexão sobre diferenças entre a opinião pessoal e dados reais, reavaliação de normas
5	O que sabemos e o que não sabemos sobre o cigarro	Teste, discussão geral, retorno, jogo	Informações sobre os efeitos do tabagismo, diferenciação de efeitos esperados vs. reais e efeitos de curto prazo vs. efeitos de longo prazo
6	Expresse-se	Jogo, discussão e plenária, trabalho em grupo	Comunicação adequada de emoções, distinção entre comunicação verbal e não verbal
7	nifeste-se no mundo e em sua vida	Discussão geral, trabalho em grupo, desempenho de papéis	Promovendo a assertividade e o respeito pelos outros
8	Novo do pedaço!	Encenação, jogo, discussão geral da turma	Reconhecimento e apreciação de qualidades positivas, aceitação de retorno positivo, prática e reflexão sobre entrar em contato com outros
9	Drogas – informe-se	Trabalho em grupo, quiz	Informações sobre efeitos positivos e negativos do uso de drogas
10	Estratégias de enfrentamento	Apresentação, discussão geral da turma, trabalho em grupo,	xpressão de sentimentos negativos, lidando com desafios
11	Solução de problemas e tomada de decisões	Apresentação, discussão geral, trabalho em grupo, tarefa de casa	Solução de problemas, fomentando o pensamento criativo e o autocontrole
12	Estabelecimento de metas	Jogo, trabalho em grupo, discussão geral	Distinguindo objetivos de longo prazo e de curto prazo, avaliação do Programa e seu processo

Fonte: Adaptado do manual do professor do *Unplugged* (www.eudap.net).

Anexo 2

QUESTIONÁRIO #TAMOJUNTO

FORMULÁRIO PARA GERAÇÃO DO CÓDIGO DE ACESSO SIGILOSO

Nome

Sobrenome

Nascimento (dd/mm/aaaa) / /

Nome da mãe

Nome do Pai

Nome da avó materna

INSTRUÇÕES SOBRE PREENCHIMENTO DO CÓDIGO DE ANONIMATO

1. O objetivo desse código é garantir que não saibamos quem deu estas respostas e para que no futuro possamos juntar com seus próximos questionários. Por favor preste atenção nas seguintes orientações:

- Complete esse formulário com atenção e preencha o código individual que fica à margem direita da folha.
- Assim que o código estiver formado, arranque esta folha e jogue no lixo.

2. Preencha as linhas dos quadradinhos seguindo essas regras:

- Escreva com LETRA MAIÚSCULA.
- Escreva uma letra por quadro;
- Não coloque acentos nem caracteres especiais (apóstrofes, por exemplo)
- Não deixe quadros em branco entre as palavras (ex.: ANAPAULA e não ANA PAULA ou ANA-PAULA)
- Se você não souber ou não se lembrar de alguma resposta, coloque Ø no quadro do código.
- Quando for usar o zero, faça um corte no número (Ø em vez de 0)
- Se uma palavra for muito curta e um dos quadros cinzas ficar em branco, coloque Ø no quadro do código.

Obrigado por sua participação!

QUESTIONÁRIO

Sobre conhecimento, atitudes e comportamentos relacionados à álcool, tabaco e outras drogas

1. Sexo: 1 ☐ Masculino 2 ☐ Feminino

2. Quantos anos você tem? ..... anos

3. Qual ou quais pessoas das listadas abaixo moram na mesma casa que você?

PODE MARCAR MAIS DE UMA

1 ☐ Pai
2 ☐ Padrasto
3 ☐ Mãe
4 ☐ Madrasta
5 ☐ Irmão(s)
7 ☐ Avós
8 ☐ Outros

4. Até que grau o chefe (pai, mãe ou responsável) de sua família estudou?

1 ☐ Nunca estudou
2 ☐ Fez até a 1ª, 2ª ou 3ª série do ensino fundamental
3 ☐ Fez até a 4ª, 5ª, 6ª ou 7ª série do ensino fundamental
4 ☐ Fez até a 8ª série do ensino fundamental
5 ☐ Fez até a 1ª e 2ª série do ensino médio (1º e 2º colegial)
6 ☐ Terminou o ensino médio (3º colegial)
7 ☐ Fez faculdade, mas não terminou o curso
8 ☐ Fez faculdade completa (terminou o curso)
9 ☐ Não sei

5. Na sua casa tem?

a) Micro-ondas?

1 ☐ Não
2 ☐ Sim. Quantos? .....

b) Máquina de lavar-louça

1 ☐ Não
2 ☐ Sim. Quantas? .....

c) Aparelho de DVD?

1 ☐ Não
2 ☐ Sim. Quantos? .....

d) Microcomputador (não vale tablet e celulares)?

1 ☐ Não
2 ☐ Sim. Quantos? .....

e) Banheiro?

1 ☐ Não
2 ☐ Sim. Quantos? .....

f) Motocicleta?

1 ☐ Não
2 ☐ Sim. Quantas? .....

g) Empregado(a) que trabalha todos os dias para sua família?
Ex.: doméstica, babá, motorista, jardineiro, etc.

1 ☐ Não
2 ☐ Sim. Quantos? .....

h) Máquina de lavar-roupa (não vale tanquinho)?

1 ☐ Não
2 ☐ Sim. Quantas? .....

i) Geladeira (não vale quebrada)?

1 ☐ Não
2 ☐ Sim. Quantas? .....

j) Freezer (da geladeira ou independente) (não vale quebrado)?

1 ☐ Não
2 ☐ Sim. Quantos? .....

k) Carro (automóvel)?

1 ☐ Não
2 ☐ Sim. Quantos? .....

l) Secadora de roupas

1 ☐ Não
2 ☐ Sim. Quantas? .....

6.a. Você já experimentou alguma bebida alcoólica?
Exemplos: cerveja, chopp, ice, vinho, pinga, caipirinha, batidas, sidra, outras.

1 ☐ Não
2 ☐ Sim

6.b. Que idade você tinha quando experimentou bebida alcoólica <u>pela primeira vez</u>?

1 ☐ Nunca tomei
2 ☐ Eu tinha ..... anos

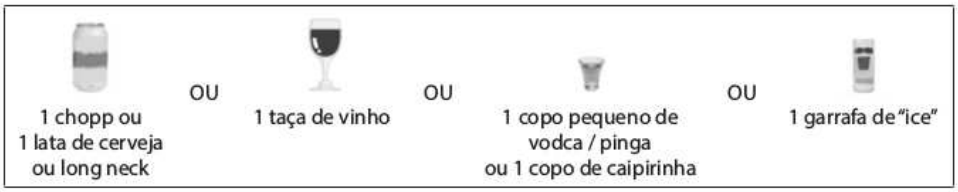
6.c. De um ano para cá, ou seja, <u>nos últimos 12 meses</u>, você tomou alguma bebida alcoólica?

1 ☐ Não
2 ☐ Sim

6.d. De um mês para cá, ou seja, <u>nos últimos 30 dias</u>, você tomou alguma bebida alcoólica?

1 ☐ Não
2 ☐ Sim, tomei de 1 a 5 dias no mês
3 ☐ Sim, tomei de 6 a 19 dias no mês
4 ☐ Sim, tomei 20 dias ou mais no mês

A próxima questão ainda é sobre o uso de bebida alcoólica. É muito importante que você responda a essa pergunta calculando quantas DOSES de bebida alcoólica você tomou. Assim, nessa questão você deve considerar UMA DOSE IGUAL A:



Exemplo: Se você tomou 3 latas de cerveja e 2 caipirinhas na mesma ocasião, então você tomou 5 doses de bebida alcoólica.

Pergunta:

7.a. Você já tomou 5 doses ou mais de bebida alcoólica em uma única ocasião?

1 ☐ Não
2 ☐ Sim

7.b. De um ano para cá, ou seja, nos últimos 12 meses, você tomou 5 doses ou mais de bebida alcoólica em uma única ocasião?

1 ☐ Não
2 ☐ Sim

7.c. De um mês pra cá, ou seja, nos últimos 30 dias, quantas vezes você tomou 5 doses ou mais de bebida alcoólica em uma única ocasião?

1 ☐ Nenhuma vez
2 ☐ 1 vez
3 ☐ 2 vezes
4 ☐ 3 a 5 vezes
5 ☐ Mais de 5 vezes

8.a. Você já fumou cigarro?

1 ☐ Não
2 ☐ Sim

8.b. De um ano para cá, ou seja, nos últimos 12 meses, você fumou algum cigarro?

1 ☐ Não
2 ☐ Sim

8.c. De um mês para cá, ou seja, nos últimos 30 dias, você fumou algum cigarro?

1 ☐ Não
2 ☐ Sim, fumei de 1 a 5 dias no mês
3 ☐ Sim, fumei de 6 a 19 dias no mês
4 ☐ Sim, fumei 20 dias ou mais no mês

8.d. Se você fuma, quantos cigarros você fuma por dia?

1 ☐ Não fumo
2 ☐ De 1 a 10 cigarros por dia
3 ☐ De 11 a 20 cigarros por dia
4 ☐ Mais de 20 cigarros por dia

9.a. Você já cheirou algum produto para sentir algum "barato/brisa"?
Exemplos: loló, lança, cola, éter, removedor de tinta, gasolina, benzina, esmalte, acetona, tíner, aguarrás, tinta, desodorante aerosol. (NÃO VALE COCAÍNA)

1 ☐ Não
2 ☐ Sim

9.b. De um ano para cá, ou seja, nos últimos 12 meses, você cheirou algum produto para sentir algum "barato/brisa"?

1 ☐ Não
2 ☐ Sim

9.c. De um mês para cá, ou seja, nos últimos 30 dias, você cheirou algum produto para sentir algum "barato/brisa"?

1 ☐ Não
2 ☐ Sim, cheirei de 1 a 5 dias no mês
3 ☐ Sim, cheirei de 6 a 19 dias no mês
4 ☐ Sim, cheirei 20 dias ou mais no mês

10.a. Você já experimentou maconha?

1 ☐ Não
2 ☐ Sim

10.b. De um ano para cá, ou seja, nos últimos 12 meses, você usou maconha?

1 ☐ Não
2 ☐ Sim

10.c. De um mês para cá, ou seja, nos últimos 30 dias, você usou maconha?

1 ☐ Não
2 ☐ Sim, usei de 1 a 5 dias no mês
3 ☐ Sim, usei de 6 a 19 dias no mês
4 ☐ Sim, usei 20 dias ou mais no mês

11.a. Você já experimentou cocaína?

1 ☐ Não
2 ☐ Sim

11.b. De um ano para cá, ou seja, nos últimos 12 meses, você usou cocaína?

1 ☐ Não
2 ☐ Sim

11.c. De um mês para cá, ou seja, nos últimos 30 dias, você usou cocaína?

1 ☐ Não
2 ☐ Sim, usei de 1 a 5 dias no mês
3 ☐ Sim, usei de 6 a 19 dias no mês
4 ☐ Sim, usei 20 dias ou mais no mês

12.a. Você já experimentou crack ou merla?

1 ☐ Não
2 ☐ Sim

12.b. De um ano para cá, ou seja, nos últimos 12 meses, você usou crack ou merla?

1 ☐ Não
2 ☐ Sim

12.c. De um mês para cá, ou seja, nos últimos 30 dias, você usou crack ou merla?

1 ☐ Não
2 ☐ Sim, usei de 1 a 5 dias no mês
3 ☐ Sim, usei de 6 a 19 dias no mês
4 ☐ Sim, usei 20 dias ou mais no mês

13. Você já experimentou holoten ou carpinol?

1 ☐ Não
2 ☐ Sim

14.a. Você já teve relação sexual?

1 ☐ Não
2 ☐ Sim

14.b. De um mês pra cá, ou seja nos últimos 30 dias, quantas vezes você teve relações sexuais?

1 ☐ Nunca tive relações sexuais
2 ☐ Nenhuma vez
3 ☐ ..... vezes

14.c. Quando você tem relações sexuais, você usa camisinha/preservativo?

1 ☐ Nunca tive relações sexuais
2 ☐ Sempre uso
3 ☐ Às vezes uso
4 ☐ Nunca uso

14.d. De um mês pra cá, ou seja, nos últimos 30 dias, alguma vez você teve relações sexuais sem camisinha/preservativo?

1 ☐ Nunca tive relações sexuais
2 ☐ Não
3 ☐ Sim

14.e. Você já ficou grávida (para meninas) ou já engravidou alguém (para meninos) com menos de 18 anos?

1 ☐ Não
2 ☐ Sim

15. Nos últimos 30 dias, quantos dias você faltou às aulas ou à escola sem permissão dos seus pais ou responsáveis?

1 ☐ Nenhum dia (0 dia)
2 ☐ 1 ou 2 dias
3 ☐ 3 a 5 dias
4 ☐ Mais de 5 dias

16. Nos últimos 30 dias, com que frequência os colegas de sua escola trataram você bem e/ou foram prestativos contigo?

1 ☐ Nenhuma vez
2 ☐ Algumas vezes
3 ☐ Sempre

17. Nos últimos 30 dias, com que frequência algum dos seus colegas de escola te esculacharam, zoaram, mangaram, intimidaram ou caçoaram tanto que você ficou magoado, incomodado, aborrecido, ofendido ou humilhado?

1 ☐ Nenhuma vez
2 ☐ Algumas vezes
3 ☐ Sempre

18. Nos últimos 30 dias, você esculachou, zombou, mangou, intimidou ou caçoou algum de seus colegas da escola tanto que ele ficou magoado, aborrecido, ofendido ou humilhado?

1 ☐ Sim
2 ☐ Não

19. Nos últimos 30 dias, quantos dias você não foi à aula porque não se sentia seguro na escola?

1 ☐ Nenhum dia (0 dia)
2 ☐ 1 ou 2 dias
3 ☐ 3 a 5 dias
4 ☐ Mais de 5 dias

20. Nos últimos 30 dias, você foi agredido(a) fisicamente em sua escola?

1 ☐ Sim
2 ☐ Não

21. Nos últimos 30 dias, você agrediu fisicamente algum colega, funcionário ou professor de sua escola?

1 ☐ Sim
2 ☐ Não

22. Nos últimos 30 dias, você foi agredido(a) verbalmente em sua escola?

1 ☐ Sim
2 ☐ Não

23. Nos últimos 30 dias, você agrediu verbalmente algum colega, funcionário ou professor de sua escola?

1 ☐ Sim
2 ☐ Não

24. Nos últimos 30 dias, você foi agredido(a) sexualmente em sua escola?

1 ☐ Sim
2 ☐ Não

25. Nos últimos 30 dias, você agrediu sexualmente algum colega, funcionário ou professor de sua escola?

1 ☐ Sim
2 ☐ Não

26. Como foram suas notas na escola no último ano?

1 ☐ Baixas
2 ☐ Médias
3 ☐ Altas

27. Como você se sente em relação à escola atualmente?

1 ☐ Gosto muito
2 ☐ Gosto um pouco
3 ☐ Não gosto

28. Quanto você concorda com as seguintes descrições em relação a sua escola?

	Discordo	Concordo
a) Os alunos da minha sala gostam de estar juntos	☐	☐
b) A maioria dos alunos da minha sala são gentis e gostam de ajudar	☐	☐
c) Outros alunos me aceitam como eu sou	☐	☐
d) Eu me importo com o meu desempenho na escola	☐	☐
e) Eu respeito muito o que meus professores dizem	☐	☐

29. Qual a chance de você se envolver nas situações descritas abaixo NO PRÓXIMO ANO?
Marque uma opção por linha

	Improvável	Provável
a) Fumar cigarros	☐	☐
b) Beber bebidas alcoólicas	☐	☐
c) Ficar bêbado	☐	☐
d) Fumar maconha	☐	☐
e) Usar outras drogas não permitidas	☐	☐

30. Quanto você concorda das afirmações abaixo sobre o uso de drogas? Marque uma resposta por linha e a que mais se aproxima da sua opinião

	Discordo	Concordo
a) Usar drogas pode ser uma atividade que dá prazer	☐	☐
b) Uma pessoa jovem não deveria jamais usar drogas	☐	☐
c) Usar drogas é divertido	☐	☐
d) Há muitas coisas mais arriscadas do que usar drogas	☐	☐
e) Todos que usam drogas um dia se arrependem	☐	☐
f) As leis sobre drogas deveriam ser mais fortes	☐	☐
g) Uso de drogas é um dos maiores problemas de um país	☐	☐
h) Drogas ajudam as pessoas a experimentar a vida com mais intensidade	☐	☐
i) As escolas deveriam ensinar os perigos de se usar drogas	☐	☐
j) A polícia não deveria perturbar pessoas que estão experimentando drogas	☐	☐
k) Experimentar drogas é abandonar o controle da sua vida	☐	☐

31. Você teve algum dos problemas abaixo nos últimos 12 meses?
Marque uma opção por linha

	Não	Sim, por causa de bebida alcoólica	Sim, por causa de uso de drogas	Sim, por outras razões diferentes de álcool e droga
a) Discussão ou desentendimento	☐	☐	☐	☐
b) Briga ou confusão	☐	☐	☐	☐
c) Acidente ou ferimento	☐	☐	☐	☐
d) Perda de dinheiro ou de bens de valor	☐	☐	☐	☐
e) Danos a objetos ou roupas que você possuía	☐	☐	☐	☐
f) Problemas na relação com seus pais ou responsáveis	☐	☐	☐	☐
g) Problemas na relação com seus amigos	☐	☐	☐	☐
h) Faltar na escola	☐	☐	☐	☐
i) Ir mal na escola	☐	☐	☐	☐
j) Ser vítima de roubo ou furto	☐	☐	☐	☐
k) Ser hospitalizado ou atendido de emergência	☐	☐	☐	☐

32. Estas são afirmações sobre como tomar decisões. Marque a que é correta para você

	Discordo	Concordo
a) Quando eu decido fazer alguma coisa, eu sempre vou até o fim	☐	☐
b) Frequentemente tomo minhas decisões sem pensar nas consequências	☐	☐
c) Às vezes, tomo decisões com a primeira coisa que passa pela minha cabeça	☐	☐
d) Eu penso em todas as opções antes de decidir por alguma coisa	☐	☐
e) Às vezes, tomo decisões e depois me arrependo delas	☐	☐
f) Sempre tomo decisões sem pensar	☐	☐
g) Às vezes, mudo de ideia várias vezes no dia	☐	☐
h) Quando decido algo, não me importa o que meus amigos pensam	☐	☐
i) Quando decido algo, não me importa o que meus pais ou responsáveis pensam	☐	☐

33. A respeito de seus pais ou responsáveis, responda os itens abaixo:

Até que ponto seus pais TENTAM saber...	**Não tentam**	**Tentam pouco**	**Tentam bastante**
1. Onde você vai quando sai com seus amigos?			
2. O que você faz com seu tempo livre?			
3. Onde você está quando não está na escola?			
Até que ponto seus pais REALMENTE sabem...	**Não sabem**	**Sabem pouco**	**Sabem bastante**
4. Onde você vai quando sai com seus amigos?			
5. O que você faz com seu tempo livre?			
6. Onde você está quando não está na escola?			
A respeito de seus pais (ou responsáveis), considere os seguintes itens:	**Quase nunca**	**Às vezes**	**Geralmente**
7. Posso contar com a ajuda deles caso eu tenha algum tipo de problema.			
8. Eles me incentivam a dar o melhor de mim em qualquer coisa que eu faça.			
9. Eles me incentivam a pensar de forma independente (valorizam minhas opiniões).			
10. Eles me ajudam nos trabalhos da escola se tem alguma coisa que eu não entendo.			
11. Quando querem que eu faça alguma coisa, explicam-me o porquê.			
12. Quando tiro uma boa nota na escola, eles me elogiam.			
13. Quando tiro uma nota baixa na escola, eles me encorajam a me esforçar mais.			
14. Eles realmente sabem quem são meus amigos.			
15. Eles passam tempo conversando comigo.			
16. Eu e meus pais (ou responsáveis) nos reunimos para fazer juntos alguma coisa agradável.			

34. Entre as pessoas de sua família e amigos citados abaixo, assinale quem:
(PODE ASSINALAR MAIS DE UMA RESPOSTA)

	Pai ou padrasto	Mãe ou madrasta	Irmão ou irmã	Melhor amigo/amiga	Nenhum destes
a) Fuma cigarro?					
b) Toma bebidas alcoólicas mesmo de vez em quando?					
c) Fica bêbado (embriagado)?					

35. O que você achou deste questionário?

1 ☐ Muito fácil de responder
2 ☐ Fácil de responder
3 ☐ Nem fácil nem difícil de responder
4 ☐ Difícil de responder
5 ☐ Muito difícil de responder

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Full Length Article

Gradient of association between parenting styles and patterns of drug use in adolescence: A latent class analysis

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ABSTRACT

Background: To identify different patterns of drug use in adolescence and determine if these are associated with parenting styles and other sociodemographic factors.
Methods: A latent class analysis was conducted using baseline data collected in a sample (n = 6381) from a randomized controlled trial conducted to evaluate the effectiveness of the #Tamojunto drug-use prevention program, carried out with 7th- and 8th-grade public school students in six Brazilian cities.
Results: Three latent classes were identified among the students: 1) abstainers/low users (81.54%), 2) alcohol users/binge drinkers (16.65%), and 3) polydrug users (1.80%). A gradient of inverse association was found between parenting styles (authoritative, authoritarian, and indulgent, with the neglectful style as a reference point) and the classes "alcohol users/binge drinkers" (aOR = 0.36, 95%CI = 0.27–0.47; aOR = 0.56, 95%CI = 0.43–0.72; and aOR = 0.64, 95%CI = 0.51–0.80, respectively) and "polydrug users" (aOR = 0.09, 95%CI = 0.03–0.24; aOR = 0.23, 95%CI = 0.11–0.52; and aOR = 0.24, 95%CI = 0.08–0.74, respectively). Associations were also revealed between the latent classes and the adolescent's age and socioeconomic status.
Conclusion: The results suggest that activities to develop parenting skills should be included in school programs aimed at the prevention of drug use among adolescents in order to reduce neglectful practices and thereby possibly reduce drug use among the children.

1. Introduction

Global concern with the damage caused by drug use among adolescents is visibly growing (Bonomo et al., 2001). In Brazil, teenagers begin by consuming licit drugs; in this country, experimentation with alcohol is most prevalent among 12- to 14-year-olds (Malta et al., 2011). These data are worrisome because the risks of beginning drug consumption at an early age are well known (James et al., 2013).

In low of this situation, it is important to develop preventive campaigns that focus on the most significant risk and protective factors associated with the onset of early consumption of drugs by adolescents (Cleveland et al., 2008). The theory of social development suggests that teenagers learn behavior patterns, such as drug use, through their first models of socialization (Catalano and Hawkins, 1996). Consistent with this hypothesis, the influence of parental attitudes on drug use among adolescents is already well documented in the literature (Becoña et al., 2013).

Maccoby and Martin (1983) proposed a typological model that classifies the styles of relationships among parents and their children, referred to as "parenting styles." This theoretical model is based on two fundamental aspects of parents' educational practices: demandingness and responsiveness. Authoritarian parents (high demandingness and low responsiveness) require obedience to rules and offer environments that are not very warm, limited communication, and regular physical punishment. Indulgent parents (low demandingness and high responsiveness) impose few rules, eschew punishment, and adopt extreme tolerance toward their children by avoiding controlling behavior. The authoritative parenting style (high demandingness and high responsiveness) is characterized by reciprocity in family relationships. Children must obey their parents' demands, but parents also accept their obligation to respond, insofar as possible, to the children's points of view and reasonable demands. Parents with a neglectful style (low demandingness and low responsiveness) show little willingness to take on the responsibilities and tasks of parenthood.

Many studies show that the authoritative parenting style is associated with lower consumption of drugs (Berge et al., 2016) by adolescents than other styles. Many studies associate the neglectful parenting style with higher rates of drug use by adolescents (Chassin,

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2005). However, the results for the indulgent parenting style have been mixed, as some findings indicate a positive association with drug use (Calafat et al., 2014), whereas other studies show a negative association with drug use (Cerezo et al., 2013).

It is noteworthy that these studies fail to consider the association that risk and protective factors have with the multiple patterns of drug use among adolescents (Lanza et al., 2010). The studies tend to examine the relationships between parenting styles and a single type of substance (Čablová et al., 2014). However, simple associations between parenting styles and various drugs fail to capture the complexity involved in the pattern of drug use itself, as they overlook the fact that a teenager can be consuming multiple substances simultaneously. Patterns of drug use are features underlying the various types of drugs being used, which most studies treat in a dichotomous manner. Youths with similar patterns of drug use can be grouped together to form what are called latent groups. These underlying *unobserved* groups of adolescents are inferred from a set of measured dichotomous questions about use (or not) of alcohol, tobacco, marijuana, and inhalants and could be treated as homogeneous, and the benefits and drawbacks of various parenting styles could then be tested in a more methodologically robust manner (Percy and Iwaniec, 2007).

Latent class analysis (LCA) is a mixture model (Collins and Lanza, 2009; Lazarsfeld and Henry, 1968) that allows to better understanding profiles of behavior outcomes such as substance use profiles (Anderson et al., 2010; Scheier et al., 2008). The breakthrough of LCA is the use of an analytical methodology focused on the person, in contrast to past data analysis techniques that have focused on the variables (Lanza and Rhoades, 2013), where for each observed outcome, a regression was build up and as consequence and increasing in the false discovery rates might occur (Simmons et al., 2011). LCA makes it possible to analyze the simultaneous use of different types of substances and different patterns of use, seeking the risk factors associated with each specific pattern (Cho et al., 2015).

In low of this, this study aims to identify different patterns of drug use in early adolescence and fill this gap in the literature by determining whether these patterns are associated with certain parenting styles and other sociodemographic factors among Brazilian students.

2. Material and methods

This study presents the results of the baseline data collection of a randomized controlled trial to evaluate a school drug-use prevention program. Thus, the original design of the study is a controlled parallel-group randomized trial among 7th- and 8th-grade public school students in six Brazilian cities. In partnership with the Brazilian branch of the United Nations Office on Drugs and Crime (UNODC), the Brazilian Ministry of Health decided to undertake a culturally adapted version of the European drug prevention program *Unplugged*, renamed #Tamojunto, to be applied in Brazilian public schools (Pedroso et al., 2015).

This article examined the data from this cross-sectional sample from the baseline data collection, prior to the application of the intervention (that is, from the pre-test). The study was registered in the Brazilian Ministry of Health's Brazilian Registry of Clinical Trials (Registro Brasileiro de Ensaios Clínicos – REBEC) under the number RBR-4mnv5g. The study protocol was approved by the Federal University of São Paulo's research ethics committee (protocol #473,498).

2.1. Sampling

The sample in this study consisted of 6391 students aged 11–15 in the 7th and 8th grades of 72 public schools in the cities of São Paulo, São Bernardo do Campo, Brasília, Florianópolis, Tubarão, and Fortaleza.

Based on Lwanga and Lemeshow (1991) calculation of sample sizes for longitudinal studies, for a power of 80%, a level of significance of 5%, and a difference between the groups of 1.5 percentage points (5%–3.5%), the sample size necessary for each group in this study was calculated to be 2835 participants. Taking into account a loss of 50%, the sample had to include 4253 participants in each group. The parameters used were based on a previous pilot study and the expected results for the randomized controlled trial. Details of the study design and a flowchart of the sampling were presented in a prior publication (Sanchez et al., 2017).

2.2. Questionnaires

The data were collected through an anonymous questionnaire completed by the participants and administered by researchers in the classroom, without the presence of the teacher. The questionnaire was developed and tested by the European Union Drug Abuse Prevention (EU-DAP) program and used in previous studies on the effectiveness of *Unplugged* (Faggiano et al., 2008). A version that had been translated into and adapted for Portuguese was used in Brazil, with some questions replaced by items from two questionnaires that have been widely used in various studies of Brazilian students: a World Health Organization questionnaire, used by the Brazilian Center for Information about Psychotropic Drugs (Centro Brasileiro de Informações Sobre Drogas Psicotrópicas – CEBRID), (Carlini et al., 2010) and the questionnaire of the National Survey of Student Health (Pesquisa Nacional de Saúde do Escolar – PENSE), used by the Brazilian Ministry of Health (IBGE, 2012).

The questionnaire assessed the use of the following drugs: alcohol, tobacco, marijuana, and inhalants. In addition, it assessed binge drinking (the consumption of 5 or more doses of alcohol during a two-hour period) and sociodemographic data. The students' socioeconomic class was assessed using the scale of the Brazilian Association of Research Companies (Associação Brasileira de Empresas de Pesquisa – ABEP) (ABEP, 2012), which takes into account the head-of-household's education and the goods and services used, with scores ranging from 0 to 46 or in categories from A to E; higher scores indicate better economic standing, and socioeconomic classes are ranked from A (highest) to E (lowest).

The data relating to parenting styles were collected through the scales of Demandingness and Responsiveness (Lamborn et al., 1991). This instrument was used to define four parenting styles (authoritarian, authoritative, neglectful, and indulgent) based on Maccoby and Martin's theoretical model (Maccoby and Martin, 1983). The instrument consists of two scales that refer to the orthogonal dimensions of demandingness and responsiveness. The scales are structured by six items on the demandingness dimension and ten items on the responsiveness dimension, assessed by means of a three-point Likert scale such that values closer to three indicate greater perceived demandingness and responsiveness.

Parents are classified as high or low in demandingness and high or low in responsiveness. The scale is corrected based on the median scores for each subscale, with the parents who score at or above the median for demandingness or responsiveness being classified as high in demandingness or responsiveness, respectively, whereas parents who score at or below the median were classified as low in demandingness or responsiveness. Parenting styles are defined in four categories, based on the combination of these two dimensions: authoritative (parents scoring high on demandingness and responsiveness), authoritarian (those scoring high on demandingness and low on responsiveness), indulgent (parents scoring low on demandingness and high on responsiveness), or neglectful (those scoring low on both demandingness and responsiveness) (Calafat et al., 2014).

The assessed outcome variables included whether the following had been used over the past 12 months: alcohol, tobacco, marijuana, or inhalants. In the case of alcohol, any pattern of binge drinking (BD) over the past year was also assessed. The explanatory variables analyzed were parenting style (neglectful, authoritative, authoritarian, or

indulgent), the ABEP score, city, gender, and age. All variables used in this study were collected at the initial (baseline) time and were therefore neither randomized nor influenced by the intervention.

2.3. Statistical analysis

Latent class analysis was used for the purpose of identifying groups with similar patterns of drug use. The enumeration process extracted from 1 to 6 classes, and due to the study's multilevel sampling, the standard errors were corrected as described in Asparouhov (Asparouhov, 2006) taking the school (second level) as cluster indicator. Mplus version 7.4 was used for all analyses (Muthén and Muthén, 2010). The extraction of latent classes ceased when the inclusion of a class yielded little additional information. The model was adjusted based on the goodness of fit criterion and took into consideration the parsimony and interpretability of the classes; that is, in addition to the statistical indices presented below, the decision about the best solution and number of latent classes took into consideration the most consistent statistical and conceptual distinctions among the groups. The following fit indices used to decide statistically the best solution: the Akaike information criterion (AIC); the Bayesian information criterion (BIC); the sample-size-adjusted Bayesian information criterion (SSABIC); and the Vuong-Lo-Mendell-Rubin test (VLMR). Finally, to assess how well discriminated the latent classes underlying the best solution were, we used entropy, which is based on a posteriori probability and indicates the accuracy of the classification; values close to 1 indicate clear and very precise classifications. We emphasize that entropy, in itself, was not used to decide the best solution for the number of latent classes. Because large amounts of data relating to parenting styles were lost due to the fact that students left many responses blank, they were imputed in Mplus through the method of imputed regression (Muthén and Muthén, 2010). The following were used as variables in the non-restricted model: group, school, gender, age, drug use (alcohol, binge drinking, cigarettes, inhalants, marijuana), and ABEP classification. Five imputed data sets were generated. Subsequently, a multinomial logistic regression (Hosmer et al., 2013) was performed in Mplus following the 3RSTEP Mplus's *AUXILIARY* command (Asparouhov and Muthén, 2014). Descriptive statistics on Table 1 are weighted percentages (wgt%s) based on random levels of the sample subjects and records of the expected population taken from official data from the Anisio Texeira National Institute of Educational Studies and Research (Instituto Nacional de Estudos e Pesquisa Educacionais Anisio Teixeira – INEP). Inferential point estimates are given in odds ratios (ORs) with their respective 95%CIs and p-values. The adopted level of significance was 5%.

3. Results

Table 1 presents the demographic characteristics of the students participating in the study (n = 6391), drawn from the baseline data collected prior to the intervention. The obtained data show that the majority of students were girls (51.21%) between the ages of 11 and 12 (53.83%) who belonged to the middle socioeconomic class (53.98%). Moreover, the drug most used by these students over the last year was alcohol (30.94%), and the most prevalent parenting style was the neglectful style (37.84%).

The latent classes were identified based on the variables related to drug consumption over the past year (alcohol, binge drinking, cigarettes, inhalants, and marijuana). A total of five classes (classes 1–5) were examined (Table 2). The three-class model showed a lower BIC value, and the lowest SSABIC value was detected in the model with four classes. Moreover, the values of AIC decreased as the number of classes increased. For the three-class solution, the value of entropy was 0.89. Taking the BIC value as the most reliable measure, (Nylund et al., 2007) the model with three latent classes was chosen as the most parsimonious, as it presented values that were acceptable considering the criteria of "goodness of fit" and interpretability from the perspective of the event.

Table 1
Sociodemographic characteristics of students participating in the baseline data collection of a study evaluating the #Tamojunto school-based program of drug-use prevention (N = 6391).

Variables	N	wgt%	wgt95%CI
Gender			
Male	3130	48.79	[47.03; 50.56]
Female	3261	51.21	[49.44; 52.97]
Age			
11–12 years	3343	53.83	[50.91; 56.72]
13–15 years	3048	46.17	[43.28; 49.09]
Average Age		12.61	[12.56; 12.67]
ABEP score			
		27.67	[26.92; 28.41]
A (35–42)	244	3.78	[2.80; 5.11]
B (23–34)	2467	36.64	[33.54; 39.85]
C (14–22)	3343	53.98	[50.41; 57.50]
D/E (0–13)	322	5.6	[4.60; 6.80]
Use in the past year			
Alcohol	2015	30.94	[28.67; 33.30]
Binge drinking	1006	16.50	[15.10;18.01]
Tobacco	243	4.02	[3.31; 4.86]
Inhalants	525	8.22	[7.45; 9.07]
Marijuana	156	2.56	[2.05; 3.20]
Parenting Style[a]			
Authoritative	1447	28.69	[26.65; 30.83]
Authoritarian	960	19.66	[18.56; 20.80]
Indulgent	662	13.81	[12.72; 14.98]
Neglectful	1863	37.84	[35.66; 40.07]

* This variable showed 22% of data as missing and included imputed data in the inferential analyses.

Fig. 1 shows the probability of drug use and binge drinking over the past year for each latent class in the model chosen for the best fit (i.e., 3 latent classes). The classes were denominated as "abstainers/low users" corresponding to 81.54% of the students, "alcohol users/binge drinkers," representing 16.66% of the total sample, and "polydrug users," accounting for 1.8% of the students. Students in the "abstainers/low users" class had an average likelihood of having used alcohol over the past year (12.4%) and a very low probability of having used other drugs (< 5%); no cases of binge drinking (BD) were found in this group. Students in the "alcohol users/binge drinkers" class had a high probability of drinking (100%) and binge drinking (70.70%), an average likelihood of inhalant use (16.82%), a low likelihood of tobacco use (8.30%), and a very low probability of marijuana use (< 3%) The students in the "polydrug users" class had a high probability of having used all drugs (> 57%).

Table 3 shows the results of the multinomial logistic regression model (univariate and multivariate), using the class "abstainers/low users" as its reference. For every year of increasing age, the students had a 46% (aOR = 1.46, 95%CI = 1.32;1.61) greater probability of belonging to the "alcohol users/binge drinkers" class compared to the "low users" class. Every point on the scale of social class (which varied from 0 to 42) corresponded to an increase of 2% (aOR = 1.02, 95%CI = 1.00–1.03) in the probability that a student would belong to the "alcohol users/binge drinkers" class compared to the "low users" class. The adolescent of authoritative, authoritarian, and indulgent parents was progressively less likely to be in the "alcohol users/binge drinkers" class, rather than the "abstainers/low users" class, compared to the children of neglectful parents (aOR = 0.33, 95%CI = 0.25–0.44; aOR = 0.55, 95%CI = 0.42–0.72; and aOR = 0.64, 95%CI = 0.51–0.80, respectively). With each passing year of age, respondents were 2.58 times more likely to belong to the "polydrug users" group than to the "abstainers/low users" group (95%CI = 2.08–3.20). A student's chance of belonging to the "polydrug users" group, rather than to the "abstainers/low users" group, increased by 4% (95%CI = 1.02–1.06) with each additional point on the social class

Table 2
Goodness-of-fit statistics for the number of latent classes of drug use over the past year among students participating in the baseline data collection of a study to evaluate the effect of the #Tamojunto school-based drug-use prevention program (N = 6381).

Models			Goodness-of-fit statistics				
	Free Parameters	Factor correction	AIC	BIC	ssaBIC	VLMR LRT	LMR-LR adjusted test
1 class	5	1.3978	20767.80	20801.60	20785.71		
2 classes	11	1.3573	16714.26	16788.63	16753.68	<0.0001	<0.0001
3 classes	17	1.4054	16391.96	16506.90	16452.88	<0.001	<0.0001
4 classes	23	1.3063	16338.12	16493.62	16420.54	0.001	0.0011
5 classes	29	1.2373	16347.53	16543.60	16451.44	0.5773	0.5786

Legend: AIC = Akaike Information Criteria; BIC = Bayesian Information Criteria; ssABIC = sample size adjusted;
VLMR-LRT = Voung-Lo-Mendell-Rubin Likelihood Ratio Test.

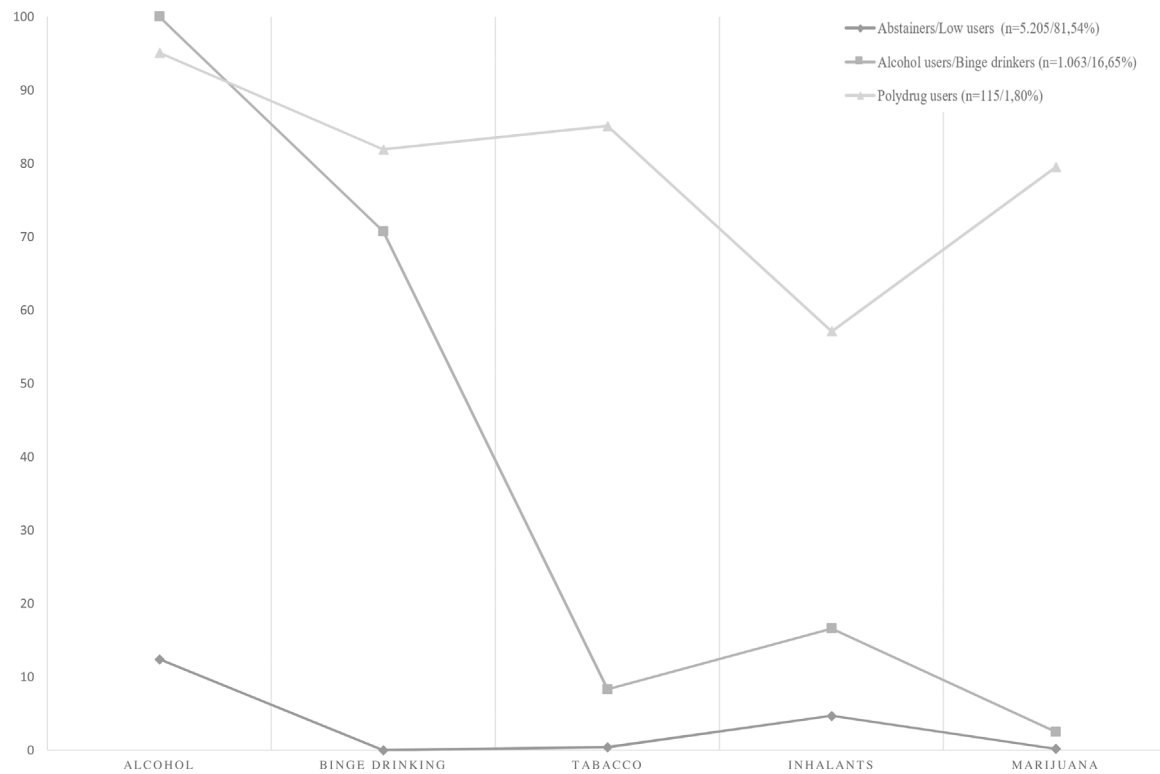

Fig. 1. Weighted probabilities associated with occurrence over the past year of alcohol use, binge drinking, tobacco use, inhalant use, and marijuana use given the model of the three latent classes among adolescents who participated in the collection of baseline data in the study evaluating the #Tamojunto program, 2014 (n = 6381).

scale. With regard to parenting styles, it was found that students whose parents adopted authoritative, authoritarian, and indulgent styles were progressively less likely to belong to the "polydrug users" group, rather than to the "abstainers/low users" group, compared to the adolescents of neglectful parents (aOR = 0.08, 95%CI = 0.03–0.22; aOR = 0.23, 95%CI = 0.11–0.53; and aOR = 0.27, 95%CI = 0.10–0.72, respectively).

4. Discussion

This study's significant contribution revolves around bringing the established knowledge about latent class formation to the understanding of the association between adolescent drug use and parenting styles to which adolescents are exposed. A solution of 3 latent classes ("abstainers/low users", "alcohol users/binge drinkers," and "polydrug users") provided the best explanation for the patterns of drug use among those adolescents surveyed. This study found differences between the "abstainers/low users" class and the two other classes ("alcohol users/binge drinkers" and "polydrug users") with regard to parenting style, age, and social class. Of particular note were the inverse associations found between parenting styles and classes of drug use among Brazilian students.

The findings related to the best solution for the latent classes were consistent with previous studies carried out in the United States and Australia, which also found the same three latent classes of drug use in adolescents ("non-users or abstainers/low users of drugs," 'predominant use of alcohol' and "polydrug users") as the best model to describe the patterns of drug use (Chung et al., 2013; Kelly et al., 2015). The great majority of students in this study fell into the class of abstainers/low users (81%). A systematic review showed that the class of "non-users" or "low users" tends to be the most prevalent and that the class of "polydrug users" is the least prevalent. The intermediate classes usually use isolated substances, such as the "use of alcohol alone" (Tomczyk et al., 2016).

This analysis identified a clear and consistent gradient of an inverse association between parenting styles and patterns of adolescent drug use, when controlling for gender, age, and social class. The evidence that the authoritative parenting style is a protective factor (Berge et al., 2016) and that the neglectful style is a risk factor (Chassin, 2005) for the use of drugs in adolescence corroborates previous studies that assessed the use of drugs in a one-dimensional manner. On the other hand, the association between

Table 3
Characteristics of polysubstance drug use and binge drinking (BD) identified through LCA in a sample of students participating in the baseline data collection of a study to evaluate the effect of the #Tamojunto school-based drug-use prevention program (N = 6381).

	Latent Classes				Univariate analysis						Multivariate analysis					
	Abstainers/ Low users	Alcohol users/ Binge drinkers	Polydrug users	p	Abstainers/Low users vs. Alcohol users/Binge drinkers			Abstainers/Low users vs. Polydrug users			Alcohol users/Binge drinkers vs. Abstainers/Low users			Polydrug users vs. Abstainers/Low users		
	w%	w%	w%		cOR	95%CI	P	cOR	95%CI	p	aOR	95%CI	p	aOR	95%CI	p
Sex				0.223												
Girl	48.93	52.81	42.58		0.96	[0.82;1.12]	0.599	0.80	[0.50;1.28]	0.346	1.00	[0.85;1.17]	0.995	0.86	[0.53;1.40]	0.544
Boy	51.07	47.19	57.42													
Age				<0.001												
	12.54 ± 1.1	12.83 ± 2.6	13.41 ± 8.2		1.51	[1.37;1.67]	0.584	2.76	[2.23;3.40]	<0.001	1.46	[1.32;1.61]	<0.001	2.58	[2.08;3.20]	<0.001
ABEP				<0.001												
	27.7 ± 36.9	28.94 ± 23.4	29.4 ± 72.1		1.01	[1.00;1.02]	0.023	1.04	[1.01;1.06]	0.004	1.02	[1.00;1.03]	0.005	1.04	[1.02;1.06]	<0.001
Parenting Style[a]																
Neglectful	37.14	39.73	46.23	0.408	1			1			1			1		
Indulgent	13.96	13.77	6.63		0.61	[0.46;0.80]	<0.001	0.24	[0.09;0.65]	0.008	0.64	[0.51;0.80]	<0.001	0.27	[0.10; 0.72]	0.013
Authoritarian	19.82	19.45	16.87		0.53	[0.40;0.69]	<0.001	0.19	[0.08;0.43]	<0.001	0.55	[0.42;0.72]	<0.001	0.23	[0.11;0.53]	<0.001
Authoritative	29.08	27.05	30.27		0.31	[0.23;0.42]	<0.001	0.06	[0.02;0.19]	<0.001	0.33	[025;0.44]	0.009	0.08	[0.03;0.22]	<0.001

* This variable was imputed.

indulgent or authoritarian parenting styles and drug use is still open to debate (Garcia and Gracia, 2009) showing that cultural and ethnic differences vary the optimal parenting style (but now, in Brazil) (Chao, 2001; Dwairy et al., 2006; Garcia, 2015; Garcia and Gracia, 2009; García and Gracia, 2014, 2010). This study showed that both the authoritarian and indulgent parenting styles serve as protective factors against adolescents' involvement with drugs. It is not clear if authoritarian parenting was associated with best benefit for the prevention of consumption than indulgent parenting once there is an overlap of the confidences intervals in respect to belonging to "alcohol users/binge drinkers (aOR = 0.55, 95%CI = 0.42–0.72; and aOR = 0.64, 95%CI = 0.51–0.80, respectively) and 'polydrug users' (OR = 0.23, 95%CI = 0.11–0.53; and aOR = 0.27, 95%CI = 0.10–0.72, respectively).

These results confirm other previously works with samples of the American white majority (Lamborn et al., 1991; Steinberg et al., 1992). This study's findings reinforce the protective function that parents' monitoring (Shin et al., 2015) of their children plays in preventing alcohol consumption in adolescence and emphasize the need for school-based drug prevention programs to include training in parenting skills in their curricula. However, on the other hand, the benefit for the prevention of consumption that supposes the component of affection and involvement, which share indulgent and authoritative parents, also you should indicate it. There is previous research that has found similar results analyzing drug (Calafat et al., 2014; Fuentes et al., 2015; Fuentes et al., 2011; Martínez et al., 2013) and other outcomes, in both Brazil (Martínez et al., 2007; Martínez and García,2008) and other countries (Garcia and Gracia, 2009; Rodrigues et al., 2013). Affection and involvement of parents is key for reasoning and bidirectional communication between parents and children. Although monitoring is generally beneficial, it is not the same that be done by imposition, that the child himself, on his own initiative, informs his parents (Ahn and Lee, 2016; Álvarez-García et al., 2016; Calafat et al., 2014; Holdsworth et al., 2017; McLaughlin et al., 2016).

With respect to sociodemographic factors, the association between drug use and increasing age among teenagers is already well known in the literature (Tomczyk et al., 2016). This can be explained by the fact that the older the teenager is, the more access he or she has to the use of drugs, and the more extensive is his or her repertoire and experience with drug use (White et al., 2013). Moreover, it was shown that higher social class is associated with an increased likelihood of belonging to the "alcohol users/binge drinkers" class and an even greater likelihood of belonging to the "polydrug users" class, which potentially corroborates previous Brazilian data suggesting that Brazilian students with higher socioeconomic standing are at greater risk of binge drinking (Sanchez et al., 2013). However, this association runs counter to observations in developed countries, such as the United States and Europe, where drug use is generally associated with lower socio-economic status (Baumann et al., 2007; Helasoja et al., 2007).

This study has some limitations that should be considered, the primary one being the fact that adolescents' perceptions provided the only measure by which parenting style was assessed. Studies that assess the perceptions of both parents and children simultaneously tend to provide more reliable data on parenting styles and drug use, as children tend to have a more negative perception of their relationship with their parents (Shek, 1998). Moreover, it is important to underscore that because this is a cross-sectional study, it is not possible to assign causal inference between the factors analyzed and the outcome. Besides, adolescents' perceptions of parenting style were used as a categorical observed covariate as normally conducted (Berge et al., 2016; Garcia and Gracia, 2009). More robust model might use such perception in a latent solving likely problems of misclassifications increasing its incremental validity (Simmons et al., 2011; Westfall and Yarkoni, 2016).

Our findings suggest that parenting style is associated with different patterns of drug use by students in early adolescence, as are age and socioeconomic status. In low of the known risks of early drug consumption, these results indicate that school-based drug prevention

programs should include activities in their curricula directed exclusively at the parents to reduce neglectful practices and thus possibly reduce drug use among adolescents.

Conflict of interest

No conflict declared.

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Contributors

The submitted manuscript has been read and approved by all authors. All authors acknowledge that they have exercised due care in ensuring the integrity of the work. JYV was responsible for drafting the article, literature review and wrote the manuscript. HCM helped with the analysis, interpretation and results. ZMS designed the original study (RCT), wrote the grant protocol and was responsible for the final approval of the version to be published. None of the original material contained in the manuscript has been submitted for consideration nor will any of it be published elsewhere.

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ORIGINAL PAPER

Predicting latent classes of drug use among adolescents through parental alcohol use and parental style: a longitudinal study

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Abstract

Purpose The present study examined the roles of parental alcohol use and parental style as predictors of adolescent patterns of drug use.

Methods 6391 students in the 7th and 8th grades at 72 Brazilian public schools participated in a three-wave randomized controlled trial to evaluate a school drug-use prevention program. Patterns of drug use were identified through two latent class analyses using measures of the adolescents' past-year drug use. Multinomial logistic regression analyses examined whether parental alcohol use and parenting style at baseline predicted patterns of drug use in waves 2 and 3 of the study after controlling for sociodemographic covariates.

Results In each of the two waves, three latent classes of drug use were identified among the students, defining three different groups of individuals: (1) abstainers/low users, (2) alcohol users/binge drinkers, and (3) polydrug users. First, parenting style (especially monitoring) was the strongest predictor for the prevention of polydrug use among adolescents. Second, occasional alcohol use by parents can act as a central predictor for adolescent alcohol use and binge drinking. Above all, maternal episodes of drunkenness were involved in the predictive models for both drug use classes in both waves.

Conclusion Parental alcohol use and parenting style seem to be important predictors of adolescent's likelihood of belonging to different latent classes of drug use. This conclusion may point to the importance of considering the inclusion of parenting skills and parental alcohol use within the scope of adolescents' preventive interventions.

Keywords Adolescence · Drug use · Latent class analysis · Parental alcohol use · Parenting style

Introduction

Adolescence is the key period for the initiation of alcohol consumption, with 55.5% of 13–15-year-old students in Brazil reporting having consumed alcohol and 9.0% reporting having taken illicit drugs [1]. Early-onset use of alcohol and other drugs places adolescents at an increased risk of engaging in heavy, frequent drinking and raises their probability of experiencing drug-related problems in later adolescence [2–5]. An early onset of alcohol and drug use is also a key predictor of drug-related problems later in life, such as adult mental disorders [6], cognitive impairment [7] and substance use problems and dependence in adulthood [8–12]. Considering the international public health impact of adolescent drug use [13], it is important to identify the predictors that underlie this behavior to prevent harm [14].

Three systematic reviews have demonstrated that parental drinking plays a central role in the development of risk for both an early onset of drinking and increased later alcohol use [15, 16], as well as negative alcohol-related consequences in adolescence [17]. Some of the studies have shown that even moderate maternal alcohol consumption is a strong risk factor for the development of alcohol problems in adolescence [18], while other studies associate only heavy episodic drinking [19] or parental alcohol-related problems [20] with adolescent alcohol use. Despite the consistent literature demonstrating the association between parental drinking and adolescent drinking, there is insufficient evidence for causal inference [21]. In addition, some studies did not find such an association between parental

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and adolescent drinking, showing instead that higher levels of parental problem drinking were related to lower levels and later onset of teen drinking [22]. Little is known about the association between parental alcohol use and adolescent drug use [23], and the findings on the subject are still very controversial [24, 25].

Evidence also points to the importance of parenting styles in the risk of drug use by offspring [26]. Studies have indicated that the authoritative parenting style is the most protective against adolescent substance use [27], while the neglectful parenting style is associated with elevated rates of drug use by adolescents [28]. However, research on indulgent and permissive parenting remains inconclusive [29–31]. Nevertheless, most studies investigating these interrelationships do not include parental alcohol use as a possible confounder variable in the analysis [32]. In addition, most studies on the subject do not consider the association between parental risk and protective factors with the multiple latent class patterns of drug use among adolescents [33]; only a few studies have considered capturing the complexity involved in the heterogeneity of drug use [34–37]. Latent class analysis (LCA) is a mixture model [38–40] that makes it possible to analyze simultaneously the consumption of multiple substances [41] and allows an improved understanding of the outcomes of different substance use profiles [42, 43].

To the best of our knowledge, this study is the first one aiming to analyze simultaneously the roles of parental alcohol use and parental style as predictors of adolescent patterns of drug use, using LCA methods to define unobserved underlying groups of adolescent drug use.

Materials and methods

This study presents the results of a three-wave longitudinal (baseline, 9-month follow-up and 21-month follow-up) randomized controlled trial to evaluate a school drug-use prevention program. Thus, the study was originally designed as a cluster randomized controlled parallel-group trial among 6.391 7th- and 8th-grade public school students in six Brazilian cities (São Paulo, São Bernardo do Campo, Federal District, Florianópolis, Tubarão and Fortaleza). In partnership with the Brazilian branch of the United Nations Office on Drugs and Crime (UNODC), the Brazilian Ministry of Health decided to undertake a culturally adapted version of the European drug prevention program Unplugged, renamed #Tamojunto, to be applied in Brazilian public schools [44], and the evaluation was performed by an independent team from two universities [45].

Randomization was performed at the school level via an Excel macro [command RAND]. Seventy-two schools were randomly selected in proportion to the number of schools in each municipality (stratum). A second allocation step used a random list to determine whether each school would be assigned to the control or intervention group according to a random list, maintaining a 1:1 allocation ratio per municipality.

This article examined the data from the baseline assessment conducted in February 2014 and the data from two follow-ups (9 months and 21 months after baseline assessment). The study was registered in the Brazilian Ministry of Health's Brazilian Registry of Clinical Trials (Registro Brasileiro de Ensaios Clínicos–REBEC) under the number RBR-4mnv5g. The study protocol was approved by the Federal University of São Paulo's research ethics committee (protocol #473.498).

Population and sample size

Based on Lwanga and Lemeshow's [46] calculation of sample sizes for longitudinal studies, the sample size necessary in this study for a power of 80%, a significance level of 5%, and a difference between groups of 1.5% points (5% vs 3.5%), was calculated to be 2835 participants per group. Assuming that 50% would be lost to follow-up, the sample had to include 4253 participants in each group. The parameters used were based on a previous pilot study and the expected results of the randomized controlled trial. Details of the study design and a flowchart of the sampling process have been presented in a prior publication [45].

Instruments and variables

To collect the data, we used an anonymous self-report questionnaire developed and tested by the European Drug Addiction Prevention Trial (EU-DAP) program and used in previous studies on the effectiveness of Unplugged [47]. As our trial was conducted in Brazil, we used a version of the questionnaire that had been translated and adapted to Portuguese, with some questions replaced by items from two questionnaires that have been widely used in various studies of Brazilian students: a World Health Organization questionnaire, used by the Brazilian Center for Information about Psychotropic Drugs (Centro Brasileiro de Informações Sobre Drogas Psicotrópicas–CEBRID) [48], and the questionnaire of the National Survey of Student Health (Pesquisa Nacional de Saúde do Escolar–PENSE), used by the Brazilian Ministry of Health [49].

In the present study, the explanatory variables (predictors) used were three sets of variables from the wave 1 (baseline) data assessment: (1) Control variables: age, gender, socioeconomic class, randomized group; use (yes/no) of alcohol, tobacco, marijuana, and inhalants within the past year; and binge drinking (yes/no) within the past year. Binge drinking was defined as the consumption of 5 or more doses of alcohol during a 2-h period. (2) Parental alcohol use: These

variables have been collected through four dichotomous questions (yes or no), asking the participant whether his/her father or mother drinks occasionally and whether his/her father or mother has episodes of drunkenness. (3) Parental style (neglectful, authoritative, authoritarian, or indulgent) was assessed through demandingness and responsiveness scales.

The students' socioeconomic class was assessed using the scale of the Brazilian Association of Research Companies (Associação Brasileira de Empresas de Pesquisa–ABEP) [50], which takes into account the education of the head of the household and the goods and services used, with scores ranging from 0 to 46 or in categories from A to E; higher scores indicate better economic standing, and socioeconomic classes are ranked from A (highest) to E (lowest).

The data relating to parenting styles were collected through scales measuring demandingness and responsiveness [51]. The results were used to define four parenting styles (authoritarian, authoritative, neglectful, and indulgent) based on Maccoby and Martin's theoretical model [52]. The instrument consists of two scales that measure the orthogonal dimensions of demandingness and responsiveness. The scales are structured into six items on the demandingness dimension and ten items on the responsiveness dimension, each assessed by means of a three-point Likert scale such that values closer to three indicate greater perceived demandingness and responsiveness. Parents are classified as high or low in demandingness and high or low in responsiveness. The scale is corrected based on the median scores for each subscale, with the parents who score at or above the median for demandingness or responsiveness being classified as high in demandingness or responsiveness, respectively, whereas parents who score at or below the median were classified as low in demandingness or responsiveness. Parenting styles are classified into four categories, based on the combination of these two dimensions: authoritative (parents scoring high on demandingness and responsiveness), authoritarian (those scoring high on demandingness and low on responsiveness), indulgent (parents scoring low on demandingness and high on responsiveness), and neglectful (those scoring low on both demandingness and responsiveness) [29].

The assessed outcome variables were from wave 2 (9-month follow-up) and wave 3 (21-month follow-up): (1) Occurrence (yes/no) of alcohol use, tobacco use, marijuana use, inhalant use and binge drinking within the past year. Binge drinking was defined as the consumption of 5 or more doses of alcohol during a 2-h period.

We choose to include alcohol, tobacco, marijuana and inhalants since they are the most prevalent drugs among Brazilian adolescents considering the last Brazilian National Survey Among School Students. Inhalants are the most consumed illicit drugs among Brazilian adolescents [48].

Figure 1 depicts the conceptual model connecting the indicator variables (past-year drug use), the latent classes, and the baseline predictors for the two latent class models in waves 2 and 3.

Statistical analysis

LCA was used to identify groups with similar patterns of drug use. The two LCA models were constructed with the observed variables from past-year drug use (alcohol, tobacco, marijuana, inhalants, and binge drinking) from the two waves (9 and 21 months). The enumeration process extracted 1–5 classes, and due to the study's multilevel sampling, the standard errors were corrected as described in Asparouhov [53], taking the school (second level) as the cluster indicator. Mplus version 7.4 [54] was used for all analyses. The extraction of latent classes ceased when the addition of a new class yielded little additional information. The model was adjusted based on the "goodness-of-fit" criterion and took into consideration the parsimony and

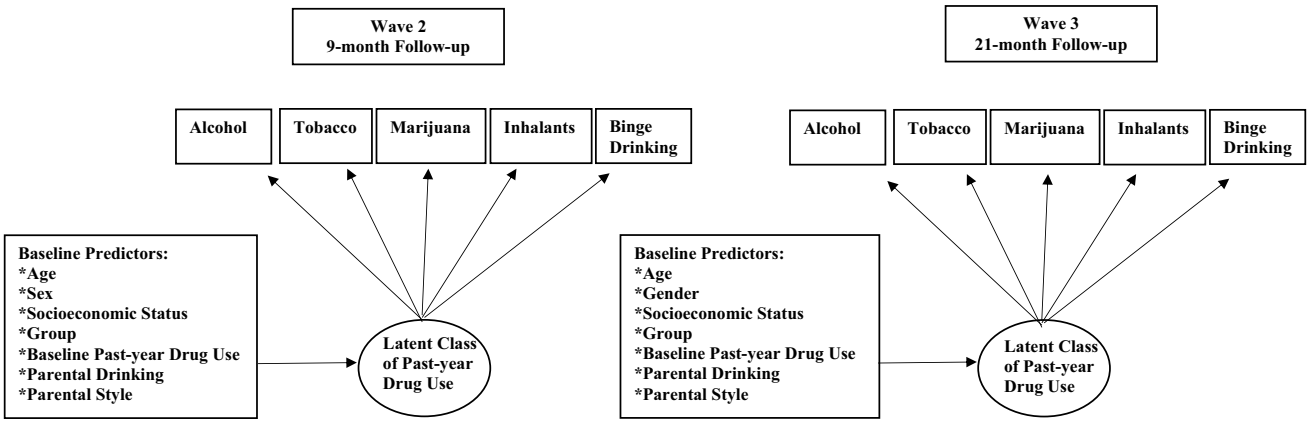

Fig. 1 Latent class model of past-year drug use, with age, gender, socioeconomic status, group, baseline past year drug use, parental drinking and parental style as baseline predictors

interpretability of the classes. That is, in addition to the statistical indices presented below, the decision regarding the best solution for the number of latent classes took into consideration whether each solution had a logical substantive interpretation. The goodness-of-fit statistics included the following: the Akaike information criterion (AIC), the Bayesian information criterion (BIC), the sample-size-adjusted Bayesian information criterion (SSABIC), and the Vuong–Lo–Mendell–Rubin (VLMR) test. Finally, to assess how well discriminated the latent classes underlying the best solution were, we used entropy, which is based on an a posteriori probability and indicates the accuracy of the classification; values close to 1 indicate clear and very precise classifications. We emphasize that entropy in itself was not used to decide the best solution for the number of latent classes.

Because large amounts of data relating to parental consumption, parental style and adolescent drug use at 9- and 21-month follow-up were lost due to missing data, they were imputed in Mplus through sequential imputation [54]. The following were used as variables in the unrestricted model: group, school, gender, age, past-year drug use at baseline (alcohol, binge drinking, cigarettes, inhalants, marijuana), and ABEP classification. Five imputed datasets were generated. Subsequently, two multinomial logistic regressions [55] were performed in Mplus using the R3STEP option of the AUXILIARY command [56] with the baseline covariant variables affecting the outcome. One regression was performed using the baseline variables impacting the latent classes in wave 2, and the other regression was performed using the baseline variables impacting the latent classes in wave 3.

The descriptive statistics are weighted percentages (wgt%s) based on random levels of the sample subjects and records of the expected population taken from official data from the Anisio Texeira National Institute of Educational Studies and Research (Instituto Nacional de Estudos e Pesquisa Educacionais Anisio Teixeira–INEP). Inferential point estimates are given as adjusted odds ratios (aORs) with their respective 95% CIs and p values. The adopted level of significance was 5%.

Results

72 schools participated in the study, totalizing 261 classes. 6391 students answered the baseline questionnaire, 5957 answered the follow-up questionnaire 9 months after baseline, and 4434 answered the follow-up questionnaire 21 months after baseline. The dropout rate was due to refusal and absence. Due to maximum information likelihood, latent classes analysis included in the cross-sectional analysis those participants who had at least one measurement of past year drug use in each wave ($n = 4231$ in wave 2 and 3635 in wave 3). In the latent class of wave 2, we had 33.80% of losses and in the latent class of wave 3 we had 43.12% of losses, considering the baseline assessment. Due to the intense, but expected missingness, we imputed the drug use missing values achieving with the 6391 participants who were analyzed in the two-waves latent classes.

Table 1 presents the characteristics of the students participating in the study ($N = 6.391$). The obtained data show that, at baseline, the majority of students were girls (51.21%) aged between 11 and 12 years (53.80%) who belonged to the middle socioeconomic class (53.98%), and the drug most used by the students over the past year was alcohol (30.94%). Moreover, alcohol use was more prevalent in the fathers than in the mothers of the adolescents, both for episodic alcohol use (30.52% and 21.24%, respectively) and for drunkenness (9.94% and 2.44%, respectively), and the most prevalent parenting style was the neglectful style (37.84%). In wave 2 and wave 3, alcohol continued to be the most prevalent drug used by the adolescents over the past year (35.5% and 47.75%, respectively).

Latent classes were created based on the drug-use indicator variables reported as occurring during the past year. The three classes distinguished polydrug users, alcohol users/binge drinkers and abstainers/low users. The latent classes were identified based on the variables related to drug consumption over the past year (alcohol, binge drinking, cigarettes, inhalants, and marijuana). Adolescents classified as polydrug users exhibited the highest probabilities of having engaged in all five categories of drug use. Those classified as alcohol users/binge drinkers had high probabilities of self-reported binge drinking and alcohol use in the past year; however, they had lower probabilities of having used cannabis, cigarettes, and inhalants. The third class exhibited very low probabilities of alcohol use, binge drinking, and use of tobacco or cannabis (see Figs. 2, 3). The relative proportions of the classes were relatively stable across the two waves. The polydrug user class was consistently the smallest (from 6.12 to 7.92%), the alcohol users/binge drinkers class was the next smallest (from 29.42 to 21.42%), and the abstainers/low users class was the largest (64.45–70.61%).

In each wave, a total of five classes were defined. Table 2 shows values of the information criteria. In wave 2, the fit indices (lower BIC, SSABIC and AIC values) suggested that the four-class model was slightly superior to the other. However, a careful examination of four-class model solutions led us to select the three-class model because it was the most coherent solution in terms of theoretical interpretation of the drug-use phenomenon and fit index. There would not be a conceptual explanation for the maintenance of this fourth class, which accounts for a small proportion of subjects (0.5% and 0.2% in wave 2 and wave 3, respectively) and is

Table 1 Sociodemographic characteristics of students participating in a study evaluating a school-based program for drug-use prevention ($N = 6.391$)

Variables	*N*	wgt%	wgt 95% CI
Baseline measures (wave 1)			
Group			
Intervention	3.243	50.26	[34.65; 65.82]
Control	3.148	49.74	[34.18; 65.35]
Gender			
Male	3.130	48.79	[47.03; 50.56]
Female	3.261	51.21	[49.44; 52.96]
Average age		12.61	[12.56; 12.67]
ABEP score		27.67	[26.92; 28.41]
A (35–42)	244	3.78	[2.80; 5.11]
B (23–34)	2.467	36.64	[33.54; 39.85]
C (14–22)	3.343	53.98	[50.41; 57.49]
D/E (0–13)	322	5.60	[4.60; 6.80]
Adolescent past-year drug use[a]			
Alcohol	2.015	30.94	[28.67; 33.30]
Binge drinking	1.006	16.50	[15.10; 18.01]
Tobacco	243	4.02	[3.31; 4.85]
Inhalants	525	8.22	[7.45; 9.07]
Marijuana	156	2.56	[2.05; 3.20]
Parenting style[a]			
Authoritative	1447	28.69	[26.65; 30.83]
Authoritarian	960	19.66	[18.56; 20.80]
Indulgent	662	13.81	[12.72; 14.98]
Neglectful	1863	37.84	[35.66; 40.07]
Family alcohol use[a]			
Paternal alcohol use	1.913	30.52	[28.03; 33.14]
Paternal drunkenness	600	09.94	[09.10; 10.84]
Maternal alcohol use	1313	21.24	[19.50; 23.10]
Maternal drunkenness	151	2.44	[2.00; 2.96]
9-month follow-up measures (wave 2)			
Adolescent past-year drug use[a]			
Alcohol	1492	35.50	[34.06; 36.95]
Binge drinking	726	7.36	[16.24; 18.53]
Tobacco	216	5.15	[4.52; 5.86]
Inhalants	422	10.07	[9.19; 11.02]
Marijuana	202	4.81	[4.20; 5.50]
21-month follow-up measures (wave 3)			
Adolescent past-year drug use[a]			
Alcohol	1731	47.75	[46.18; 49.38]
Binge drinking	908	25.19	[23.80; 26.64]
Tobacco	252	6.99	[6.20; 7.87]
Inhalants	377	10.45	[9.49; 11.48]
Marijuana	276	7.67	[6.84; 8.58]

[a]Missing values of these variables were imputed for the inferential analyses

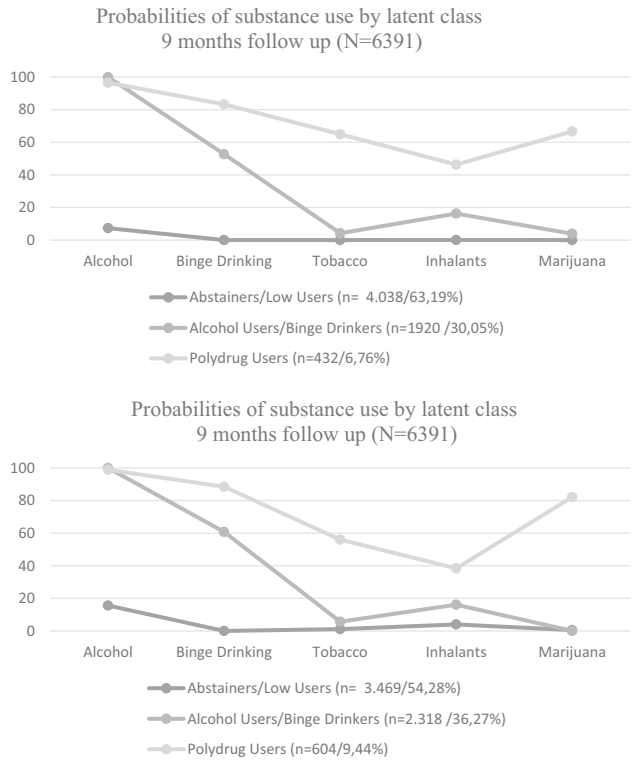

Fig. 2 Weighted probabilities of occurrence over the past year of alcohol use, binge drinking, tobacco use, inhalant use, and marijuana use according to the model of the three latent classes with imputation data among adolescents who participated in waves 2 and 3 (9- and 21-months follow-up data) in a study evaluating a school-based drug-use prevention program

derived from the class of "polydrug users". For the three-class solution, the value of entropy was 0.851.

In wave 3, the BIC value suggested that the three-class model was slightly superior to the others in that it showed a lower value, while the SSABIC value more clearly suggested the four-class model. A careful examination of both the three- and four-class model solutions led us to select the three-class model because, taking the BIC value as one of the most reliable measures [57] and considering the same theoretical interpretation criteria used for latent class solutions in wave 2, the model with three latent classes was chosen as the most parsimonious. For the three-class solution, the value of entropy was 0.82. Therefore, for each of the two waves, the best model solution identified three latent classes.

Tables 3 (for the second wave) and 4 (for the third wave) show the results of the integrative models, which were multinomial logistic regression models (univariate and multivariate) using the latent classes as the outcomes. The class of "abstainers/low users" was used as a reference.

Girls were more likely than boys to belong to the "alcohol users/binge drinkers" class rather than the "abstainers/low users" class in waves two and three (aOR = 1.63, 95% CI

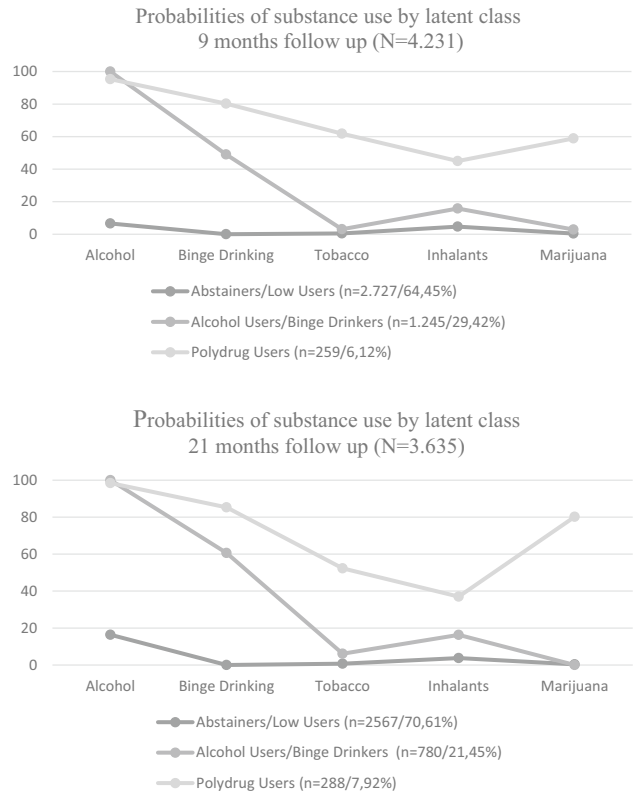

Fig. 3 Weighted probabilities of occurrence over the past year of alcohol use, binge drinking, tobacco use, inhalant use, and marijuana use according to the model of the three latent classes without imputation data among adolescents who participated in waves 2 and 3 (9- and 21-months follow-up data) in a study evaluating a school-based drug-use prevention program

[1.29; 2.05], and aOR = 1.73, 95% CI [1.35; 2.21], respectively). In wave three, each increase of point on the socioeconomic scale (which varied from 0 to 42) corresponded to an increase of 2% (aOR = 1.02, 95% CI [1.00; 1.04]) in the probability that a student would belong to the "alcohol users/binge drinkers" class rather than the "abstainers/low users" class. The adolescents who reported that their mothers or fathers drank were more likely than the children of abstainers to be in the "alcohol users/binge drinkers" class rather than the "abstainers/low users" class in wave two (aOR = 1.57, 95% CI 1.20; 2.07], and aOR = 1.59, 95% CI [1.30; 1.95], respectively) and wave three (aOR = 1.62, 95% CI [1.01; 2.60], and aOR = 1.36, 95% CI [1.12; 1.65], respectively). The same result was found for parental drunkenness: adolescents who reported that their mothers or fathers had episodes of drunkenness were more likely than the children of abstinent parents to be in the "alcohol users/binge drinkers" class rather than the "abstainers/low users" class (aOR = 1.74, 95% CI [1.02; 2.98], and aOR = 1.59, 95% CI [1.19; 2.16], respectively) in wave two. In wave three, only the adolescents who reported at baseline that their mothers had episodes of drunkenness were more likely than the children of abstainers to be in the "alcohol users/binge drinkers" class rather than the "abstainers/low users" class (aOR = 2.10, 95% CI [1.31; 3.35]).

In wave three, girls were also more likely than boys to belong to the "polydrug users" class rather than the "abstainers/low users" class (aOR = 1.43, 95% CI [1.14; 1.80]). In wave two, for each additional year of age, the probability of belonging to the "polydrug users" group rather than the "abstainers/low users" group was multiplied by a factor of 1.43 (95% CI [1.16; 1.74]). The students who reported that their mothers had episodes of drunkenness at baseline were more likely than the children of abstainers to belong to the "polydrug users" group rather than to the "abstainers/low users" group in waves two and three (aOR = 3.73, 95% CI [1.61; 8.60], and aOR = 2.79, 95% CI [1.52; 5.12], respectively). With regard to parenting styles, it was found that students whose parents adopted authoritative or authoritarian styles were less likely than the children of neglectful parents to belong to the "polydrug users" group rather than to the "abstainers/low users" group in wave two (aOR = 0.47, 95% CI [0.26; 0.86], and aOR = 0.30, 95% CI [0.12; 0.75], respectively) and wave three (aOR = 0.62, 95% CI [0.44; 0.89], and aOR = 0.46, 95% CI [0.31; 0.69], respectively).

In wave 2, no effect of the program was identified regarding the probability of belonging to the "alcohol users/binge drinkers" or "polydrug users" class rather than to the "abstainers/low users" class (aOR = 1.29, $p = 0.058$, and aOR = 1.03, $p = 0.903$, respectively). Similarly, in wave 3, no effect of the program was identified regarding to the probability of belonging to the "alcohol users/binge drinkers" or "polydrug users" class rather than to the "abstainers/low users" class (aOR = 1.20, $p = 0.300$, and aOR = 1.51, $p = 0.334$, respectively).

Discussion

The strength of this large-scale, three-wave prospective study is that it applies established knowledge of LCA to illuminate the roles of parents' alcohol use and parenting styles in predicting adolescent drug use. A solution with three latent classes ("abstainers/low users", "alcohol users/binge drinkers," and "polydrug users") provided the best explanation for the patterns of drug use among those adolescents surveyed in the two waves. This study identified differences between the "abstainers/low users" class and the two other classes ("alcohol users/binge drinkers" and "polydrug users") with regard to parenting style and parent's alcohol use. In this study, we analyze early adolescence (baseline average age 12.61) since it was a period before the average age of onset of drug use in Brazil (13 years-old). Average age of onset for the different substances between

Table 2 Goodness-of-fit statistics for the number of latent classes of drug use over the past year among students participating in the 9-month follow-up phase of a study to evaluate the effect of a school-based program for drug-use prevention

Model	Factor correction	Log likelihood	AIC	BIC	SSABIC	VLMR-LRT	LMR Adjusted LRT	Polydrug users (*n*, %)	Final count based on most likely membership		
									Alcohol users/binge drinkers (*n*, %)	Abstainers/low users (*n*, %)	Entropy
9 months ($N=4.231$)											
1 Class	2.29	−7693.84	15,397.69	15,429.44	15,413.55						
2 Classes	1.57	−6308.88	12,639.75	12,709.61	12,674.65	<0.001	<0.001				
3 Classes	1.41	−6209.99	12,453.99	12,561.94	12,507.93	<0.001	<0.001	259 (6.12%)	1245 (29.42%)	2727 (64.45%)	0.851
4 Classes	1.26	−6177.48	12,400.97	12,547.02	12,473.94	0.0002	0.0002				
5 Classes	1.23	−6174.09	12,406.18	12,590.33	12,498.18	0.5620	0.5670				
21 months ($N=3.635$)											
1 Class	1.69	−7638.96	15,287.92	15,318.91	15,303.02						
2 Classes	1.41	−6254.99	12,531.99	12,600.18	12,565.22	<0.001	<0.001				
3 Classes	1.25	−6134.69	12,303.31	12,408.75	12,354.74	<0.001	<0.001	288 (7.92%)	780 (21.45%)	2567 (70.61%)	0.820
4 Classes	1.24	−6116.83	12,279.66	12,422.22	12,349.13	0.071	0.074				
5 Classes	1.12	−6115.40	12,288.79	12,468.55	12,376.40	0.335	0.337				

AIC Akaike information criterion, *BIC* Bayesian information criteria, *SSABIC* sample-size-adjusted Bayesian information criterion, *VLMR-LRT* Vuong–Lo–Mendell–Rubin, *LRT* likelihood ratio test, *LMR* Lo–Mendell–Rubin

Table 3 Characteristics of polysubstance drug use and binge drinking (BD) identified through latent class analysis in a sample of students participating in the 9-month follow-up (wave 2) of a study to evaluate the effect of a school-based program for drug-use prevention ($N = 6.391$)

	Latent classes, wave 2			*p*	Univariate analysis[b]						Multivariate analysis[b]					
	Abstainers/low users[c]	Alcohol users/ binge drinkers	Polydrug users		Abstainers/low users vs. alcohol users/binge drinkers			Abstainers/low users vs. polydrug users			Abstainers/low users vs. alcohol users/binge drinkers			Abstainers/low users vs. polydrug users		
	%	%	%		cOR	95% CI	*p*	cOR	95% CI	*p*	aOR	95% CI	*p*	aOR	95% CI	*p*
Group				0.531												
Intervention	46.83	48.03	44.40		1.27	[0.96; 1.57]	0.927	1.02	[0.66; 1.67]	0.927	1.29	[0.99; 1.68]	0.058	1.03	[0.67; 1.58]	0.903
Control	53.17	51.97	55.60													
Sex				0.697												
Girl	50.06	50.92	52.51		1.63	[1.29; 2.05]	< 0.001	1.27	[0.85; 1.90]	0.234	1.63	[1.29; 2.05]	< 0.001	1.33	[0.89; 1.97]	0.164
Boy	49.94	49.08	47.49													
Age				0.537												
	12.60 ± 0.76	12.56 ± 0.77	12.49 ± 0.73		1.06	[0.93; 1.20]	0.368	1.49	[1.20; 1.85]	< 0.001	1.06	[0.94; 1.21]	0.329	1.43	[1.16; 1.74]	0.001
ABEP				0.766												
	27.79 ± 7.66	27.93 ± 7.71	28.01 ± 7.44		1.01	[0.99; 1.02]	0.340	1.00	[0.98; 1.02]	0.957	1.01	[0.99; 1.02]	0.270	1.00	[0.98; 1.03]	0.547
Parenting style[a]				0.556												
Neglectful	31.19	32.10	32.43													
Indulgent	14.66	13.56	15.68		0.81	[0.60; 1.09]	0.167	0.62	[0.29; 1.36]	0.235	0.86	[0.64; 1.17]	0.349	0.67	[0.31; 1.45]	0.313
Authoritarian	20.69	23.07	17.30		0.98	[0.79; 1.23]	0.891	0.47	[0.26; 0.83]	0.010	0.93	[0.74; 1.16]	0.512	0.47	[0.26; 0.86]	0.014
Authoritative	33.47	31.27	34.59		0.86	[0.65; 1.12]	0.256	0.27	[0.11; 0.67]	0.005	0.83	[0.64; 1.08]	0.165	0.30	[0.12; 0.75]	0.010
Parents alcohol use[a]																
Maternal abstinence	75.98	75.31	74.39	0.311												
Maternal alcohol use	21.30	22.93	23.58		1.56	[1.16; 2.06]	0.001	1.74	[1.04; 2.89]	0.034	1.57	[1.20; 2.07]	0.001	1.96	[0.99; 2.89]	0.053
Maternal drunkenness	2.72	1.76	2.03		1.71	[0.99; 2.98]	0.055	3.75	[1.61; 8.74]	0.002	1.74	[1.02; 2.98]	0.043	3.73	[1.61; 8.60]	0.002
Paternal abstinence	58.10	58.90	56.10	0.732												
Paternal alcohol use	31.87	32.33	34.15		1.61	[1.32; 1.98]	< 0.001	0.79	[0.53; 1.17]	0.245	1.59	[1.30; 1.95]	< 0.001	0.90	[0.59; 1.35]	0.607
Paternal drunkenness	10.03	8.77	9.76		1.56	[1.15; 2.12]	0.004	0.88	[0.47; 1.63]	0.687	1.59	[1.19; 2.16]	0.002	0.91	[0.48; 1.73]	0.777

[a]Missing values of these variables were imputed

[b]Analysis controlled for drug use at baseline

[c]Abstainers/low users was considered the reference class

Table 4 Characteristics of polysubstance drug use and binge drinking identified through latent class analysis in a sample of students participating in the 21-month follow-up (wave 3) of a study to evaluate the effect of a school-based program for drug-use prevention ($N=6391$)

	Latent classes, wave 3			*p*	Univariate analysis[b]						Multivariate analysis[b]					
	Abstainers/low users[c]	Alcohol users/ binge drinkers	Polydrug users		Abstainers/low users vs. alcohol users/binge drinkers			Abstainers/low users vs. polydrug users			Abstainers/low users vs. alcohol users/binge drinkers			Abstainers/low users vs.polydrug users		
	%	%	%		cOR	95% CI	*p*	cOR	95% CI	*p*	aOR	95% CI	*p*	aOR	95% CI	*p*
Group				0.132												
Intervention	48.54	49.26	52.48		1.27	[0.96; 1.57]	0.927	1.65	[0.88; 1.54]	0.289	1.20	[0.85; 1.70]	0.300	1.51	[0.86; 1.53]	0.334
Control	51.46	50.74	47.52													
Sex				< 0.001												
Girl	49.07	58.02	52.27		1.70	[1.36; 2.15]	< 0.001	1.39	[1.11; 1.74]	0.004	1.73	[1.35; 2.21]	< 0.001	1.43	[1.14; 1.80]	0.002
Boy	50.93	41.98	47.73													
Age				0.000												
	12.56 ± 0.80	12.71 ± 0.82	12.94 ± 0.93		0.96	[0.77; 1.19]	0.711	1.09	[0.87; 1.37]	0.445	0.97	[0.73; 1.21]	0.775	1.07	[0.84; 1.35]	0.580
ABEP				< 0.001												
	27.85 ± 8.07	28.36 ± 7.82	28.68 ± 9.75		1.01	[1.00; 1.04]	0.035	1.01	[0.10; 1.04]	0.098	1.02	[1.00; 1.04]	0.033	1.02	[0.10; 1.04]	0.061
Parenting style[a]				< 0.001												
Neglectful	26.19	33.47	46.90													
Indulgent	10.50	10.56	8.47		0.92	[0.69; 1.23]	0.595	0.74	[0.48; 1.14]	0.173	0.93	[0.69; 1.25]	0.626	0.75	[0.48; 1.18]	0.219
Authoritarian	14.73	15.14	17.56		1.04	[0.76; 1.42]	0.809	0.63	[0.45; 0.88]	0.007	0.97	[0.71; 1.33]	0.845	0.62	[0.44; 0.89]	0.009
Authoritative	25.04	15.47	17.56		0.84	[0.60; 1.20]	0.356	0.46	[0.32; 0.68]	< 0.001	0.80	[0.56; 1.13]	0.206	0.46	[0.31; 0.69]	< 0.001
Parents alcohol use[a]																
Maternal abstinence	80.04	55.40	58.26	< 0.001												
Maternal alcohol use	15.71	34.78	31.40		1.61	[1.04; 2.51]	0.035	1.59	[1.00; 2.53]	0.051	1.62	[1.01; 2.60]	0.046	1.58	[0.98; 2.56]	0.062
Maternal drunkenness	0.66	6.14	9.30		2.00	[1.29; 3.10]	0.002	2.72	[1.49; 4.96]	0.001	2.10	[1.31; 3.35]	0.002	2.79	[1.52; 5.12]	0.001
Paternal abstinence	61.90	41.57	45.45	< 0.001												
Paternal alcohol use	27.45	38.22	33.06		1.39	[1.14; 1.69]	0.001	0.90	[0.68; 1.20]	0.479	1.36	[1.12; 1.65]	0.002	0.94	[0.70; 1.27]	0.694
Paternal drunkenness	6.62	15.96	19.63		1.24	[0.92; 1.68]	0.152	0.73	[0.44; 1.23]	0.240	1.30	[0.96; 1.76]	0.095	0.76	[0.46; 1.25]	0.282

[a]Missing values of these variables were imputed

[b]Analysis controlled for drug use in the baseline

[c]Abstainers/low users was considered the reference class

Brazilian adolescents are: alcohol: 13.0 y.o. (IC: 12.9–13.1); tobacco 13.3 y.o. (IC: 13.2–13.4); inhalants: 13.2 y.o. (IC: 13.1–13.4); and marijuana: 14.6 y.o. (IC: 14.4–14.7) [48]. Collecting the data before the occurrence of the outcomes we would be more able to understand the casual relationships related to them.

The results related to the best solution for the latent classes were in line with previous studies carried out in other countries, which also found the same three latent classes of drug use in adolescents as the best model to describe their patterns of drug use [58, 59].

With respect to adolescents in the class of "alcohol users/binge drinkers", our findings indicate that any parental alcohol use (episodic or drunkenness) can act as a predictor of belonging to this class, whether it is the mother or the father who drinks. Our results confirm earlier findings that parental alcohol use is predictive of an early age of first alcohol use [15]. Furthermore, this finding adds to the existing evidence linking parental alcohol use and adolescent-onset drinking in that it suggests the existence of a causal association even after controlling for important covariates, such as parenting style. Our results suggest that adolescents' alcohol use is partially shaped by their parents' drinking behavior, as social cognitive/learning theory [60] suggests. Parents directly model drinking behavior for their adolescent children [19], and even positive expectations surrounding alcohol use are transmitted from parents to their children [61], enhancing adolescents' positive views of drinking and subsequent likelihood of initiating use [62]. Another possible explanation is that parents who drink tend to be more permissive about their children's alcohol use [22] and may facilitate their teenage children's access to drinking [18]. In addition, genetic susceptibility plays an important role in the relation between parental drinking problems and the alcohol use behavior of their adolescent offspring [63].

This longitudinal analysis identified that the authoritative and authoritarian parenting styles play an important role as protective factors against membership in the "polydrug users" class (at wave 2 and wave 3). Our results, showing that authoritative parenting style is a protective factor and that the neglectful style is a risk factor, are consistent with previous studies [27, 28]. However, the association between authoritative parenting styles and drug use is still controversial and may vary from culture to culture [34, 64]. Our results highlight the importance of parental monitoring [36] in the prevention of adolescent drug use because both styles (authoritative and authoritarian) that exercise this function are associated with a decreased probability that the adolescent will belong to the "polydrug users" class. Parental monitoring involves a set of behaviors related to providing attention to, remain informed about child's use of free time and also tracking child's whereabouts, activities and friends [15, 65].

Findings from this study point to maternal episodes of drunkenness as a strong risk factor, predicting adolescents' likelihood of belonging to the "polydrug users" and "alcohol users/binge drinkers" classes in both waves (wave 2 and wave 3). Therefore, we can suggest that maternal drunkenness is a key element in the risk of adolescent alcohol consumption and other drug use. Previous studies determined the same predictive relationship with adolescent alcohol use [22, 66] but a few studies found an association between parents' problem use of alcohol and adolescent drug use [23]. Two main pathways for the effect of mothers' episodes of drunkenness on adolescent drug use can be hypothesized. The first possible explanation is a biological pathway through a genetic factor, while the second pathway is through the well-known role of maternal influences on child development [63]. Problematic maternal substance use may model adolescent drug use by promoting the perception of low levels of risk associated with drug use [67]. Furthermore, exposure of a child to problematic patterns of maternal alcohol use, such as those resulting in noticeable intoxication, is highly harmful to the child's emotional development, leading to premature involvement in licit and even illicit drug use [68–70].

Our findings highlight that health approaches should target parenting skills and parenting alcohol use to prevent adolescent drug use. The effects of school-based universal programs may be increased by adding parent-based components [71]. The combined student–parent intervention showed substantial effects on the prevention of alcohol [72–74] and other drugs [75]. According to a systematic review, a central focus in all successful programs was on monitoring the children's activities, however, less is known about the exclusive effect of targeting parenting alcohol use [76].

Another important consideration is that the drug prevention program #Tamojunto had no effect on adolescents' past-year drug use at 9-month or 21-month follow-up; however, we retained this variable in the analysis to control for any possible confounding effect, since this study is a randomized controlled trial.

This study has some limitations that should be considered. First, we only collected measures provided by the adolescents; thus, we assessed only the adolescents' perceptions of parenting style and parental alcohol use. However, it is common practice to use adolescents' perceptions of parenting behaviors as a categorical observed covariate, as we did [27, 64]. Studies that assess the perceptions of both parents and children simultaneously tend to provide more reliable data on parenting styles and drug use, as children tend to have a more negative perception than parents regarding the parent–child relationship [77]. Second, we did not collect data on parents' illicit drug use because it could be unethical to ask adolescents to report their parents' illicit behavior. Third, the attrition

rate due to the losses over the time, leading to a lack of information about non-respondents. However, it is worth noting that the absence of some data is an expected limitation in longitudinal studies, especially those with long follow-up periods [78–80]. However, imputation processes offer excellent solutions to these missing-data problems by estimating the missing values [81]. Another limitation that must be considered is that we analyzed data only from adolescents aged 11–15 years old and how they are able to answering the questions. Finally, we must consider that we analyzed data only from adolescents aged 11–15 years old and how they are able to answering the questions. Finally, this study correlation of parenting dimension with adolescent substance use cannot exclusively be interpreted as effects of parenting on the child outcome, once associations are in most cases bidirectional. Although it is common practice to use adolescents' perceptions of parenting behaviors as an observed covariate, this rating by the children limits the possibility to draw conclusions. There remains a possibility that the perception of the parents is shaped by the drug using style of their children.

In conclusion, this study adds to the existing literature suggesting that parents' behavior is an important predictor of latent classes of drug use by adolescents. First, parenting style, especially monitoring, is a strong predictor for the prevention of polydrug use among adolescents. Second, occasional parental alcohol use can act as a central predictor for adolescent alcohol use and binge drinking. Moreover, maternal drunkenness is involved in predictive models for both drug use classes in both waves. Regarding the prevention of adolescent drug use, our findings highlight the importance of comprehensive public health approaches that target parenting skills, especially monitoring, while simultaneously targeting parental alcohol use. To educate parents to be more aware of their role in the prevention of adolescent drug use, school-based prevention programs should also target parenting skills and parental alcohol use, giving special attention to the influence of problematic patterns of maternal drinking on adolescents' risk of drug use.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflicts of interest.

Human participants and/or animals All procedures in the present study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. This study was approved by the Ethics in Research Committees at the University of São Paulo (#473.498) and the Federal University of Santa Catarina (#711.377).

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Anexo 5

Does parenting style and parenting alcohol use in early adolescence predict patterns of risk behaviors 21 months later?

The role of parenting in predicting patterns of risk behaviors.

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Abstract

The aim of this study was to identify different patterns of adolescent risk behaviors and to understand whether these patterns are predicted by parental behavior among Brazilian adolescents. A three-wave cluster randomized controlled trial was conducted with 6391 students in 72 public schools to evaluate a school drug-use prevention program. Patterns of risk behaviors were identified through latent class analyses using measures of the adolescents' drug use, bullying and unprotected sex. Multinomial logistic regression analyses examined whether baseline parental alcohol use, parenting style and parental living status predicted patterns of drug use at follow-up. Results showed that maternal drunkenness and parenting style seem to be important predictors of adolescent's

likelihood of belonging to different latent classes of risk behaviors. School prevention programs should consider focusing at the three behaviors and mainly focus on including parental skills activities as part of the mandatory curriculum for middle-schoolers, in pre-adolescent years.

Keywords: Adolescence; Risk behaviors; Latent class analysis; Parental alcohol use; Parenting style.

Introduction

Adolescence is a period of life characterized by a set of emotional changes [1] and consequently is a key period for an increase in the chance of being involved in risky behaviors [2], that is, activities that can damage one's health and well-being [3] and tend to contribute to youth morbidity and mortality [4]. Among these behaviors we can highlight substance use, bullying and unprotected sexual as the most relevant risk behaviors in adolescence [4].

Early onset drug use places adolescents at a greater risk to experiencing drug related problems in later adolescence [5]; such as of mental disorders [6], cognitive function prejudices [7], substance use problems and dependence in adulthood [8]. In Brazil, 55.5% of adolescents aged between 13 and 15 reported consuming alcohol and 9.0%, illicit drugs at least once in their lifetime [9]. In regards to bullying, it is known that it affects adolescent emotional development and wellbeing [10] and can be associated with suicidality [11] and future delinquent behaviors [12]. In Brazil, 7.2% of the 9th grade students reported always or almost always being bullied and 20.8% reported to have bullied other children always or almost always in the last 30 days [13]. Unprotected sex also has been considered as a major public health problem, once it leaves adolescents at risk for situations that may jeopardize their development by the exposure to sexually

transmitted infection [14], unplanned pregnancy [15] and abortions [16]. In Brazil, only 61.2% of the students among 13 to 15 years of age who reported having ever had intercourse in life, responded that they had used condoms the first time they had sex [9]. The literature indicates that substance use tend to frequently co-occur with bullying [17] as well as unprotected sex [18] in adolescence; and unprotected sex also tend to co-occur with bullying [19]. However, these studies are limited to evaluate separately all these risk behaviors with no consideration for multi-dimensional patterns of co-occurrence [20].

Youths with similar patterns of risk behaviors can be grouped together to form what are called latent groups [21]. The findings of several studies found that there is a strong association between drug use, violence and unprotected sex in adolescence [2] suggesting that there are several mechanisms by which these behaviors might co-occur. One possible explanation is that these risk behavior groups may be sharing the same risk and protective factors, such as the family environment. The theory of social development suggests that teenagers learn behavior patterns through their first models of socialization [22]. Consistent with this hypothesis, the influence of parental attitudes on adolescents risk behaviors, evaluated independently, is already well documented in the literature [23–25].

Many studies show that the authoritative parenting style is associated with lower consumption of drugs [26] as well as lower sexual risk behaviors [27] and with lower violence perpetration [28] by adolescents compared with other styles. On the other hand, many studies associate the neglectful parenting style with higher rates of risk behaviors [26] by adolescent. However, the findings related to indulgent parenting style are still very controversial, once some studies indicate a protective association with drug use [29, 30] whereas other studies show a risk association between with drug use and violent behavior [25, 31].

Evidence also points to the role of parental drinking on the development of adolescent risk behaviors especially externalization problems [32]. Studies highlighted the risky for both earlier initiation to drinking and increased later alcohol use [33, 34] as well as alcohol related negative consequences [35] associated with parental drinking. The results for the violence and sexual risk behaviors are more rare and have been mixed, as some findings indicate a positive association with parental alcohol use [36], whereas other studies didn't find evidence to support this association [37].

The aim of this study was to identify different latent patterns of risk behaviors and to evaluate whether these patterns are predicted by certain parenting styles, parental alcohol use and parental living status among Brazilian adolescent students.

Materials and methods

This study presents the results of a secondary analysis of a three-wave (baseline, 9 and 21-month follow-up) cluster randomized controlled trial to evaluate a school drug-use prevention program. The study evaluated 6.391 7th- and 8th-grade in 72 public school students in six Brazilian cities. In partnership with the Brazilian branch of the United Nations Office on Drugs and Crime (UNODC), the Brazilian Ministry of Health decided to undertake a culturally adapted version of the European drug prevention program *Unplugged*, renamed *#Tamojunto*, to be applied in Brazilian public schools, and the evaluation was performed by an independent team from two universities [38].

Randomization was performed at the school level via an Excel macro [command RAND]. Seventy-two schools were randomly selected in proportion to the number of schools in each municipality (stratum). A second allocation step used a random list to determine whether each school would be assigned to the control or intervention group according to a random list, maintaining a 1:1 allocation ratio per municipality.

This article examined the data from the baseline assessment conducted in February 2014 and the data from the last follow-up (21 months after baseline assessment). The study was registered in the Brazilian Ministry of Health's Brazilian Registry of Clinical Trials (Registro Brasileiro de Ensaios Clínicos –REBEC) under the number RBR-4mnv5g. The study protocol was approved by the Federal University of São Paulo's research ethics committee (protocol #473.498).

Population and sample size

Based on Lwanga and Lemeshow's [39] calculation of sample sizes for longitudinal studies, the sample size necessary in this study for a power of 80%, a significance level of 5%, and a difference between groups of 1.5 percentage points (5% vs 3.5%), was calculated to be 2,835 participants per group. Assuming that 50% would be lost to follow-up, the sample had to include 4,253 participants in each group. More details of the study design have been presented in a prior publication [38, 40].

Instruments and variables

To collect the data, we used an anonymous self-report questionnaire developed and tested by the European Drug Addiction Prevention Trial (EU-DAP) and used in previous studies on the effectiveness of *Unplugged* [41]. As our trial was conducted in Brazil, we used a version of the questionnaire that had been translated and adapted to Portuguese [42], with some questions replaced by items from two questionnaires that have been widely used in various studies of Brazilian students: a World Health Organization questionnaire, used by the Brazilian Center for Information about Psychotropic Drugs (Centro Brasileiro de Informações Sobre Drogas Psicotrópicas –

CEBRID) [43], and the questionnaire of the National Survey of Student Health (Pesquisa Nacional de Saúde do Escolar – PENSE), used by the Brazilian Ministry of Health [44].

The assessed **outcome variables** came from the **21-month follow-up** and 3 group of risk behaviors variables were included in the latent class analysis:

1) Recent drug use: The data relating to adolescent drug use were collected through five dichotomous questions (yes or no) asking if they have consumed the following drug in the past month: alcohol, tobacco, marijuana, inhalants, and binge drinking. Binge drinking was assessed by the consumption of 5 or more doses of alcohol during a two-hour period, such as "From one month to the next , i.e., in the last 30 days, have you drunk alcoholic beverages?"

2) Bullying: The data relating to bullying victimization and bullying perpetration were measured by two items in the questionnaire: "In the past 30 days, how often have your classmates scolded you, bullied you, or teased you so much that you were hurt, harassed, annoyed, offended or humiliated?" for bullying victimization and "In the past 30 days, have you scolded, mocked, manipulated, intimidated or teased any of your classmates so much that s/he was hurt, annoyed, offended or humiliated?" for bullying perpetration. Originally, the response items were "never", "sometimes", and "always", which we transformed to binary responses (yes/no) by grouping the answers "sometimes" and "always" to obtain the "yes" group, and the response "never" was considered "no".

3) Sexual risk behavior: The data relating to adolescence sexual risk behavior was measured with the question: "When you have sex, do you use condoms?" Responses included never had sex; always use; sometimes use; and & never use and were dichotomized into no/yes by grouping never had sex and always use as "No", and grouping sometimes use and never use as "Yes".

The **explanatory variables** (predictors) came from four sets of variables from the **baseline** data assessment:

1) Parental alcohol use (mother and father sporadic alcohol use and drunkenness episodes): The data relating to parental alcohol use were collected through four dichotomous questions (yes or no): Specificall, the question asked "among the people in your family who: 1. drinks alcohol occasionally; 2. gets drunk". The possible answers were "father/stepfather (yes or no) and mother/stepmother (yes/no).

2) Parental style (neglectful, authoritative, authoritarian, or indulgent): The data relating to parenting styles were collected through the scales of Demandingness and Responsiveness [45]. This instrument was used to define four parenting styles (authoritarian, authoritative, neglectful, and indulgent) based on Maccoby and Martin's theoretical model [46]. The instrument consists of two scales that refer to the orthogonal dimensions of demandingness and responsiveness. The scales are structured by six items on the demandingness dimension and ten items on the responsiveness dimension, assessed by means of a three-point Likert scale such that values closer to three indicate greater perceived demandingness and responsiveness. Parents were classified as high or low in demandingness and high or low in responsiveness. The scale was corrected based on the median scores for each subscale, with the parents who score at or above the median for demandingness or responsiveness being classified as high in demandingness or responsiveness, respectively, whereas parents who score at or below the median were classified as low in demandingness or responsiveness. Parenting styles were defined in four categories, based on the combination of these two dimensions: authoritative (parents scoring high on demandingness and responsiveness), authoritarian (those scoring high on demandingness and low on responsiveness), indulgent (parents scoring low on demandingness and high on responsiveness), or neglectful (those scoring low on both

demandingness and responsiveness) [30]. Evidence for validity based on in the internal consistency was obtained through the confirmatory factor analysis showed that in the model has a good fit, as follows: $X^2 = 1518.249$, $p < 0.001$, RMSEA = 0.050, CFI = 0.940, TLI = 0.929, WRMR = 2.377 [47].

3) Parental living status: The data relating to Parental living status were collected through three dichotomous questions (yes or no) if the student lived in the same house with both parents, or only father or only mother.

4) Model adjustment variables (age, gender, socioeconomic class, randomized group and baseline outcomes variables – drug use, bullying, sexual risk behavior): The students' socioeconomic class was assessed using the scale of the Brazilian Association of Research Companies (Associação Brasileira de Empresas de Pesquisa - ABEP) [48], which takes into account the head-of-household's education and the goods and services used, with scores ranging from 0 to 46 or in categories from A to E; higher scores indicate better economic standing, and socioeconomic classes are ranked from A (highest) to E (lowest).

To pair the questionnaires answered at both times in the study (baseline and follow-up), students created an anonymous code that was based on the personal information. This process provided them anonymity and confidentiality, which are essential in studies on illicit behaviors [49]. School and class codes were included in the matching process. The students' codes were matched using the Levenshtein algorithm, which identifies similarities between a set of characters [50]. Questionnaires that were positive for lifetime use of a fictional drug (Holoten and Carpinol) were excluded from the analysis (n = 48).

Statistical analysis

LCA was used to identify groups with similar patterns of risk behaviors and create the final outcome variable that reflects latent classes of risk behaviors. The LCA model

was constructed with the observed variables from past-month drug use (alcohol, tobacco, marijuana, inhalants, and binge drinking), bullying (perpetration and victimization) and engagement in unprotected sex at the 21 months follow-up. The enumeration process extracted 1 to 5 classes, and due to the study's multilevel design, the analysis were corrected as described in Asparouhov [51], considering the complex sample, taking the school (second level) as the cluster indicator. The extraction of latent classes ceased when the addition of a new class yielded little additional information. The model was adjusted based on the "goodness-of-fit" criterion - Akaike information criterion (AIC), the Bayesian information criterion (BIC), the sample-size-adjusted Bayesian information criterion (SSABIC), and the Vuong-Lo-Mendell-Rubin (VLMR) test - and took into consideration the parsimony and interpretability of the classes. Finally, to assess how well discriminated the latent classes underlying the best solution were, we used entropy, which is based on a posteriori probability and indicates the accuracy of the classification; values close to 1 indicate clear and very precise classifications. The best solution was defined by the combination of all the above indices.

Because large amounts of data relating to the outcome variables at 21-month follow-up were lost due to missing data, they were imputed in Mplus through sequential imputation [52].. The following were used as variables in the unrestricted model: group, school, gender, age, ABEP classification, past-month drug use (alcohol, binge drinking, cigarettes, inhalants, marijuana), bullying, and practice-unprotected sex at baseline. Five imputed data sets were generated. Then, multinomial logistic regressions (Hosmer, Lemeshow, & Sturdivant 2013) were performed in Mplus using the R3STEP option of the AUXILIARY command [54] with the baseline covariant variables affecting the outcome at 21 months follow-up.

The descriptive statistics are weighted percentages (%wgts) based on random levels of the sample subjects and records of the expected population taken from official data from the Anisio Texeira National Institute of Educational Studies and Research (Instituto Nacional de Estudos e Pesquisa Educacionais Anisio Teixeira – INEP). Inferential point estimates are given as adjusted odds ratios (aORs) with their respective 95%CIs and p-values. The adopted level of significance was 5%.

Results

Table 1 presents the characteristics of the students that participated in the study. Data show that, at baseline, most of the students were girls (48.79%), with an average age of 12.61, who belonged to the socioeconomic C class (53.97%). The drug most used by the students in the past month was alcohol (16.01%), bullying victimization (28.69%) was more prevalent than bullying perpetration (18.81%) and 4.48% of the adolescents reported past-month unsafe sex. Moreover, alcohol use was more prevalent among fathers than among mothers of the adolescents, both for episodic alcohol use (30.52% and 21.30%, respectively) and for drunkenness (9.94% and 2.44%, respectively), and the most prevalent parenting style was the neglectful style (37.84%). After 21 months (**Table 2**), alcohol continued to be the most prevalent drug used by the adolescents over the past month (27.30 %), however the most prevalent bullying behavior was victimization (29.90 %) and 7.60% of the adolescents reported past-month unsafe sex.

We tested for up to six class models. **Table 3** shows values of the information criteria. The fit indices (lower BIC and SSABIC values) suggested that the four-class model was slightly superior to the other. The BIC value for the four model class was lower compared with the five model class and was higher compared with the three class model. Taking the BIC value as one of the most reliable measures [55] and considering

the theoretical interpretation criteria the model with four latent classes was chosen as the most parsimonious. For the four latent classes solution, the value of entropy was 0.749 and VLMR LRT <0.001.

Four classes were distinguished and classified as: Low Risk Behaviors, High Bullying High Alcohol Use and Bullying and High Risk Behavior. Adolescents classified in the High Risk Behavior class exhibited the highest probabilities of having engaged in all eight categories of risk behaviors. Those classified as High Alcohol Use and Bullying had high probabilities of self-reported binge drinking, alcohol use, bullying perpetration and victimization in the past month; however, they had lower probabilities of having used other drugs in the past month. Those in the High Bullying class exhibited very low probabilities of drug use and practice-unprotected sex in the past month, however, they had higher probability of self-reported bullying behaviors. Those students classified in the Low Risk Behaviors class exhibited low probabilities of having engaged in all eight categories of risk behaviors. The High Risk Behavior class was the smallest, the High Alcohol Use and Bullying class was the second smallest followed by High Bullying class and the Low Risk Behaviors class, the largest (see **Fig. 1**).

Tables 4 show the results of the univariate logistic regression model and **Table 5** shows the multinomial logistic regression model, both using the latent classes as the outcomes. The "Low Risk Behaviors" class was the reference group and the final model was adjusted for age, gender, socioeconomic class, randomized group and baseline outcomes variables.

Regarding parenting styles, students whose parents adopted authoritative style were less likely than the children of neglectful parents to belong to the all the risk behaviors class rather than the Low Risk Behaviors class: High Bullying (aOR=0.64, 95%CI=[0.42; 0.98]), High Alcohol Use and Bullying class (aOR=0.61, 95%CI=[0.46;

0.80]) and to the High Risk Behavior (aOR=0.41, 95%CI=[0.16; 0.10]). Students whose parents adopted indulgent parenting styles were less likely than the children of neglectful parents to belong to High Bullying class (aOR=0.59, 95%CI=[0.40; 0.87]) rather than the Low Risk Behaviors class.

Students who reported that their mothers had episodes of drunkenness at baseline were more likely than the children of abstainers to belong to the High Alcohol Use and Bullying class and High Risk Behavior group (aOR=3.73, 95%CI=[1.25; 11.11] and aOR=4.98 , 95%CI=[1.20; 20.76], respectively) rather than to the Low Risk Behaviors class group.

No effect of the prevention program was identified regarding the probability of belonging to the High Bullying or High Alcohol Use and Bullying class or High Risk Behavior class rather than to the Low Risk Behaviors class (aOR=1.13, 95%CI=[0.73; 1.43]; aOR=1.07, 95%CI=[0.82; 1.36] and aOR= 1.14, 95%CI=[0.75; 1.74] respectively).

Discussion

To our knowledge, this is the first longitudinal study that applies the established knowledge of LCA to illuminate the role of parents' alcohol use and parenting styles in early adolescence in predicting adolescent risk behaviors. A solution with four latent classes ("Low Risk Behaviors", "High Bullying", "High Alcohol Use and Bullying" and "High Risk Behavior") provided the best explanation for the patterns of risk behaviors (defined as drug use, bullying and unsafe sex) among those adolescents. This study identified differences between adolescents in the Low Risk Behaviors class and the other classes of risk behavior: 1. Indulgent parenting style showed to be a protective factor of belonging to the High Bullying class; 2. Authoritative parenting style seems to be a protective factor for membership in all the risk behaviors classes; 3. Maternal episodes of

drunkenness were a risk factor for belonging to the High Alcohol Use and Bullying and High Risk Behavior classes.

The results related to the best solution for the latent classes confirmed the tendency of the co-occurrence of this behaviors (drug use, bullying and unsafe sex) in adolescents [20, 56]. However, this is the first study that we are aware off that cluster these three behaviors in latent patterns. Similar to previous research our study found that the majority of adolescents belonged to the low risk subgroup and the minority belonged to the high risk subgroup [56, 57].

Indulgent parenting style showed to play an important role as protective factor of belonging to the High Bullying class. This results contradict previous traditionally literature that showed that indulgent parenting style was related to greater bullying perpetration [58, 59]. However, emergent studies carried out in Spain and other European and Latin-American countries showed that indulgent parenting style can act as a protective factor for bullying [30, 60]. Our results highlight the importance of the responsiveness dimension in the prevention of bullying once both the indulgent and authoritative parenting styles share high levels of parental warmth and involvement as a characteristic. The possible reason is that parents with responsiveness characteristic are highly supportive and may help their children in overcoming their issues with dialogue helping to acquire adaptive coping strategies which in turn make the child more resilient helping to deal with aggressiveness behavior such as bullying [61]. Specific parental training programs may be necessary to strengthen supportive involvement and warm and affectionate parenting to improve family relationships and prevent or reduce bullying [62].

Results from this study point to authoritative parenting style as an important protective factor for the membership in all the risk behaviors classes. Our finding are

consistent with consistent previous literature that showed that the combinations of parental support and supervision which characterizes authoritative parenting style are associated with better offspring outcomes [63] and act as protective factors against adolescent drug use [26, 64], adolescent bullying behavior [58, 65, 66] and adolescent sexual risk behavior[67, 68]. We should stress that none of these prior studies considered the multi-dimensional patterns of co-occurrence of these risk behavior. As such, these findings add to the current literature of parenting styles the knowledge that authoritative parenting style is also protective against patterns of risk behaviors. This might be owing to the contribution that authoritative parents have to multiple aspects of children's well-being through the development of self-regulation and resistance efficacy [69, 70]. This positive parenting behaviors hold the potential to buffer the effects of risk factors, and also reduce the effect of less-changeable moderators (such as media exposure, poverty and neighborhood risks) on adolescent risk behaviors [25]. Therefore, the benefit for the prevention of risk behaviors that supposes the component of supervision together with parental support should indicate it.

These analyses identified maternal episodes of drunkenness as a strong risk factor, predicting adolescents' likelihood of belonging to the High Alcohol Use and Bullying and High Risk Behavior classes. Maternal drunkenness is an important factor in the risk of adolescent belonging to the classes that involve alcohol consumption and other drug use. Our results are in the same direction of previous studies that showed the same predictive relationship between maternal drunkenness and adolescent alcohol use [34, 35] and adolescent drug use [71, 72]. There are two possible explanations for this effect of mothers' episodes of drunkenness on adolescent drug use. First, problematic maternal alcohol use may promote low risk perception associated with drug use [73], may leave alcohol more accessible and may allow their children to drink alcohol earlier [74].

Second, be exposed to maternal episodes of noticeable intoxication may bring harmful to child's emotional development, leading to premature involvement in licit and even illicit drug use [75, 76]. This finding highlights the importance of public health prevention approaches that promote parental awareness of the role played as children models and that their problematic alcohol use may be a risk factor for several adolescent risk behavior, not only early alcohol initiation.

This study has limitations. We assessed only the adolescents' perceptions of parenting style and parental alcohol use, once we only collected measures from adolescents. Nevertheless, this is widely way to use adolescents' perceptions of parenting behaviors [26, 77]. In addition, there was an excessive amount of missing data from follow-up measures, leading to a lack of information about non- respondents. However, the absence of some data is an expected limitation in longitudinal studies, especially those with long follow-up periods [78, 79] and imputation processes offer excellent solutions to these missing-data problems by estimating the missing values [80]. Despite that we must say that missing data results in loss of statistical power and always be a limitation when interpreting trial results that should be interpreted with caution [81].

Thus, current findings add knowledge to literature showing that several adolescent risk behaviors are interrelated and tend to co-occur, indicating that community-based and school-based prevention need to address the multiple behaviors. Positive parenting skills, such as supervision and support, and parenting alcohol use should be target in order to prevent adolescent risk behaviors, such as drug use, bullying and unprotected sex.

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Table 1. Baseline predictors of students participating in a cluster randomized controlled trial for drug-use prevention (N=6,391).

Variables	N	wgt%	wgt95%CI
Baseline Measures (Wave 1)			
Group			
Intervention	3.243	50.26	[34.65; 65.82]
Control	3.148	49.75	[34.18; 65.35]
Gender			
Female	3.130	48.79	[47.03; 50.55]
Male	3.261	51.20	[49.44; 52.97]
Average Age		12.61	[12.56; 12.67]
Socioeonomic Status Score		27.67	[26.92; 28.41]
A (35-42)	244	3.78	[2.80; 5.11]
B (23-34)	2.467	36.64	[33.54; 39.85]
C (14-22)	3.343	53.97	[50.41; 57.50]
D/E (0-13)	322	5.60	[4.60; 6.80]
Adolescent Past-Month Drug Use			
Alcohol	1.002	16.01	[14.58; 17.56]
Binge Drinking	787	13.17	[11.92; 14.53]
Tobacco	115	1.84	[1.39; 2.42]
Inhalants	176	2.75	[2.26; 3.35]
Marijuana	76	1.22	[0.88; 1.67]
Adolescent Past-Month Bullying			
Perpetration	1156	18.81	[17.30; 20.42]
Victimization	1702	28.69	[27.75; 30.71]
Adolescent Past-Month Unsafe Sex			
	249	4.48	[03.76; 05.33]
Parenting Style			
Authoritative	1.447	28.69	[26.65; 30.83]
Authoritarian	960	19.66	[18.56; 20.80]
Indulgent	662	13.81	[12.72; 14.98]
Neglectful	1.863	37.84	[35.66; 40.07]
Family Alcohol Use			
Paternal Alcohol Use	1.913	30.52	[28.03; 33.14]
Paternal Drunkenness	600	09.94	[09.10; 10.84]
Maternal Alcohol Use	1.313	21.30	[19.54; 23.16]
Maternal Drunkenness	151	2.44	[2.00; 2.96]
Household structure			
Not living with mother	688	11.15	[09.96; 12.46]
Not living with father	2.631	42.93	[40.95; 44.93]
Living with mother and father	3.444	52.24	[49.91; 54.57]

Table 2. Outcome latent class indicators measures of students participating in a randomized controlled trial 21 months after the baseline.

Variables	N	%	95%CI
Outcome Measures (21 months follow-up)			
Adolescent Past-Month Drug Use			
Alcohol	991	27.30	[25.87; 28.77]
Binge Drinking	676	18.72	[17.47; 20.02]
Tobacco	119	3.29	[02.75; 03.92]
Inhalants	147	4.06	[03.46; 04.75]
Marijuana	159	4.39	[03.77; 05.11]
Adolescent Past-Month Bullying			
Perpetration	883	24.48	[23.10; .25.91]
Victimization	1.075	29.90	[28.42; .31.42]
Adolescent Past-Month Unsafe Sex			
	273	7.60	[06.78; 08.52]

Table3. Goodness-of-fit statistics for the number of latent classes of risk behaviors among students participating in the baseline data collection of a study to evaluate the effect of the #Tamojunto school-based drug-use prevention program (n=3635).

Models	Goodness-of-fit statistics						
	Free Parameters	AIC	BIC	ssaBIC	VLMR LRT	LMR-LR adjusted test	Entropy
1 Class	8	21668.650	21718.237	21692.817			
2Classes	17	18456.417	18561.789	18507.772	<0.0001	<0.0001	0.939
3Classes	26	18255.499	18416.657	18334.042	<0.0001	<0.0001	0.714
4Classes	35	18070.840	**18287.783**	**18176.570**	**<0.0001**	**<0.0001**	0.749
5Classes	44	18045.944	18318.672	18178.862	0.5981	0.6027	0.743
6Classes	53	18024.129	18352.642	18184.235	0.3830	0.3852	0.765

Fig1. Probabilities associated with occurrence over the past month of drug use, bullying and unsafe sex given the model of the four latent classes **with imputed data** among adolescents who participated in the collection of baseline data in the study evaluating the #Tamojunto program (n= 6391).

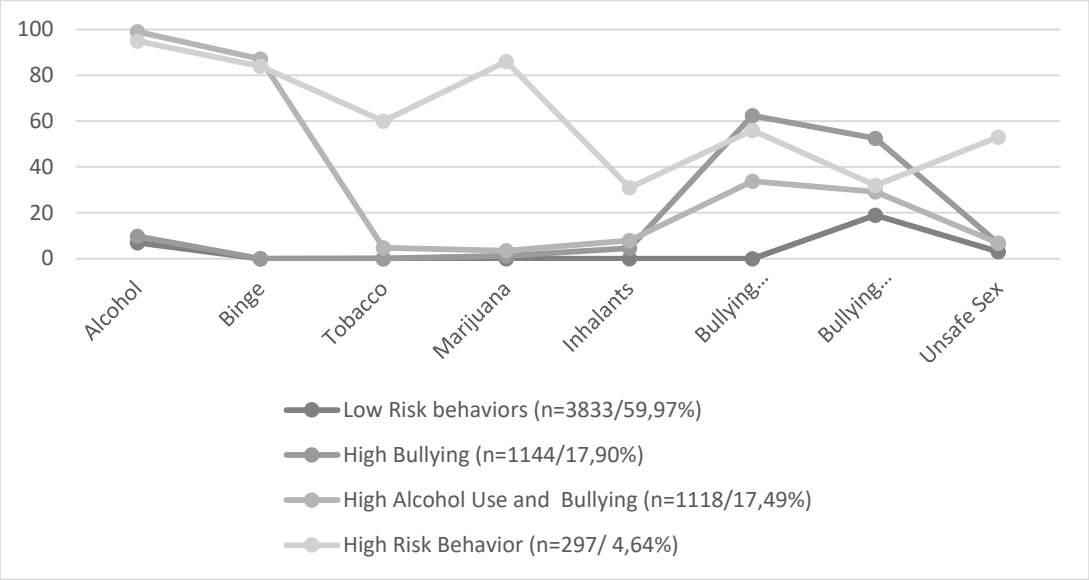

Fig2. Probabilities associated with occurrence over the past month of drug use, bullying and unsafe sex given the model of the four latent classes **without imputed** data among adolescents who participated in the collection of baseline data in the study evaluating the #Tamojunto program (n= 3635).

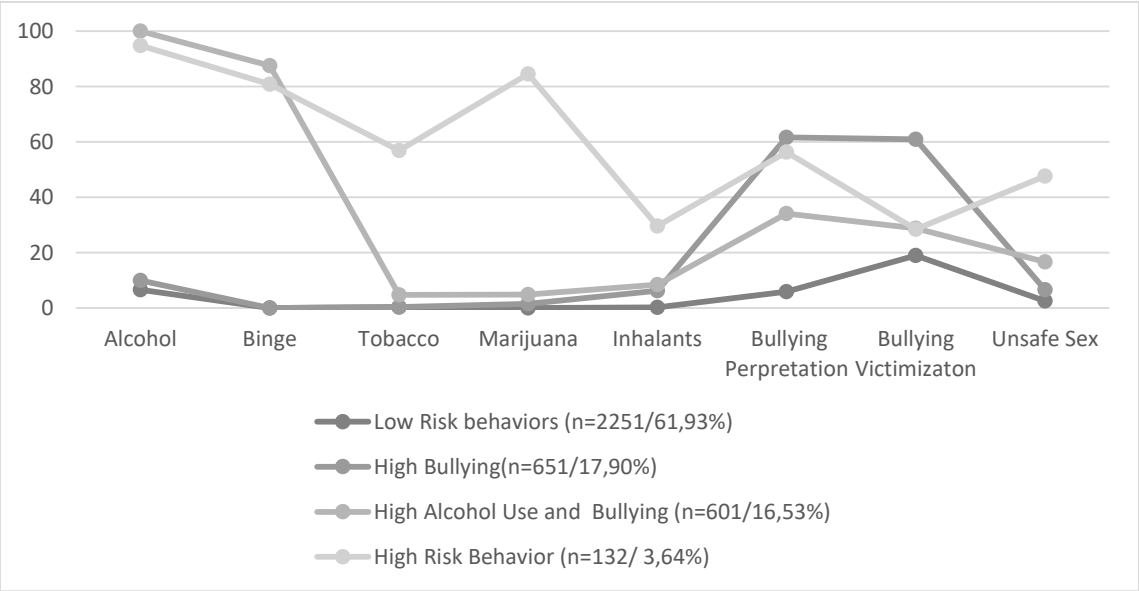

Table 4: Univariate Analysis of risk behaviors identified through LCA in a sample of students participating in the three waves data collection of a study to evaluate the effect the #Tamojunto school-based drug-use prevention program (n= 6391).

	Latent Classes					Univariate Analysis								
	Low Risk Behavior	High Bullying	High Alcohol Use and Bullying	High Risk Behavior	p	High Bullying vs. Low Risk Behaviors			High Alcohol Use and Bullying vs. Low Risk Behaviors			High Risk Behavior vs. Low Risk Behaviors		
	%	%	%	%		aOR	95%CI	p	aOR	95%CI	p	aOR	95%CI	p
Baseline Past-month Drug Use														
Alcohol	6.97	11.06	25.96	38.64	<0.001	1.73	[0.97; 3.08]	0.062	3.37	[1.58;7.19]	0.002	**7.60**	**[3.95; 14.62]**	**<0.001**
Binge	5.15	7.37	20.47	28.79	<0.001	0.70	[0.31; 1.60]	0.405	1.29	[0.59;2.86]	0.523	0.89	[0.35; 14.62]	0.807
Tobacco	0.22	0.92	2.16	6.82	<0.001	1.30	[0.15;11.29]	0.806	1.17	[0.32;4.26]	0.812	2.97	[0.80; 14.62]	0.104
Inhalants	1.60	3.53	4.49	2.27	<0.001	2.17	[0.81;5.81]	0.121	1.69	[0.72; 3.94]	0.226	1.62	[0.59; 4.44]	0.344
Marijuana	0.13	0.31	1.66	6.82	<0.001	1.39	[0.03;55.96]	0.858	2.50	[0.40;15.65]	0.328	**11.43**	**[1.89; 68.94]**	**0.008**
Baseline Unsafe Sex	1.42	2.61	3.33	9.85	<0.001	2.02	[0.76; 5.40]	0.160	1.95	[0.97;3.91]	0.060	**6.72**	**[2.41; 18.69]**	**<0.001**
Baseline Bullying														
Victimization	23.46	35.64	27.12	26.52	<0.001	**2.22**	**[1.57; 3.12]**	**<0.001**	1.22	[0.91; 1.65]	0.181	1.07	[0.68; 1.68]	0.775
Perpetration	10.62	23.66	23.29	32.58	<0.001	3.74	[2.71; 5.16]	**<0.001**	3.38	[2.14; 5.34]	**<0.001**	**3.83**	**[1.68; 8.72]**	**0.001**
Sociodemographic Variables														
Group	47.71	49.77	50.42	55.30	0.243	1.04	[0.77; 1.41]	0.790	1.08	[0.85; 1.38]	0.509	1.19	[0.78; 1.79]	0.416
Sex	52.82	41.78	57.57	43.94	<0.001	**0.63**	**[0.45; 0.87]**	**0.005**	1.23	[0.98; 1.56]	0.077	0.84	[0.57; 1.21]	0.350
Age	12.48±0.72	12.49±0.73	12.62±0.78	12.69±0.80	0.038	0.98	[0.83; 1.15]	0.832	1.18	[1.00; 1.39]	0.048	1.08	[0.81; 1.44]	0.581
SES	19.89±7.49	20.84±8.45	20.70±7.70	21.09±8.25	0.001	1.02	[1.00; 1.03]	0.064	1.02	[1.00; 1.03]	0.008	1.01	[0.98; 1.05]	0.507
Parenting Style*														
Neglectful						1			1		1			
Indulgent	10.44	7.99	9.65	13.64	0.076	0.59	[0.40; 0.87]	0.008	0.78	[0.58; 1.06]	0.114	0.94	[0.49; 1.82]	0.868
Authoritarian	15.99	16.74	13.48	10.61	0.140	0.87	[0.57; 1.32]	0.510	0.82	[0.58; 1.15]	0.258	0.62	[0.28; 1.36]	0.234
Authoritative	27.37	21.04	18.64	11.36	<0.001	**0.62**	**[0.41; 0.95]**	**0.027**	0.58	[0.45; 0.74]	**<0.001**	**0.38**	**[0.16; 0.91]**	**0.030**
Parents Alcohol Use*														
Maternal Alcohol Use	19.59	21.81	24.29	25.00	0.024	1.23	[0.79; 1.89]	0.351	1.33	[0.98; 1.79]	0.061	1.37	[0.86; 2.18]	0.184
Maternal Drunkenness	1.29	2.92	3.49	6.82	<0.001	2.40	[0.59; 9.71]	0.219	**4.13**	[1.44;11.86]	**0.008**	**5.52**	**[1.34;22.76]**	**0.018**
Paternal Alcohol Use	32.83	28.73	33.78	24.24	0.023	0.76	[0.54; 1.08]	0.128	0.99	[0.73; 1.34]	0.961	0.73	[0.45; 1.17]	0.189

Paternal Drunkenness	7.82	11.06	12.15	12.88	0.001	1.24	[0.70; 2.17]	0.455	1.18	[0.76; 1.82]	0.454	1.01	[0.57; 1.78]	0.976
Parents Living Status														
Absence of Mother	8.80	11.83	12.81	7.58	0.007	1.36	[0.62; 3.00]	0.439	1.39	[0.84; 2.31]	0.203	1.36	[0.62; 3.00]	0.439
Absence of Father	35.05	38.86	42.10	50.00	<0.001	1.03	[0.45; 2.37]	0.938	1.06	[0.58; 1.94]	0.838	1.03	[0.45; 2.37]	0.938
Mother and Father	61.00	55.91	51.75	44.70	<0.001	0.96	[0.34; 2.55]	0.886	0.78	[0.37; 1.67]	0.529	0.93	[0.34; 2.55]	0.886

Table 5. : Multivariate Analysis of risk behaviors identified through LCA in a sample of students participating in the three wave data collection of a study to evaluate the effect of the #Tamojunto school-based drug-use prevention program (n= 6391).

	Multivariate Analysis								
	High Bullying vs. Low Risk Behaviors			High Alcohol Use and Bullying vs. Low Risk Behaviors			High Risk Behavior vs. Low Risk Behaviors		
	aOR	95%CI	p	aOR	95%CI	p	aOR	95%CI	p
Baseline Past-month Drug Use									
Alcohol	1.63	[0.87; 3.04]	0.124	**2.86**	**[1.32; 6.16]**	**0.007**	**6.55**	**[3.20; 13.43]**	**<0.001**
Binge	0.72	[0.30; 1.70]	0.451	1.36	[0.62; 2.98]	0.439	0.94	[0.35; 2.56]	0.908
Tobacco	1.07	[0.12; 9.22]	0.948	0.96	[0.29; 3.15]	0.941	2.23	[0.65; 7.63]	0.202
Inhalants	2.20	[0.77; 6.23]	0.139	1.67	[0.67; 4.11]	0.268	1.55	[0.54; 4.43]	0.411
Marijuana	1.44	[1.89;74.55]	0.843	2.55	[0.36; 18.24]	0.351	**11.86**	**[1.88; 74.55]**	**0.008**
Baseline Unsafe Sex	1.85	[0.60; 5.66]	0.283	1.65	[0.76; 3.57]	0.202	**5.65**	**[1.88; 17.00]**	**0.002**
Baseline Bullying									
Victimization	**2.17**	**[1.54; 3.08]**	**<0.001**	1.20	[0.91; 1.58]	0.189	1.05	[0.66; 1.65]	0.836
Perpetration	**3.35**	**[2.40; 4.65]**	**<0.001**	**3.11**	**[1.94; 4.96]**	**<0.001**	**3.36**	**[1.52; 7.42]**	**0.003**
Sociodemographic Variables									
Group	1.13	[0.73; 1.43]	0.896	1.07	[0.82; 1.36]	0.644	1.14	[0.75; 1.74]	0.526
Sex	**0.63**	**[0.46; 0.87]**	**0.006**	1.28	[1.01; 1.61]	0.038	0.88	[0.59; 1.30]	0.511
Age	0.89	[0.80; 1.09]	0.409	1.14	[0.95; 1.36]	0.149	1.02	[0.76; 1.35]	0.905
SES	1.01	[1.00; 1.04]	0.067	1.02	[1.01; 1.04]	0.002	1.02	[0.98; 1.06]	0.313
Parenting Style*									
Neglectful	1								
Indulgent	**0.59**	**[0.40; 0.87]**	**0.008**	0.84	[0.61; 1.16]	0.292	1.01	[0.53; 1.88]	0.998
Authoritarian	0.91	[0.60; 1.37]	0.652	0.82	[0.59; 1.14]	0.245	0.63	[0.28; 1.40]	0.257
Authoritative	**0.64**	**[0.42; 0.98]**	**0.039**	**0.61**	**[0.46; 0.80]**	**<0.001**	**0.41**	**[0.16; 0.10]**	**0.049**
Parents Alcohol Use*									
Maternal Alcohol Use	1.23	[0.75; 1.89]	1.19	1.26	[0.93; 1.69]	0.130	1.20	[0.74; 1.92]	0.458
Maternal Drunkenness	2.37	[0.48; 9.74]	2.17	**3.73**	**[1.25; 11.11]**	**0.018**	**4.98**	**[1.20; 20.76]**	**0.027**
Paternal Alcohol Use	0.86	[0.54; 1.16]	0.79	1.05	[0.76; 1.44]	0.760	0.83	[0.54; 1.29]	0.419
Paternal Drunkenness	1.19	[0.68; 2.16]	1.21	1.25	[0.80; 1.95]	0.325	1.07	[0.59; 1.95]	0.825
Parents Living Status									
Absence of Mother	1.39	[0.66; 2.95]	0.383	1.41	[0.85; 2.34]	0.184	0.46	[0.15; 1.41]	0.176
Absence of Father	1.13	[0.47; 2.75]	0.783	1.15	[0.62; 2.12]	0.660	0.48	[0.13; 1.79]	0.278
Mother and Father	0.96	[0.36; 2.89]	0.96	0.87	[0.41; 1.84]	0.711	0.22	[0.04; 1.11]	0.067

Anexo 6

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A Latent Transition Analysis of a Cluster Randomized Controlled Trial for Drug Use Prevention

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Objective: The objective of the study was to evaluate the impact of #Tamojunto, a Brazilian adaptation of the Unplugged prevention program, on patterns of drug use among adolescents and to characterize their trajectories of drug use over time. ***Method:*** An in-cluster randomized controlled trial was conducted in 2014–2015 with 2 parallel arms (intervention and control). The intervention group attended 12 weekly classes of the #Tamojunto intervention. The control schools did not offer a prevention program. The target population was students attending seventh and eighth grades. The primary dichotomous outcome measures were use of drugs (any alcohol use, binge drinking, tobacco, marijuana, inhalants, and cocaine) in the past year assessed using a questionnaire before intervention and in 2 waves of follow-up (9 and 21 months). ***Results:*** A latent transition analysis in 6,391 students from 72 public schools in 6 Brazilian cities revealed 3 distinct patterns of drug use behavior: abstainers/low users (81.54% at baseline, 70.61% after 21 months), alcohol users/binge drinkers (16.65% at baseline, 21.45% after 21 months), and polydrug users (1.80% at baseline, 7.92% after 21 months). No differences in the probabilities of transitions between these drug use patterns were found between the intervention and control groups. The most likely trajectory was no transition between patterns, regardless of the intervention and baseline pattern. ***Conclusions:*** The intervention was not successful in changing adolescent drug use patterns over time, showing that the components of the Brazilian adaptation of the Unplugged prevention program should be reevaluated.

What is the public health significance of this article?
This study suggests Brazilian adaptation of the Unplugged European school-based prevention program was not successful in changing adolescents' drug use patterns over time. Adolescents' drug use patterns were shown to be stable and have small changing probabilities over time. It implies that the initial drug use pattern commonly is preserved to subsequent evaluated moments. This study highlights the importance of rigorously evaluating the effectiveness of cultural adaptation version of evidence-based prevention programs to inform public policy.

Keywords: prevention, adolescence, drug use, randomized controlled trial, latent transition analysis

Supplemental materials: http://dx.doi.org/10.1037/ccp0000329.supp

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All procedures in the use of human participants and/or animals in the present study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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Unplugged is a school-based drug prevention program, based on the Model of Global Social Influence (Sussman, Stacy, Johnson, Pentz, & Robertson, 2004), which is intended to strengthen the personal and interpersonal skills of adolescents through interactive techniques and normative education (Kreeft et al., 2009). The social influence model assumes that drug use initiation results from social influences, through which adolescents develop erroneous perceptions of the frequency and acceptability of drug consumption (Giannotta, Vigna-Taglianti, Rosaria Galanti, Scatigna, & Faggiano, 2014). In a large multicenter randomized controlled trial of Unplugged in seven European countries, significant reductions in episodes of recent drunkenness and frequent cannabis use among adolescents were observed (Faggiano et al., 2010; Faggiano, Vigna-Taglianti, et al., 2008).

In Brazil, drug use has been identified as a major health concern in adolescents (Madruga et al., 2012; Pinsky, Sanches, Zaleski, Laranjeira, & Caetano, 2010), especially because the onset of drug use occurs early, between 12 and 14 years of age (Carlini et al., 2010; Malta et al., 2011). By the age of 14 years, 55.5% of adolescents have consumed alcoholic beverages, 21.4% reported episodes of drunkenness, 18.4% consumed tobacco, and 9% reported a lifetime use of any illicit drug (IBGE, 2016). Brazil has not historically implemented evidence-based drug use prevention programs in schools (Pereira, Paes, & Sanchez, 2016). To fill this gap, the national Ministry of Health conducted a transcultural adaptation and implementation of the Unplugged program, renamed #Tamojunto. The short-term goal of this program was to reduce the number of adolescents who experiment with and consume alcohol and other drugs (Faggiano, Galanti, et al., 2008). Because public policies should be supported by an evidence base that justifies national investment and expansion, it is necessary to assess the effectiveness of this program as implemented in Brazil.

Heterogeneity in the nature of adolescent drug use behavior has been described (Evans-Polce, Lanza, & Maggs, 2016), and patterns may cluster dynamically over time (Mistry et al., 2015). Statistical approaches that can characterize patterns of behaviors, and evaluate changes in behavioral patterns over time, have been applied to identify individuals who are at risk for drug use (Collins & Lanza, 2009). Latent transition analysis (LTA) assumes that a set of variables can be used to inform an underlying population structure, in which members of the same classes have common patterns of behaviors. LTA can be used to investigate how individuals transition from one latent class to another over time (Collins & Lanza, 2009). In a recent systematic review, most studies applying latent class approaches to drug use behavior identified four patterns: (a) no/low substance use; (b) alcohol use; (c) alcohol, tobacco, and marijuana use; and (d) polysubstance use (Tomczyk, Isensee, & Hanewinkel, 2016). That systematic review identified six drug use LTA studies, all of which examined adolescents in the United States, with one comparing the results of a U.S. and a Puerto Rican sample (Tomczyk et al., 2016). Of those studies that evaluated the probability of transitions between latent classes over the time, the most common scenarios involved remaining in the same class (Chung, Kim, Hipwell, & Stepp, 2013; Maldonado-Molina et al., 2007) or escalating to a polysubstance use class (Shin, Hong, & Wills, 2012).

The LTA approach offers powerful tools to estimate the probabilities of transitions from each substance use profile to the others over time (Lanza, Patrick, & Maggs, 2010), which is useful when testing intervention effects (Velicer, Martin, & Collins, 1996). This pattern-centered approach offers more qualified conclusions about the effects of an intervention compared with examining each behavior separately. It avoids blanket statements (Steinman & Schulenberg, 2003), and it provides greater statistical power for testing overall program effectiveness because it assesses changes in behavior patterns that underly individual observed indicators as opposed to performing multiple comparisons for multiple outcomes (Baldwin, 2015; Taylor, Graham, Cumsille, & Hansen, 2000). Despite these advantages, only a few studies have applied LTA to evaluate prevention programs (Graham, Collins, Wugalter, Chung, & Hansen, 1991; Spoth, Lopez Reyes, Redmond, & Shin, 1999; Strøm et al., 2014).

The current study advances two aims: (a) to evaluate the effectiveness of #Tamojunto, a Brazilian adaptation of the Unplugged prevention program, on drug use behavior over a 21-month follow-up period in early adolescence; and (b) to characterize the trajectories of early adolescent drug use patterns over time, evaluating the likelihood of change from previously observed behavior at 9 and 21 months. We hypothesized that the #Tamojunto prevention program would delay the onset of drug use and reduce the use of drugs; specifically, we aimed to show that the expected transitions between drug use patterns (i.e., an escalation in substance use behaviors over time) would be less likely among adolescents in the intervention condition compared with those in the control condition.

Method

Study Design

A 2-group, parallel-arm, school-clustered randomized controlled trial was conducted to compare the integration of the prevention program #Tamojunto into school curricula (intervention condition) with the usual curricula in Brazil, that is, no prevention program (control condition), among adolescents in public schools in six Brazilian cities (São Paulo, Federal District, São Bernardo do Campo, Florianópolis, Fortaleza, and Tubarão), located in four Brazilian states. The trial registration protocol at the Brazilian Register of Clinical Trials–REBEC, of the Brazilian Federal Government, is RBR-4mnv5*g*.

The target population was students attending seventh and eighth grades (12–13 years of age) in the participating cities. Selection of the age group was based on the feasibility of a 2-year follow-up during compulsory middle school attendance. From the sample universe of all public schools in the participating cities (according to the national registration list of schools from the Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira), 72 schools were randomly selected, proportional to the number of schools in the municipality (stratum). Among the schools selected to participate in the study, a second allocation determined whether each school would be assigned to the control or intervention group according to a random list, maintaining a 1:1 allocation ratio per municipality. Randomization was performed at the school level, via the Excel macro [command RAND].

In the intervention schools, students received 12 lessons of the #Tamojunto program substituted in place of a normal curriculum, whereas the control schools did not implement any prevention program. No other prevention programs were implemented simul-

taneously in any of the participating schools. The cultural adaptation and implementation of the program were responsibilities of the Brazilian Ministry of Health (BMH). Evaluation was conducted by independent researchers.

Data were collected simultaneously in the control and intervention schools at three time points (see Figure 1). The first follow-up was collected at the end of the school year to avoid likely loss to follow-up because of summer vacation. Consent to participate in the study was obtained from all of the school directors, teachers, and student participants. All participants took part voluntarily after informed consent, based on the principle of adolescent autonomy under the Brazilian Statute of Children and Adolescents (Law No. 8969/1990). This study was approved by the Ethics in Research Committees at the University of São Paulo (#473.498) and the Federal University of Santa Catarina (#711.377).

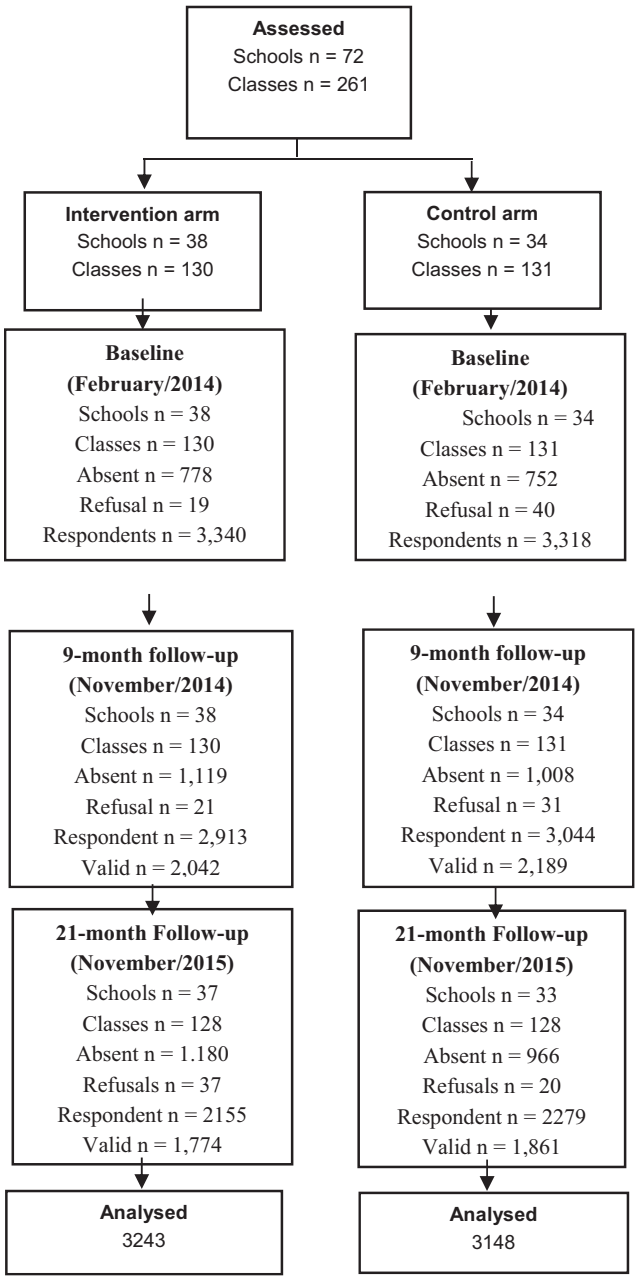

Figure 1. CONSORT flow diagram for the randomized controlled trial. Absent = absent from school in moment of the assessment; refusals = subjects who refused to participate in the assessment; valid = number of subjects used in the cross-sectional latent class analysis; respondent = participants assenting to participate, providing data.

Population and Sample Size

Based on the sample size calculation (Lwanga, Lemeshow, & World Health Organization) to achieve a power of 80%, a significance level of 5% for a difference between groups of 1.5 percentage points (e.g., from 5% to 3.5%), the necessary sample size for each study arm was calculated to be 2,835, in a ratio of 1:1. To account for losses to follow-up and for a high intraclass correlation, the sample was increased by 50% to a recruitment target of 4,253 participants in each arm. The parameters used were based on a previously conducted pilot study, and historical school absence rate data (Sanchez et al., 2016).

Because the target population was 13-year-old students (enrolled in eighth grade) and because each school had approximately four eighth-grade classes of 30 students each, at least 35 schools in the intervention arm and the same number in the control arm (total of 70 schools) were needed to achieve the number of students required. Considering a 10% refusal of schools, 38 schools were enrolled in each arm. In each of the participating municipalities, four to 30 schools were randomly selected (in proportion to the size of the city's population).

In each of the schools, all eighth-grade classes were invited to participate in the study prior to randomization of groups. In Fortaleza, Santa Catarina, and Tubarão, the seventh-grade classes of the selected schools were also included because these cities were in the process of changing the age of students assigned to each grade.

Intervention

The Unplugged program was first designed by the European Drug Addiction Prevention Trial (EU-DAP) group (Kreeft et al., 2009), and it consists of 12 classes (four 1-hr classes on attitudes and knowledge about drugs, four classes on social and interpersonal skills, and four classes on personal skills) with on average 50 min, applied to students by teachers trained and guided by the student and teacher manuals. Both manuals are open access and made available in several languages on the website www.eudap.net.

The BMH team performed the translation and transcultural adaptation of the program under supervision of the European developers, in 2013. The English version of the Unplugged material was translated into Portuguese, retaining the original format and subjects (educational strategies provided in 12 classes and three parent workshops) but with adapted activities. Given the epidemiological profile of illegal drug use among students in Brazil, information on heroin was replaced with information on crack-cocaine (Carlini et al., 2010). Further details of the cultural adaptation process are described elsewhere (Abreu et al., 2017).

The teachers who delivered the program attended a 16-hr training facilitated by coaches trained by the European developers, the

master-trainers of the EU-DAP Intervention Planning Group (Gabrhelik et al., 2012). At the end of each class, teachers completed a fidelity questionnaire to assess the dose of the program delivered. To guarantee fidelity and dose, teachers were supervised monthly by the coaches from the BMH who had facilitated the initial training.

Instrument and Variables

The instrument used for data collection was developed, tested, and implemented previously by the EU-DAP (Faggiano, Vigna-Taglianti, et al., 2008). In Brazil, we used an adapted version of the questionnaire translated into Portuguese (Cainelli et al., 2016). The questionnaire evaluates a set of variables including sociodemographic data and past-month (yes/no) and past-year (yes/no) use of alcohol, tobacco, marijuana, inhalants, cocaine, and crack. It also evaluates the practice of binge drinking (the consumption of five or more alcoholic drinks on a single occasion) in the past month and past year. Socioeconomic status (SES) was assessed using the scale from the Brazilian Association of Research Companies (ABEP, 2012). The outcomes analyzed were past-year use of alcohol, tobacco, marijuana, inhalants, and binge drinking at the three time points (baseline, 9 months after, and 21 months after the baseline).

To pair (link) the questionnaires of each subject, students filled in a secret code involving letters and numbers created from their first name, surname, date of birth, mother's name, father's name, and maternal grandmother's name. Each code was composed of eight characters (seven letters and one number), which could be decoded only by the students themselves. These codes allow researchers to link individual questionnaires at different times of the study while protecting the anonymity and confidentiality of the participants (Galanti et al., 2007). The secret codes were matched using the Levenshtein algorithm, which identifies similarities among a set of characters. School and class codes were included in the matching process (Levenshtein, 1965). Questionnaires that were positive for lifetime use of a fictional drug (Holoten or Carpinol) were excluded from the analysis.

Statistical Analysis

LTA, a longitudinal extension of latent class analysis involving multiple latent class variables, was used to evaluate the effectiveness of the intervention on the probabilities of transitioning between drug use patterns (Nylund, 2007). LTA characterizes drug use patterns within each wave and identifies the probabilities of transitions between them from one wave to the next. Robust maximum likelihood estimation was used under full information maximum likelihood (FIML) and the assumption of a missing at random mechanism, subverting the need to impute missing data. Because of the nested structure of the data (i.e., individual adolescents nested within 72 schools), the standard errors and χ^2 test of the model fit took into account nonindependence (Asparouhov, 2005, 2006).

To test whether transitional probabilities from baseline to 9 months and from 9 to 21 months were all significantly different from zero between groups, an omnibus (Wald) test was used. This is a formal omnibus test comparing all the same pattern of class transitional probabilities between #Tamojunto and control within each adjacent period (e.g., four logits coming from baseline to 9 months and four logits from 9 to 21 months). The statistical significance level was $p = .05$. All analyses were run in Mplus version 7.4 (Muthén & Muthén, 2010) and outputs are available upon request.

The extraction of latent classes ceased when the inclusion of a class yielded little additional information. The model was adjusted based on the goodness-of-fit criterion and took into consideration the parsimony and interpretability of the classes; that is, in addition to the statistical indices presented below, the decision about the best solution and number of latent classes took into consideration the most consistent statistical and conceptual distinctions among the groups. The following fit indices were used to decide statistically the best solution: the Akaike information criterion; the Bayesian information criterion (BIC); the sample size–adjusted Bayesian information criterion (SSABIC); and the Vuong-Lo-Mendell-Rubin test (VLMR). Finally, to assess how well discriminated the latent classes underlying the best solution were, we used entropy, which is based on an a posteriori probability and indicates the accuracy of the classification; values close to 1 indicate clear and very precise classifications. We emphasize that entropy, in itself, was not used to decide the best solution for the number of latent classes.

Because FIML assumes a missing at-random mechanism, in which data are missing completely at random in relation to other variables, the following covariates were included in the model: sex, age, SES, and group assignment at the individual level. The outcomes were modeled conditional on covariates and the covariates have no distributional assumptions. For missing data, the standard errors of the parameter estimates are computed using the observed, rather than the expected, information matrix (Kenward & Molenberghs, 1998). In short, covariates were included to support the missing at random approximation under FIML.

Given that LTA assumes local independence of class indicators, we also tested the bivariate residuals to rule out dependence, in which values higher than 1.96 would indicate lack of local independence (Reboussin, Ip, & Wolfson, 2008).

Results

Participants

A total of 72 schools accepted our invitation to participate in the study, as described in Figure 1, and school characteristics were similar between groups (Supplemental Table 1). Table 1 shows the distribution of students' sociodemographic data and the frequency of five indicators of drug use within the three waves and the percentage of missing data by group. The intervention was offered March through June 2014. A total of 89% of the classes received the complete program (12 lessons); the other 11% discontinued the program between lessons 4 and 11. Questionnaires endorsing use of a fictional drug were excluded from the analysis ($n = 49$ at baseline, $n = 70$ at 9 months, and $n = 25$ at 21 months).

Class Enumeration (Cross-Sectional)

In each wave, a total of five classes were defined. Table 2 shows values of the information criteria. In Wave 1, a higher BIC value suggested that the three-class model was slightly superior to the others, whereas the SSABIC value and the VLMR and Lo-Mendell-Rubin test (LMR) favored the four-class model. In Wave 2, the fit indices (lower BIC, SSABIC and Akaike information

Table 1
Proportion of Past-Year Drug use in the Intervention and Control Groups Across Time (n = 6,391)

Variables	Control		Experimental	
	n (%)	Missing (%)	*n* (%)	Missing (%)
Baseline				
Gender		—		—
Boys	1,530 (48.6%)		1,600 (49.3%)	
Girls	1,618 (51.4%)		1,643 (50.7%)	
Age, years		—		—
11–12	1,700 (54%)		1,643 (50.7%)	
13–14	1,448 (46%)		1,600 (49.3%)	
SES		7 (.22%)		8 (.25%)
A	119 (3.8%)		125 (3.8%)	
B	1,206 (38.3%)		1,261 (38.9%)	
C	1,639 (52.1%)		1,704 (52.5%)	
D/E	177 (5.62%)		145(4.5%)	
Past-year drug use				
Alcohol	1001 (31.8%)	21 (.7%)	1014 (31.3%)	26 (.8%)
Binge drinking	487 (15.5%)	28 (.9%)	519 (16.0%)	42 (1.3%)
Tobacco	115 (3.7%)	28 (.9%)	128 (3.9%)	35 (1.1.%)
Inhalants	254 (8.1%)	27 (.9%)	271 (8.4%)	37 (1.1%)
Cannabis	73 (2.3%)	25 (.8%)	83 (2.6%)	39 (1.2%)
9 months				
Past-year drug use				
Alcohol	731 (23.2%)	977 (31%)	761 (23.5%)	1,211 (37.3%)
Binge drinking	353 (11.2%)	981 (31.2%)	373 (11.5%)	2,016 (62.2%)
Tobacco	111 (3.5%)	976 (31.0%)	105 (3.2%)	1,224 (37.7%)
Inhalants	237 (7.5%)	976 (31.%)	185 (5.7%)	2,018 (62.2%)
	94 (3.0%)	976 (31.%)	108 (3.3%)	2,026 (62.5%)
21 months				
Past-year drug use				
Alcohol	849 (27.05)	1,294 (41.1%)	882 (27.2%)	1,472 (45.4%)
Binge drinking	460 (14.6%)	1,304 (41.45)	448 (13.8%)	1,760 (54.3%)
Tobacco	122 (3.9%)	1,302 (41.4%)	130 (4.0%)	1,484 (45.8%)
Inhalants	202 (6.4%)	1,845 (58.6%)	175 (5.4%)	1,764 (54.4%)
Cannabis	133 (4.2%)	1,302 (41.4%)	143 (4.4.%)	1,489 (45.9%)

criterion values, and VLMR and LMR statistic significant) suggested that the four-class model was slightly superior to the others. However, examination of the four-class solution in Waves 1 and 2 led us to select the three-class model because it was the most coherent on the balance of theoretical and mode fit criteria. The fourth class, a subgroup of the polydrug users who did not consume alcohol, accounted for a very small proportion of subjects (0.25–0.52%), which did not satisfy the recommendation that a valid class should contain not less than 5% of the sample (Nagin, 2005). For the three-class solution, the entropy values were 0.89 and 0.85 in Waves 1 and 2, respectively. In Wave 3, the BIC value and the VLMR and LMR tests favored the three-class model, whereas only the SSABIC favored the four-class model. For the three-class solution, the value of entropy was 0.82. Taking the BIC as one of the most reliable measures (Nylund, Asparouhov, & Muthén, 2007) and the small proportion of subjects in the fourth class (0.25%), the model with three latent classes was also chosen as the most parsimonious in Wave 3. Therefore, for each of the three waves, the best model solution identified three latent classes based on a combination of theoretical and model fit criteria (Marsh, Lüdtke, Trautwein, & Morin, 2009). The three classes distinguished polydrug users, alcohol users/binge drinkers, and abstainers/low users. For each wave, the class memberships are enumerated in Supplemental Table 2.

Adolescents classified as polydrug users exhibited the highest probabilities to have used all five drugs. Those classified as alcohol users/binge drinkers had high probabilities to endorse alcohol use and binge drinking in the past year; however, they had lower probabilities to endorse use of cannabis, cigarettes, and inhalants. The third class exhibited very low probabilities of alcohol use, binge drinking, and use of tobacco or cannabis; however, there was a small probability for isolated use of alcohol (12.4%) or inhalants (4.7%) in this class (see Supplemental Figure 1 in online supplemental material).

The relative proportions of the classes were relatively stable across the waves. That is, the polydrug user class was consistently the smallest (from 1.8% to 7.8%), the alcohol users/binge drinkers comprised the next smallest (from 16.6% to 29.4%), and the abstainers/low users class comprised the largest (from 64.4% to 81.5%).

The results of the bivariate residuals test showed that the assumption of local independence of class indicators at the three waves held. This was conducted via inspection of the standardized residuals, which ranged from −0.012 to 0.018 at Wave 1, −0.003 to 0.003 at Wave 2, and −0.003 to 0.003 at Wave 3.

Invariance Testing and Longitudinal Findings

Regarding invariance, the log likelihood ratio test comparing full invariance and full noninvariance models was not statistically

Table 2
Probability of Transition Between Classes From Baseline to 9 Months and from 9 Months to 21 Months in Control and Intervention Arms

	9 months				21 months		
	Polydrug users	Alcohol users/binge drinkers	Abstainers/ low users		Polydrug users	Alcohol users/binge drinkers	Abstainers/ low users
				Control			
Baseline							
Polydrug users	.808	.087	.105		Polydrug users	.760	.087	.153
Alcohol users/binge drinkers	.139	.570	.291	9 months	Alcohol users/binge drinkers	.164	.708	.128
Abstainers/low users	.031	.135	.834		Abstainers/low users	.031	.216	.753
				#Tamojunto			
Baseline							
Polydrug users	.880	.053	.067		Polydrug users	.878	.066	.056
Alcohol users/binge drinkers	.108	.629	.263	9 months	Alcohol users/binge drinkers	.144	.673	.184
Abstainers/low users	.033	.170	.797		Abstainers/low users	.032	.249	.719

significant ($\chi^2_{[30]} = 2.35$, $p = .999$), indicating that the class solutions are stable across time, consistent with visual inspection of the cross-sectional drug profile plots (Supplemental Figure 1).

Table 2 describes the movement of individuals into and out of the drug use behavior classes, allowing comparison of transition probabilities over time (i.e., baseline to 9 months and 9 months to 21 months). There were no significant differences in transition probabilities between the intervention and control groups ($\text{Wald}_{[8]} = 8.700$, $p = .3683$), controlling for age, sex, and SES. For example, the probability that an individual who was a polydrug user at baseline remained in this class after 9 months was 0.808 for the control group and 0.880 for the intervention group. The probability to remain in the same drug behavior class at the adjacent time was the highest observed for each baseline behavior patterns (along the diagonal axis in Table 2). The off-diagonal values (see Table 2) describe movement between the classes over time. Numerically, the highest probability of transition occurred among those who began the study as alcohol users/binge drinkers; after 9 months 29.1% of those in the control group and 26.3% of those in the intervention group became abstainers/low users. After 21 months, the highest probability of transition from one class to another was among those who were abstainers/low users at 9 months and become alcohol users/binge drinkers by 21 months, representing 21.6% in the control group and 24.9% in the intervention group.

Table 3 shows the effects of the intervention on class membership over time. At baseline there was no increased likelihood in the intervention arm to be a polydrug user ($\beta = -0.042$, $p = .851$) or a alcohol users/binge drinkers ($\beta = 0.035$, $p = .720$), indicating no difference in the class composition entering the trial between the study arms. Moreover, the three-class solution was invariant across the arms at baseline, indicating that the probabilities to endorse yes

Table 3
Logistic Regression Coefficients for Time-Varying Intervention Effect in an LTA Model With Nonstationary Transitions

Classes[a]	Effect[b]	Coefficent	*SE*	*p* value	Odds ratio	95% CI
Polydrug users (baseline)	#Tamojunto	−.042	.226	.851	.958	[.61, 1.49]
Alcohol users/binge drinkers (baseline)	#Tamojunto	.035	.098	.720	1.035	[.85, 1.25]
Polydrug use (9 months)	#Tamojunto	−.105	.318	.742	.900	[.48, 1.67]
Sex[c]		.268	.160	.094	1.300	[.95, 1.78]
Age		.417	.128	.001	1.517	[1.18, 1.95]
SES		.000	.010	.985	1.000	[1.18, 1.95]
Alcohol users/binge drinkers (9 months)	#Tamojunto	−.277	.146	.058	.758	[.56, 1.00]
Sex		.462	.091	<.0001	1.587	[1.32, 1.89]
Age		.153	.066	.02	1.160	[1.02, 1.32]
SES		.012	.006	.066	1.012	[1.00, 1.02]
Polydrug users (21 months)	#Tamojunto	−.067	.386	.862	.935	[.43, 1.99]
Sex		.312	.163	.056	1.366	[.99, 1.88]
Age		−.048	.100	.623	.952	[.78, 1.15]
SES		.012	.012	.312	1.010	[.98, 1.03]
Alcohol users/binge drinkers (21 months)	#Tamojunto	−.191	.123	.120	.826	[.64, 1.05]
Sex		.439	.078	<.0001	1.550	[1.33, 1.80]
Age		.045	.061	.464	1.046	[.92, 1.17]
SES		.022	.007	.001	1.022	[1.00, 1.03]

Note. CI = confidence interval.
[a] Abstainers/low users is the reference. [b] Control group is the reference. [c] Sex and age at baseline are the reference.
Adjusted for age, sex, and SES.

for any of the five indicators were no different between the control and intervention groups. At 9 months and 21 months, there were no differences in the likelihood of being in any particular drug use class based on randomization to #Tamojunto, indicating that the intervention exerted no significant effects on patterns of drug use.

Post Hoc Power Calculation

In terms of power, as per Baldwin (2015), we conducted a Monte Carlo simulation to evaluate the power to identify the transitional probabilities using the observed estimates (item probabilities across classes and times) for a sample size of $n = 6{,}391$ under 10,000 replications. The eight logit transition probabilities were estimated per group (intervention vs. control). Twelve of the 16 transition probabilities achieved power greater than 0.8 (data available upon request). The four transitional probabilities with power <0.8 involved changing from polydrug users to binge drinking (power to predict transition from polydrug users at baseline to binge drinking at 9 months was 69% in the control group and 49% in the intervention group).

Discussion

This study evaluated the effectiveness of a universal program on changing drug use behavior among adolescent students. Although some studies have examined the patterns of substance use trajectories (Chung et al., 2013; Lanza et al., 2010; Shin, Lee, Lu, & Hecht, 2016), little is known about how prevention programs might affect transitions between substance use profiles (Dielman, 1994; Spoth et al., 1999). The present study describes a pattern-centered approach for evaluating substance use prevention programs in an attempt to bridge the gap between developmental theory and prevention practices (Steinman & Schulenberg, 2003).

The main result is a lack of effect of the intervention on the probability of belonging to a given class of substance use. #Tamojunto did not delay the onset of drug use or reduce drug use behavior because the escalation in substance use behaviors was similar over time in the intervention group and the control group. Most of the students maintained their pattern of drug use, regardless of their allocated group over 21 months of follow-up. The finding differs from the positive results from the Unplugged program in Europe (Faggiano et al., 2010; Faggiano, Vigna-Taglianti, et al., 2008); however, that evaluation focused on differences in change over time in the use of individual substances separately, which assumes independence of the outcomes without considering the interdependence of drug use behaviors that indicate underlying heterogeneity among adolescents. Because these patterns cannot be accounted for by correcting for multiple comparisons to account for false discovery rate, an LTA approach may be preferable.

Three classes of drug use behavior were identified: polydrug users (1.8–7.8%), alcohol users/binge drinkers (16.65–29.42%), and abstainers/low users (64.4– 81.5%). The findings are consistent with those of a recent systematic review, which found that the class of abstainers/low users was usually the largest class, the class of polydrug users was the smallest class, and the intermediate classes were usually intended to identify the use of isolated substances or other patterns such as binge drinkers (Tomczyk et al., 2016). Two other studies identified three similar latent class structures as the best models to understand patterns of drug use by adolescents: one in Australian youth (Kelly et al., 2015) and the other in American girls (Chung et al., 2013).

We report a general stability regarding drug use behaviors from baseline to 9 months and from 9 months to 21 months. For example, the adolescents classified as abstainers/low users were most likely to remain in this category, with much lower probability to move to a polydrug user profile, and this was independent of receiving the intervention. This result was in accordance with recent studies, which showed that the highest probability among transition alternatives was remaining in the same latent class and not to progress further (Baggio et al., 2014; Patrick et al., 2009). As expected, the prevalence of polydrug users and alcohol users/binge drinkers increased numerically over 21 months, whereas the proportion of abstainers/low users decreased similarly in both the intervention and control arms.

Because a null effect of the intervention was observed, the implementation of the intervention and its components should be evaluated. One potential alternative approach would be to consider implementing selective programs as opposed to a universal program. The possible advantages of selective programs have been discussed recently, with several positive studies highlighting effectiveness (Conrod, 2016; Shetgiri, Kataoka, Lin, & Flores, 2011). Based on the current analysis, discreet drug use profiles can be identified, and selective approaches targeting these specific profiles would be one possible approach (Offord, 2000).

The results emphasize the importance of rigorously evaluating the effectiveness of prevention programs to inform public policy (UNODC, 2015). Specifically, they highlight the importance of cultural considerations in adapting drug prevention interventions across sociogeographical landscapes (Barrera, Berkel, & Castro, 2017).

Attrition is an expected limitation in randomized trials, especially among those with long follow-up. LTA estimates under full-information maximum likelihood offer solutions to these missing data problems. The lowest coverage covariance was 0.44 among drug indicators from the second and third waves, indicating that 44% of the data are present (see Supplemental Table 3). Moreover, although data for those who have information at only one of the three waves do not contribute to the estimation of the transition parameters, they do contribute to estimating the time-specific parameters, helping to provide estimates that are more accurate and in compliance with intention-to-treat analytical paradigm (Moher, Schulz, & Altman, 2001).

Although the intervention showed a lack of evidence for the effect of treatment on transitions between behavior patterns, baseline patterns of drug use appeared to have been balanced between the trial arms, suggesting low risk of bias. In terms of power, our Monte Carlo simulation suggested adequate power to identify all common transitions, with power <0.8 observed only for four uncommon transitions involving escalation patterns that were not the target of treatment a priori (e.g., switching from polydrug use to binge drinking). Although there was an overlap of 3 months in the baseline and 9-month data for the last-year drug use, there was no overlap in the 21-month follow-up period, and the proportions in each class were consistent between the two follow-up time-points. If a true effect of the program over 9 months was not observed because of partial overlap with baseline data, that effect was not relevant in a 9- to 21-month period after baseline. Additionally, if we consider only assessments at baseline 21 months, no

transition probabilities differed between groups ($\text{Wald}_{[4]} = 2.261$, $p = .688$, with $p > .05$ for all probabilities of transitions between groups). Another potential limitation is that the control group should have been exposed to the same procedures (albeit not the intervention) as the experimental group; however, this does not invalidate a negative finding. Moreover, the prevention program replaced other curricular elements to maintain consistent time in class, attention to students, and so forth between study arms.

Conclusion

The latent transition analysis approach identified three common drug use patterns in this large Brazilian sample. Because this is the first application of latent transition analysis to patterns of drug use behavior in a randomized controlled trial, future studies might explore the impact of interventions on transitions between other latent class structures based on these and additional indicators of drug use. Transition probabilities in drug use patterns were relatively uncommon over time, and they were not influenced by the intervention. In terms of local policy, the null effect of this intervention suggests that the #Tamojunto program components might be reevaluated before attempting broad, national expansion.

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ORIGINAL CONTRIBUTION

Evaluating the effects of parenting styles dimensions on adolescent drug use: secondary analysis of #Tamojunto randomized controlled trial

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Abstract
The present study examined parenting style dimensions (demandingness and responsiveness) as predictors of adolescent drug use and also evaluated whether parenting styles dimensions moderate the effects of the implemented prevention program. 6.391 students in the 7th and 8th grades at 72 Brazilian public schools participated in a three-wave randomized controlled trial to evaluate a school drug-use prevention program. We used structural equation modeling to test if baseline parenting style dimensions (demandingness and responsiveness) would predict the use of drugs (alcohol, binge drinking, cannabis, inhalants, and tobacco) after 21 months. Additionally, we evaluated an interaction version of the above-described model to test if the effect of the prevention program would be moderated by either or both parenting style dimensions. Higher levels of parent demandingness predicted lower chances of adolescent drug use (e.g., Cigarette use OR 0.76, 95% CI 0.64–0.89); responsiveness on the five outcomes showed p value superior to 0.01. The effect of the #Tamojunto intervention is unlikely to be conditioned to either parenting style dimensions on the assessed outcomes.
Clinical trial registration Brazilian Register of Clinical Trials (REBEC): #RBR-4mnv5g (https://www.ensaiosclinicos.gov.br/rg/?q=tamojunto).

Keywords Adolescence · Drug use · Confirmatory factor analysis · Parenting style · Moderation · Randomized controlled trial

Introduction

Adolescent drug use is a growing global health priority and a condition that can lead to many health risks and social consequences [1]. To prevent harm and reduce the global impact of early drug use, it is important to identify the predictors of this behavior [2]. The family environment is one of the most influential domains for drug use among adolescents, and parenting styles are a common way of studying this domain [3].

In general, the classification of parenting style is derived from the Baumrind [4] and Maccoby and Martin [5] conceptualization, defined by the combination of two parenting style dimensions: responsiveness, defined as being supportive and warm; and demandingness, defined as parental supervision and monitoring. Studies have indicated that high levels of both dimensions are protective against adolescent substance use, while low levels are associated with elevated rates of drug use by adolescents [6, 7]. However, the discussion about which domain is more protective remains inconclusive and the answer may vary from culture to culture [8]. In addiction, most studies look at parenting styles with no consideration of their continuous dimensionality (in terms of demandingness and responsiveness), categorizing parents into four discrete groups based on the combination of parenting style dimensions (authoritative, authoritarian, permissive and negligent) treated as present/absent or high/low binaries [9]. Statistically, dimensional covariates are always preferable to those categorized under arbitrary procedures (e.g.,

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median as cutoff, as it generally adopted to create parenting groups).

Together with the application of protective parenting styles, another way to reduce or delay the onset of drug use among adolescents is through the implementation of school-based prevention programs [10]. However, most implemented prevention programs have never been evaluated for efficacy, and even of those evaluated, most do not reduce or delay consumption or otherwise show positive iatrogenic results [11]. A meta-analysis found that only a prevention program that measured drug use as a continuous variable showed small positive effects of school-based preventive interventions on adolescent alcohol use; nevertheless, tests of heterogeneity showed a significant variance in effect size across studies leaving the generalizability of findings in doubt [10].

In Brazil, the Ministry of Health conducted a transcultural adaptation and implementation of the unplugged program, renamed #Tamojunto. Unplugged is a school-based drug prevention program based on the "Model of Global Social Influence", which is intended to strengthen the personal and interpersonal skills of adolescents to reduce the social influence fostering adolescent drug use [12]. In European countries, unplugged yielded significant reductions in episodes of recent drunkenness and frequent cannabis use among adolescents [13]. In Brazil, evaluations of effectiveness were more mixed, showing that #Tamojunto seemed to increase first alcohol use and decrease first inhalant use in the intervention group compared to the control group [14].

These findings highlight the need for a well-conducted evaluation of adolescent substance use prevention programs that can justify public support for and investment in them [10] and also points to the necessity of robust analyses to identify whether prevention programs are equally effective across diverse groups of adolescents [15]. One potential reason for heterogeneity and null effects is that prevention programs may be differentially effective with specific groups of adolescents, requiring more attention to moderators that can influence participants' response to preventive intervention [10]. Such moderating variables can affect the relationship between the intervention and the results, increasing, reducing or changing the effect of the intervention [15].

Some studies have begun to examine possible moderators of the effects of interventions based on the analysis of risk and protection factors related to drug use among adolescents [16]. Despite the evidence for the roles of parenting styles as risk and protection factors, as described above, there is a lack of studies analyzing their influence as moderators of the effect of prevention programs targeting only adolescents [17, 18].

Given the importance of parental influence for the prevention of adolescent drug use, we examined the effect of parenting style dimensions (demandingness and responsiveness) as predictors of adolescent drug use. The study's first hypothesis is that low levels in parenting styles dimensions will predict adolescents' drug use, independently of the intervention effect. In addition, the second aim of the present study is to evaluate whether parenting styles dimensions moderated the effects of the #Tamojunto prevention program. The study's second hypothesis is that the effect of intervention on adolescents' past-year drug use would be higher among those students' whose parents own higher levels of responsiveness and demandingness parenting styles dimensions will serve as moderators of intervention effects.

Methods

Study design

A two-group parallel-arm school-clustered randomized controlled trial was conducted to compare the integration of the prevention program #Tamojunto into school curricula (intervention condition) with the usual curriculum in Brazil, sporting no prevention program (control condition), among students attending 7th and 8th grade (12–13 years of age) in public schools in six Brazilian cities (São Paulo, Federal District (Brasília), São Bernardo do Campo, Florianópolis, Fortaleza, and Tubarão), located in four Brazilian states. The trial registration protocol at the national Brazilian Register of Clinical Trials (REBEC) is #RBR-4mnv5g.

From a sample universe of all public schools in the participating cities (according to the national registration list of schools from the Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira), 72 schools were randomly selected, proportional to the number of schools in the municipality (stratum). Among the schools selected to participate, a second allocation, according to a random list, determined whether each school would be assigned to the control or intervention group, maintaining a 1:1 allocation ratio per municipality. Randomization was performed at the school level, via the Excel macro [command RAND].

In the intervention schools, students received 12 lessons of the #Tamojunto program substituted in place of the normal curriculum, while the control schools faced no alteration in their curriculum, which does not implement any prevention program. The cultural adaptation and implementation of the program were responsibilities of the Brazilian Ministry of Health (BMH). Evaluation was conducted by independent researchers.

Data were collected simultaneously in the control and intervention schools at three time points (Fig. 1). The first follow-up was conducted at the end of the school year to avoid likely loss to follow-up due to summer vacation. This study was approved by the Ethics in Research Committees

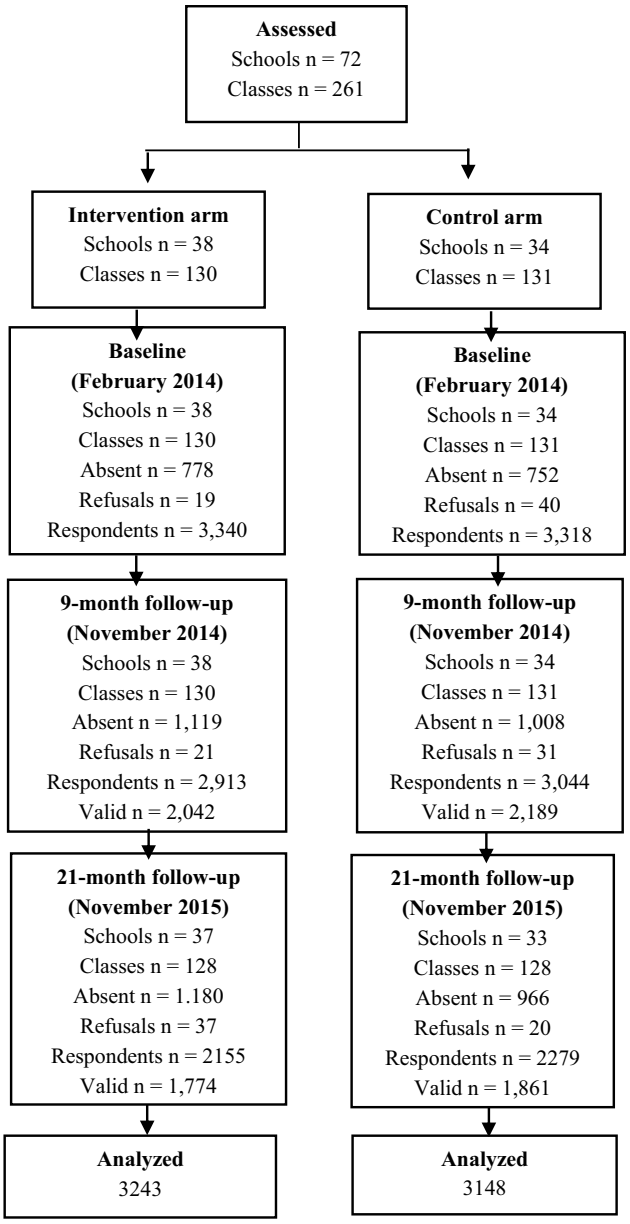

Fig. 1 Flowchart of total sample data and sample from baseline (2014) and 9-month follow-up. Absent = absent from school on the day of the assessment. Refusals = refused to participate in the assessment. Valid = number of subjects used in the cross-sectional analysis. Respondent = assenting to participate, providing data

at the University of São Paulo (#473.498) and the Federal University of Santa Catarina (#711.377).

Population and sample size

Based on the sample size calculation, to achieve a power of 80% and a significance level of 5% for a difference between groups of 1.5 percentage points (e.g., from 5 to 3.5%), the necessary sample size for each study arm was calculated to be 2835, with a ratio of 1:1. To account for losses to follow-up and for high intraclass correlation, this number was increased by 50% to a recruitment target of 4253 participants in each arm. Details on sampling procedures are presented in previous studies [19].

The sample consisted of 6391 adolescents [51% females, average age = 12.62 years old, standard deviation (SD) = 0.825, ranging from 11 to 15 years old at the baseline]. Table 1 shows the frequency of drugs use in the two waves (baseline and 21 months after the intervention) together with missing values. The mean of demandingness was 8.36 (SD 3.51; ranging from 0 to 12, where the higher score, the more demandingness) and for responsiveness 14.04 (SD 5.62; ranging from 0 to 20, where the higher score, the more responsiveness).

Intervention

The Unplugged program was first designed by the EU-DAP (European Drug Addiction Prevention Trial) group [20]. It consists of 12 classes (4 one-hour classes on attitudes and knowledge about drugs, 4 classes on social and interpersonal skills, and 4 classes on personal skills), 50 min long, applied to students by teachers trained and guided by the student and teacher Unplugged manuals. Both manuals are open access and are available in several languages on the website www.eudap.net.

A BMH team performed the translation and transcultural adaptation of the program under the supervision of the European developers, in 2013. The English version of the unplugged material was translated into Portuguese, retaining the original format and subjects (educational strategies provided in 12 classes and 3 parent workshops) but with adapted activities. Given the epidemiological profile of illegal drug use among students in Brazil, information on heroin was replaced with information on crack cocaine. Further details of the cultural adaptation process are described elsewhere [21].

The teachers who delivered the program attended a 16-hour training program facilitated by coaches trained by the European developers, the master trainers of the EU-DAP Intervention Planning Group [13]. At the end of each class, teachers completed a fidelity questionnaire to assess the dose of the program delivered. To guarantee fidelity and dose, teachers were supervised monthly by the same coaches from the BMH who had facilitated the initial training.

Instrument and variables

The instrument used for data collection had been developed, tested and implemented previously by the EU-DAP [13]. In Brazil, we used an adapted version of the questionnaire, translated into Portuguese [22]. The questionnaire evaluates

Table 1 Proportion of past-year drug use in the intervention and control groups across time

	Control			Unplugged		
	No (valid %)	Yes (valid %)	Missing %	No (valid %)	Yes (valid %)	Missing %
Baseline						
Alcohol	2126 (67.5)	1001(31.8)	21 (0.7)	2203 (67.9)	1014 (31.3)	26 (0.8)
Binge	2633 (83.6)	487 (15.5)	28 (0.9)	2682 (82.7)	519 (16.0)	42 (1.3)
Cigarette	3005 (95.5)	115 (3.7)	28 (0.9)	3080 (95)	128 (3.9)	35 (1.1)
Inhalants	2867 (91.1)	254 (8.1)	27 (0.9)	2935 (90.5)	271 (8.4)	37 (1.1)
Cannabis	3050 (96.9)	73 (2.3)	25 (0.8)	3121 (96.2)	83 (2.6)	39 (1.2)
21 months						
Alcohol	1005 (31.9)	849 (27.05)	1294 (41.1)	889 (27.4)	882 (27.2)	1472 (45.4)
Binge	1384 (44.0)	460 (14.6)	1304 (41.45)	1312 (40.5)	448 (13.8)	1760 (54.3)
Cigarette	1724 (54.8)	122 (3.9)	1302 (41.4)	1629 (50.2)	130 (4.0)	1484 (45.8)
Inhalants	1643 (52.2)	202 (6.4)	1845 (58.6)	1589 (49.0)	175 (5.4)	1764 (54.4)
Cannabis	1713 (54.4)	133 (4.2)	1302 (41.4)	1611 (49.7)	143 (4.4)	1489 (45.9)

a set of variables including sociodemographic data and past-month (yes/no) and past-year (yes/no) use of alcohol, tobacco, marijuana, inhalants, powder cocaine, and crack. It also evaluates the practice of binge drinking (the consumption of five or more alcoholic drinks on a single occasion) in the past month and past year. Socioeconomic status (SES) was assessed using a scale from the Brazilian Association of Research Companies (ABEP) [23]. The outcomes analyzed were past-year use of alcohol, tobacco, marijuana, inhalants and binge drinking at the three time points (baseline, 9 months after and 21 months after the baseline).

To pair (link) the questionnaires on each subject, students filled in a secret code involving letters and numbers created from their first name, surname, date of birth, mother's name, father's name, and maternal grandmother's name. Each code was composed of eight characters (7 letters and one number) and could only be decoded by the students themselves. These codes allow researchers to link individual questionnaires at different times of the study while protecting the anonymity and confidentiality of the participants [24]. The secret codes were matched using the Levenshtein algorithm, which identifies similarities among a set of characters; school and class codes were included in the matching process [25]. To avoid overreporting, questionnaires that were positive for lifetime use of a fictional drug (Holoten or Carpinol) were excluded from the analysis.

In the present study, outcome variables were used from wave 3 (21-month follow-up): Occurrence (yes/no) of alcohol use, tobacco use, marijuana use, inhalant use, and binge drinking within the past year was assessed the 5 questions, such as "From one year to the next, i.e., in the last 12 months, have you drunk alcoholic beverages?".

The assessed explanatory variables (predictors) used were three sets of variables from the wave 1 (baseline) data assessment: control variables: age, gender, SES, randomization group; use (yes/no) of alcohol, tobacco, marijuana, and inhalants within the past year; and binge drinking (yes/no) within the past year. Binge drinking was defined as the consumption of 5 or more doses of alcohol during a 2-h period. The students' SES was assessed using the scale of the Brazilian Association of Research Companies [23], which takes into account the education of the head of the household and the goods and services consumed, with scores ranging from 0 to 46 or in categories from A to E; higher scores indicate better economic standing, and SES is ranked from A (highest) to E (lowest).

The moderating variables used were the two latent dimensions of parenting style (demandingness and responsiveness) from wave 1 (baseline). The data relating to parenting styles were collected through a questionnaire completed by the students who evaluated their parents on the two dimensions (demandingness and responsiveness); evidence for validity based on the internal consistency is shown in supplementary material (Figure S1.) The instrument consists of two ordinal scales that respectively measure the orthogonal dimensions of demandingness (six items) and responsiveness (ten items), each assessed by means of a three-point Likert type on which values closer to three indicate greater perceived demandingness or responsiveness [26].

Statistical analysis

To test the two hypotheses, we used a structural equation modeling (SEM) approach. For the first hypothesis, we tested if parents' demandingness and responsiveness dimensions (estimated via confirmatory factor analysis) would predict their adolescent children's past-year use for five different drug types (alcohol, binge drinking, cannabis, inhalants, and cigarettes) after 21 months of intervention. For the second hypothesis, we evaluated an interaction version of the above-described model (also called an interaction model), where the effect of the proposed intervention would be conditioned

to parents' behaviors on both dimensions (also estimated via confirmatory factor analysis).

The analysis had two steps:

1. The two behavioral dimensions of parents were estimated via confirmatory factor analysis. The following fit indices were used to evaluate the model: chi-squared, comparative fit index (CFI), Tucker–Lewis Index (TLI), root–mean–square error of approximation (RMSEA), and weighted root mean square residual (WRMR) [27]. Using confirmatory factor analysis, missing values are dealt with using full-information maximum likelihood. In this way, we preserve as much information as possible by not excluding subjects if they have only one single missing datum out of the 16 questions about parents' perceived behavior.
2. The two latent factors were used as predictors of drug use together with control variables. For the interaction model, we added to the covariates two interaction terms: demandingness × group and responsiveness × group. It is important to note that the created interaction terms are products of continuous latent variables (demandingness and responsiveness) with a dichotomous observed variable. We assumed a correlated factor model, because it is a default to assume that both domains would be correlated. In Mplus, interaction between a continuous latent variable and an observed categorical variable is conducted using a Model Command called XWITH.

For the attrition analysis, we compared students whose data from the two time points had been matched with students who answered only the baseline questionnaire (See Table S1 Supplementary file).

Dealing with missing data

In this longitudinal study, some data were missing on different variables (outcomes, moderators). Therefore, we employed a procedure to deal with such missingness called full information maximum likelihood (FIML), in which each parameter is estimated directly without first filling in missing data values, assuming that the missing data mechanism is missing at random (MAR); MAR mechanism occurs "[when] the probability of missing data on outcome variable is related to another measured variable in the analysis model but not to the value of the outcome itself" (Enders, 2010, page 11), [28] having an unverifiable assumption, differently of missing completely at random (MCAR) mechanism and its testable inference Little's MCAR test. FIML estimates a likelihood function for each individual based on the variables that are present so that all the available data are used. Moreover, FIML is invoked by the estimator called robust maximum likelihood, which is efficient compared to the other methods (i.e., multiple imputation) of dealing with missing data under the assumption of missing at random (MAR) mechanism [29]. Even if the data MCAR, FIML is still superior to other traditional techniques by maximizing the statistical power [28].

The robust version of maximum likelihood was used as estimator throughout all the analysis, which allowed to generate standard errors taking into account non-independence due to the cluster structure in the data (i.e., adolescents nested in 72 schools) using the implementation proposed by Asparouhov [30]. Due to the five dichotomous outcome being evaluated concomitantly, the adopted significance level was 0.05/5 = 0.01.

Results

Fit of two correlated factor model

The model fit indices indicated that our model, constituted by observed and latent variables, has a good fit, as follows: $\chi^2 = 1518.249$, $p < 0.001$, RMSEA = 0.050, CFI = 0.940, TLI = 0.929, WRMR = 2.377. The distribution of the two dimensions can be found in Figure S1, Supplementary file.

Figure 2 depicts the linear tested statistical model, consisting of two factors (demandingness and responsiveness) both regressed on five different outcomes separately together with the following observed covariates: age, sex, SES, group assignment, and baseline assessment of the outcome under evaluation. Figure 3 shows the interaction model, with two added interactions variables called int1 [demandingness × group] and int2 [responsiveness × group]. Because Fig. 2, the linear model, has an outcome of alcohol use after 21 months, the baseline assessment on alcohol use was added as a covariate.

Predictors of factor dimensions

Table 2 shows the predictions (in odds ratios) of the linear and interaction models for the two parenting style dimensions presented with their respective confidence intervals [95%] and *p* values.

Under the FIML, with regard to the first hypothesis (the linear model), demandingness was associated with lower chances of binge drinking (OR 0.88, [95% CI 0.80–0.96], tobacco use (OR 0.76, [95% CI 0.64–0.89], and inhalants use (OR 0.81, [95% CI 0.72–0.91]. None of the p values regarding the effect #Tamojunto on adolescents' drug use were inferior to 0.01. Responsiveness showed to be unlikely predicting adolescents' drug use.

Regarding the second hypothesis, all the interaction effects on parents' behaviors and group assignment on the five outcomes had p values superior to 0.01. Our sample

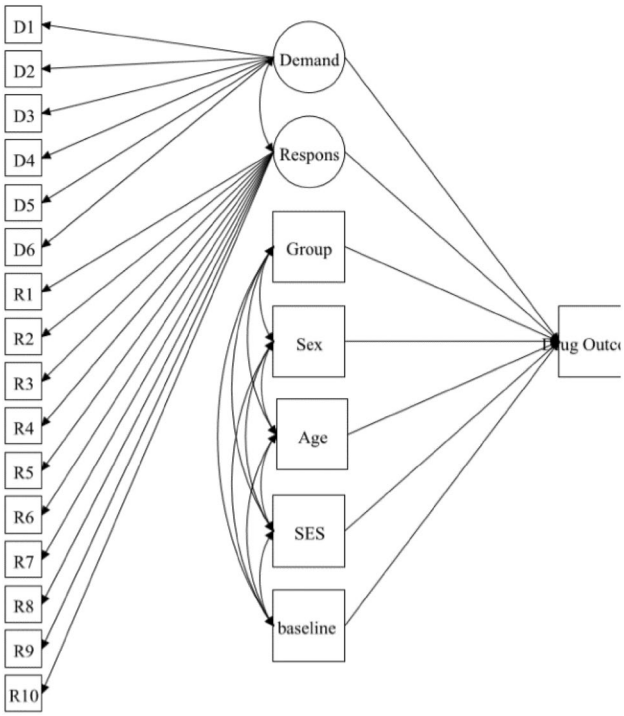

Fig. 2 Linear statistical model. Parental Demandingness: How much do YOUR PARENTS TRY to know …: D1: What you do with your friends? D2: What you do with your free time? D3: Where were you most afternoons after school? How much do your parents REALLY know …: D4: What you do with your friends? D5: What you do with your free time? D6: Where were you most afternoons after school? Parental Responsiveness: About YOUR PARENTS consider the following items…R1: I can count on them to help me out, if I have some kind of problem. R2: They keep pushing me to do my best in whatever I do. R3: They keep pushing me to think independently. R4: They help me with my school work if there is something I do not understand. R5: When they want me to do something, they explain me why. R6: When I get a good grade in school, they praise me. R7: When I get a poor grade in school, they encourage me to try harder. R8: They really know who my friends are. R9: They spend time just talking with me. R10: My family does something fun together

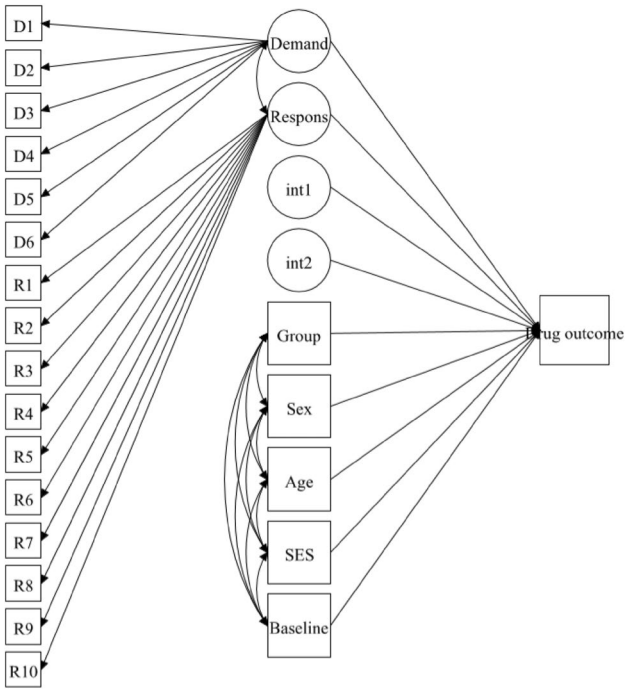

Fig. 3 Interaction statistical model. Parental Demandingness: How much do YOUR PARENTS TRY to know …: D1: What you do with your friends? D2: What you do with your free time? D3: Where were you most afternoons after school? How much do your parents REALLY know …: D4: What you do with your friends? D5: What you do with your free time? D6: Where were you most afternoons after school? Parental Responsiveness: About YOUR PARENTS consider the following items…R1: I can count on them to help me out, if I have some kind of problem. R2: They keep pushing me to do my best in whatever I do. R3: They keep pushing me to think independently. R4: They help me with my school work if there is something I do not understand. R5: When they want me to do something, they explain me why. R6: When I get a good grade in school, they praise me. R7: When I get a poor grade in school, they encourage me to try harder. R8: They really know who my friends are. R9: They spend time just talking with me. R10: My family does something fun together

size and sampling features (i.e., ICC) allow us to identify interaction effects with magnitude ranging below than moderate effect sizes. This means that the effects of the proposed intervention are really unlikely to be conditioned to either parenting style dimensions or if they exist, they have a very small effect, which would be not meaningful.

Attrition

Most of the students that were lost in at least one time point of follow-up reported higher prevalence of drug use in the baseline, were older and more assigned to the intervention group (Table S1, in Supplementary file).

Discussion

This study is the first, as far as we could determine, to investigate parenting style dimensions (demandingness and responsiveness) as predictors of adolescent drug use and as moderators of the effect of a school-based drug use prevention program. The linear model confirmed partially our first hypothesis that higher levels of parent demandingness predicted lower chances of adolescent drug use. However, the second hypothesis, that #Tamojunto would have stronger effects in students who reported parents with high demandingness and responsiveness, was not supported. Therefore, the intervention's effects on drug use at the third wave seem to be unlikely conditioned by either parenting style dimensions.

Table 2 The linear and the interaction model considering the moderator from baseline (analysis controlled by age, sex, SES, group, and baseline measures)

	Outcomes	Odds ratio (95% CI)	*p*	Odds ratio (95% CI)	*p*	Odds ratio (95% CI)	*p*	Odds ratio (95% CI)	*p*
		Int1 (demandingness × group)		Int2 (responsiveness × group)		Demandingness		Responsiveness	
Linear model	Alcohol ($n=6103$)					0.94 (0.86–1.01)	0.104	0.99 (0.93–1.05)	0.742
	Binge ($n=6084$)					**0.88 (0.80–0.96)**	**0.006**	0.96 (0.90–1.03)	0.254
	Cigarette ($n=6087$)					**0.76 (0.64–0.89)**	**0.001**	1.05 (0.93–1.18)	0.458
	Inhalant ($n=6089$)					**0.81 (0.72–0.91)**	**< 0.001**	1.02 (0.94–1.12)	0.592
	Cannabis ($n=6092$)					0.83 (0.70–0.98)	0.018	0.98 (0.86–1.12)	0.764
Interaction model	Alcohol ($n=6103$)	0.99 (0.85–1.16)	0.922	1.07 (0.95–1.21)	0.258	0.94 (0.85–1.04)	0.243	0.96 (0.88–1.04)	0.293
	Binge ($n=6084$)	0.85 (0.72–1.00)	0.057	1.08 (0.95–1.22)	0.227	0.95 (0.84–1.08)	0.440	0.93 (0.85–1.01)	0.085
	Cigarette ($n=6087$)	0.95 (0.69–1.32)	0.773	0.95 (0.75–1.21)	0.687	0.77 (0.59–1.00)	0.052	1.07 (0.89–1.30)	0.455
	Inhalant ($n=6089$)	0.939 (0.744–1.184)	0.595	0.897 (0.764–1.05)	0.185	0.83 (0.70–0.97)	0.023	1.08 (0.95–1.23)	0.235
	Cannabis ($n=6092$)	0.936 (0.683–1.281)	0.678	1.009 (0.776–1.31)	0.950	0.85 (0.67–1.08)	0.194	0.98 (0.79–1.20)	0.823

This paper shows association between lower parenting demandingness and higher adolescent drug use, regardless of preventive intervention. This result seems to contradict the previous literature that considered parenting styles as four categories (authoritative, authoritarian, permissive and negligent) since it shows that only one dimension of parenting style (demandingness, not responsiveness) acts as a protective factor against adolescent drug use. Studies have indicated that authoritative parenting (combining high levels of demandingness and responsiveness) is the most protective parenting style against adolescent substance use [6] and was also associated with greater offspring emotional well-being and fewer depressive symptoms [31]. On the other hand, previous studies already suggested that the association between parenting styles and drug use may vary from culture to culture [8, 32] and in Brazilian culture being supportive and warm is not so important as parental supervision and monitoring. One possible explanation is the lack of drug control policies and the unregulated alcohol market in Brazil [33, 34]. Thus, the role of Brazilian parents in monitoring their children becomes more relevant on drug prevention.

Considering that parenting demandingness refers to parental control of children's behavior and actively monitoring and supervising a child's activities [4], this result is in line with previous studies carried out in other countries, which found that monitoring parenting (which has very similar concept to "demanding" parenting styles in this study) is a protective factor for adolescent drug use [3]. Our result highlights the importance of the parenting demandingness dimension in the prevention of adolescent drug use. Considering that parenting interventions tend to produce small to moderate effects on adolescent substance use [35], addressing parenting behaviors shown to be strong predictors of adolescent drug use might magnify the effect of these prevention programs. However, parental demandingness or monitoring must be distinguished from harsh, psychologically abusive control, which has been shown to be strongly associated with externalizing problems [36].

Despite the already known negative [14] findings on #Tamojunto as a universal program for alcohol and drug use, our second hypothesis reflected the possibility that by testing for specific subgroups or moderators we might be able to find a selective effect. This hypothesis was based on the idea that the students whose parents present high demandingness and responsiveness should be more able to take advantage of prevention program lessons, as previous studies have shown that parenting styles affect school performance [37] and adaptive achievement strategies [38]. However, the unlikely moderating effects we found of parenting styles dimensions on the effect of #Tamojunto were contrary to our second hypothesis. Although many studies demonstrate the importance of parenting skills on offspring's drug use, we found no other studies evaluating the moderating role of parenting on drug use prevention programs targeting adolescents—only previous studies that evaluated the moderating effect of parenting skills training programs on adolescent drug use [17, 18]. It is important that more studies be implemented in this area, as more knowledge could help us understand the importance of parenting skills for general drug use prevention programs.

We must say that this lack of evidence on moderation effect of #Tamojunto is in line with previous studies that evaluated the direct effect of the program and also showed negative [14] effects, despite the positive results of the similar unplugged prevention program in European contexts—reducing episodes of recent drunkenness and frequency of cannabis use among adolescents [13]. The possible explanations include poor adherence to the curriculum [39], flawed cultural adaptation [14], and the weak regulatory framework controlling the sale and promotion of alcohol in Brazil [33].

This study has some limitations that should be considered. First, there was an excessive amount of missing data, especially from follow-up measures. However, the absence of some data is an expected limitation in longitudinal studies, especially those with long follow-up periods [40]. FIML and the assumption of MAR borrow information from the observed data maximizing the statistical power. FIML is not imputing the missing values, differently of other procedures to deal with missing data, as for example, multiple imputation [41]. FIML yield unbiased parameter estimates with MAR and allow us to follow the principle of intention-to-treat where all the randomized participants were analyzed. However, the inspection of the covariance coverage showed that none of the coverage was below 30%, being the minimum limit default in Mplus of 10%: for covariance coverage below such value, Mplus stops the analyses. We hope that this was adequately addressed using full-information maximum likelihood. Second, we only collected measures provided by the adolescents; thus, we assessed only the adolescents' perceptions of parenting style. It is common practice to use adolescents' perceptions of parenting behaviors as a categorical observed covariate, as we did [42]; nevertheless, studies that assess the perceptions of both parents and children simultaneously tend to provide more reliable data on parenting styles and drug use, as adolescents tend to have a more negative perception than parents regarding the parent–child relationship [43].

In conclusion, we observed parenting demandingness (monitoring) skills, per se, reduced slightly the chance of drug use and such reduction, being very unlikely to be conditioned to the #Tamojunto. Therefore, the potential hypothesized "booster" of the parenting behaviors on drug use among those who received intervention was not identified. Importantly, it is of note that the lack of significance of the interaction model is also valid for the other side of the dimension of parenting (low levels of demandingness and responsiveness) where those adolescents who did not receive the intervention do not use more drugs, given that their parents have low levels of demandingness and responsiveness.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflicts of interest.

Human participants and/or animal subjects All procedures in the present study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. This study was approved by the Ethics in Research Committees at the University of São Paulo (#473.498) and the Federal University of Santa Catarina (#711.377).

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Anexo 8

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Full length article

Decision-making skills as a mediator of the #Tamojunto school-based prevention program: Indirect effects for drug use and school violence of a cluster-randomized trial

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ABSTRACT

Background: The aim of the present study was to evaluate a formal mediation analysis effect of the #Tamojunto program on adolescents' drug use and violent behavior in schools through decision-making skills using a potential outcomes approach.

Methods: An in-cluster randomized controlled trial was conducted in 2014–2015 with 6691 7th- and 8th-grade students in 72 public schools in 6 Brazilian cities to evaluate the effects of the European drug prevention program Unplugged, called #Tamojunto in Brazil. Baseline data were collected prior to program implementation, and follow-up data were collected 9 and 21 months later. Mediation analysis using a potential outcomes approach, in which counterfactuals are modeled if positivity is met, was used to evaluate the indirect effects of the program #Tamojunto on the third-wave of drug use (alcohol, tobacco, marijuana, inhalants, and binge drinking) and school violence (bullying or physical, verbal and sexual aggression) assessment through decision-making skills.

Results: When controlling for all covariates, the Total Natural Indirect Effect (TNIE) was significant only for past-year drug use (TNIE = 0.003, 95%CI = 0.001; 0.007). In the adjusted models, 37.5% of the effect of the intervention on drug use was mediated by decision-making skills.

Conclusions: The #Tamojunto program increased drug use through decreasing decision-making skills. The findings demonstrate that this program changes decision-making skills but in the opposite direction proposed by the theoretical model of the program, suggesting that modifications are needed to produce the intended effect of the program.

1. Introduction

The European school drug prevention program Unplugged, called #Tamojunto in Brazil, is based on the Comprehensive Social Influence approach; it is expected to improve adolescents' personal and interpersonal skills to control social influences, through which adolescents develop erroneous perceptions of the frequency and acceptability of drug consumption (Giannotta et al., 2014). The short-term goal of this program was to reduce the number of adolescents who used alcohol and other drugs (Faggiano et al., 2008a). In European countries, a large multicenter randomized controlled trial (RCT) showed that Unplugged was effective in reducing drunkenness episodes and recent cigarette and cannabis smoking among adolescents (Faggiano et al., 2010, 2008b).

In Brazil, an RCT was conducted to evaluate the transcultural adaptation of the Unplugged program (adapted and implemented by the Brazilian Ministry of Health) and showed that #Tamojunto increased first alcohol use and decreased first inhalant use in the intervention group compared to the control group at the 9-month (Sanchez et al., 2017) and 21-month follow-ups (Sanchez et al., 2018). Considering there is a well-known association between drug use and violence among adolescents (Ttofi et al., 2016; Weiner et al., 2005), as well as the positive findings on students' interpersonal relationships from the #Tamojunto pilot study (Medeiros et al., 2016), school violence was also evaluated as an outcome in the #Tamojunto RCT. The program was found to reduce only bullying victimization, particularly in girls aged 13–15 years at the 9-month follow-up time point, but the effect was not sustained at 21 months (Gusmões et al., 2018).

Considering these unexpected results, understanding the likely

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mechanisms underlying the success and failure of this program is needed to identify whether the prevention program affected the mediating variables that were targeted by the intervention as proposed in its logic model (Kreeft et al., 2009b; Vadrucci et al., 2016). Training in decision-making skills was expected to be one of the mediators of the causal process of the Unplugged program. Preventive interventions in this period of life can be extremely helpful, as adolescents are particularly vulnerable to risky decision-making associated with violent behaviors and drug use (Kelley et al., 2004), because the regions of their brains required for decision-making are still developing (Spear, 2018). Considering that early adolescents are in the middle of a maturational process related to improvements in many aspects of executive functioning (Christie and Viner, 2005; Steinberg, 2007), the logistic model of the program expects short-term changes in decision-making skills. According to problem behavior theory (Jessor and Jessor, 1977) by practicing self-control and creative thinking with structured problem-solving activities, the program aimed to help adolescents to better evaluate and react to environmental influences through the increase of decision-making skills (Vadrucci et al., 2016). The hypothesis was that decision-making skills would impact the intentions to use drugs increasing students' ability to make informed decisions about using drugs in the face of proximal risk factors such as life stressors and peer pressure (Sussman et al., 2004). Decision-making should work as a mediator of the intervention effects (Cuijpers, 2002; Griffin and Botvin, 2010; Onrust et al., 2016) through two paths: prevention program activities modifying the mediators (Chen, 1990) and the mediators affecting the outcome measurements (MacKinnon et al., 2002).

Decision-making is one of the most commonly applied elements in general skills training (Onrust et al., 2016) that is presented as a core element in most school-based prevention programs (Hecht et al., 2008; Hurry and McGurk, 1997; Rohrbach et al., 2010; Sloboda et al., 2009). A recent meta-analysis showed that the effectiveness of universal drug prevention programs was predicted by decision-making skills training (Onrust et al., 2016). Other social influence-based school prevention program studies have conducted mediation evaluations and showed positive findings (McNeal et al., 2004; Stephens et al., 2009). Despite the fact that decision-making skills are one of the core elements of the *Unplugged* program, the study that evaluated the short-term mediation factor did not evaluate the effect on decision-making skills as a mediator (Giannotta et al., 2014). In general, there is a lack of evaluations of mediation mechanisms, especially using new analytical paradigms in which results have causal interpretation (Liu and Flay, 2009).

We propose a mediation analysis using a potential outcomes approach, an epidemiological method recently developed in which counterfactuals are modeled if positivity is met. The potential outcomes method allows the decomposition of the total effect (i.e., the effect of #Tamojunto on adolescent drug use and on violent behavior), particularly when interactions and nonlinearities are present that can lead to inaccuracies in the estimates obtained from more traditional approaches. Moreover, unlike traditional statistical methods, the potential outcomes approach clarifies the likelihood that the assumption of no confounding by unmeasured variables is met, which is necessary for causal interpretation (VanderWeele, 2015). It is important to highlight that path a (i.e., effects of the exposure on the mediator) and path b (i.e., effect of mediator on outcome) do not need to be statistically significant in order to the indirect effect being statistically significant. This is because the indirect effect per se is given by a product between path a and path b (called "product method"), which may be also not asymptotically distributed and because of that it is commonly use of bias corrected bootstrapped confidence intervals to evaluate its statistically significance (VanderWeele, 2015; Vanderweele and Vansteelandt, 2009).

The aim of the present study was to evaluate the mediator effect of adolescents' decision-making skills from the #Tamojunto program on drug use and violent behavior in schools after 21 months. We hypothesized that decision-making skills would mediate the associations between the intervention and drug use and violence perpetration and that larger causal relationships would be observed.

2. Methods

2.1. Study design

The present study was based on a two-arm, three-wave school cluster randomized controlled trial in which schools were randomly assigned to either the intervention arm (#Tamojunto program) or to a control arm that received the usual education curriculum in Brazil (no prevention program); this study included adolescents in 72 public schools in 6 Brazilian cities (São Paulo, Distrito Federal, São Bernardo do Campo, Florianópolis, Fortaleza and Tubarão) in 4 Brazilian states.

Excel's macro [command RAND] was used to perform the randomization at the school level, and in the drawn school, all potential classrooms were invited to participate. Data were collected simultaneously in the control and intervention schools at three time points. Pretest data were collected in February 2014. The first follow-up assessment was carried out in November 2014, 9 months after baseline assessment and 6 months after the last session of the intervention. The second follow-up assessment was conducted 21 months after baseline and 18 months after the last session of intervention, in November 2015.

The RCT was registered at the Brazilian Ministry of Health Register of Clinical Trials (REBEC) under protocol number RBR-4mnv5g with a Pre-Registered Hypothesis and the protocol publicly available at this registry (http://www.ensaiosclinicos.gov.br/rg/?q=tamojunto). All procedures in the present study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. The Universidade Federal de São Paulo Ethics Committee approved the protocol for human research (# 473.498). Consent to participate in the study was written and obtained from the schools' directors before randomization and from students, after randomization. All participants took part voluntarily after having given their free and informed consent based on the autonomy of adolescents guaranteed by the Brazilian Statute of the Child and Adolescent (Law No. 8069/1990). Moreover, parents were informed of the study by the directors and could recommend non-participation in data collection if they preferred. However, participation in the intervention was part of the school curriculum and was mandatory for all the students in the participating schools.

2.2. Population and sample size

Based on the sample size calculation (Lwanga and Lemeshow, 1991), for a given power of 80%, a significance level of 5% and a difference between groups of 1.5% (i.e., from 5% to 3.5%), the necessary sample size for each study arm was calculated to be 2835. To account for losses and for a high intraclass correlation, the sample was increased by 50% and had to include 4253 participants for each arm at a 1:1 ratio.

The target population was students attending 7th and 8th grade (12 to 13 years of age) in the geographical areas of the cities participating in the study. The school drawing occurred in each of the participating municipalities using the complete list of public middle schools in these locations as the database for randomization according the national registration list of schools from the Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira (INEP). Considering a 10% rate of school refusal, 38 schools were enrolled in each arm. A total of 72 schools accepted our invitation to participate in the study, as described in Fig. 1. Details on the study design and sampling methods have been previously presented (Sanchez et al., 2018; Valente et al., 2018).

2.3. Intervention

The *Unplugged* program was first designed by the European Drug

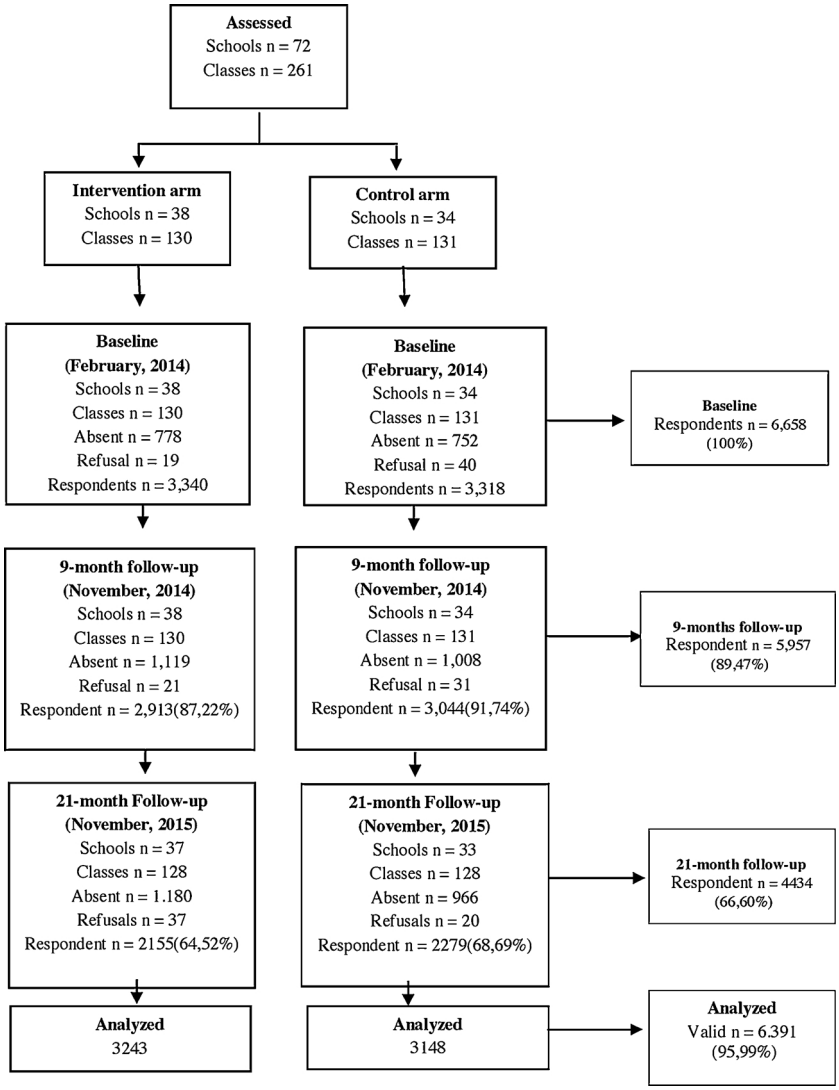

Fig. 1. Flow diagram for the randomized controlled trial.
Int* = Interaction.
Control Variables: Age, Sex, Baseline assessment and socio economic status.
Absent = absent from school at time of assessment.
Refusals = subjects who refused to participate in the assessment.
Valid = number of subjects cross-sectional.
Respondent = participants who assented to participate and provided data.

Addiction Prevention Trial (EU-DAP) group (Kreeft et al., 2009a) and consists of 12 classes of a social influence curriculum (4 one-hour classes on attitudes and knowledge of drugs, 4 classes on social and interpersonal skills, and 4 classes on personal skills), with an average class time of 50 min. The classes are delivered by class teachers trained and guided by the student and teacher manuals. Both manuals are open-access and made available in several languages on the website www.eudap.net and major details regarding implementation and cultural adaptation might be found in details in (Sanchez et al., 2018, 2017).

The implementation and cultural adaptation of the program were the responsibility of the Brazilian Ministry of Health (BMH) team under the supervision of the European developers (in 2013). The English version of the *Unplugged* material was translated into Portuguese, retaining the original format and subject (educational strategies provided in 12 classes and 3 parent workshops) but with adapted activities. Nevertheless, the main changes were made to align the activities of the program with the Alcohol and Other Drugs Policy paradigm advocated by the Brazilian government (Brasil, 2015), changing the original perspective of the program, which is alcohol abstinence, to a harm reduction paradigm focused on the prevention of episodes of intoxication. More details about the cultural adaptation process were described previously (Madruga and Quirino, 2018).

2.4. Instrument and variables

The instrument used for data collection was developed and tested by the EU-DAP and used in previous studies of the effectiveness of *Unplugged* (Faggiano et al., 2008b). In Brazil, we used a translated and adapted version of the EU-DAP questionnaire in Portuguese (Cainelli de Oliveira Prado et al., 2016) that had some questions replaced with items from two questionnaires that were widely used in several studies among Brazilian students: a questionnaire by the World Health Organization for drug surveys at schools that was adapted by the Brazilian Center for Psychotropic Drug Information (Carlini et al., 2010) and a questionnaire by the Brazilian National Survey of School Health (PENSE) that was used by the BMH (IBGE, 2013).

The following two outcomes were analyzed after 21 months of follow-up: 1) polydrug use, which was the simple sum of past-year use (yes = 1 vs. no = 0) of alcohol (including binge drinking or the consumption of five or more alcoholic drinks on a single occasion), tobacco, marijuana, and inhalants, ranging then from 0 to 5; and 2) school-violence perpetration, which was the simple sum of past-month episodes (yes = 1 vs. no = 0) of 4 types of school-violence perpetration, bullying and verbal, physical and sexual aggression, ranging from 0 to 4.

The confounder variables were sex, age and socioeconomic class (SES) assessed using the Associação Brasileira de Empresas de Pesquisas (ABEP) scale (ABEP, 2012). To evaluate decision-making skills, we used the 9-item (agree or disagree) scale developed by EU-DAP (Giannotta et al., 2014) with the following questions: "When I have decided to do something, I always carry it through"; "I often make up my mind without thinking of the consequences"; "Sometimes I decide on something "off the top of my head"; "I seldom decide to do something that I later regret"; "When I get an idea I often make a decision without thinking"; "Sometimes I change my mind about something several times a day"; "When I decide on something it doesn't matter what my friends think" and "When I decide on something it doesn't matter what my parents think". We create parceling scores of the 8-item from the scale, where the higher the score the lower the decision making skill, with lower scores representing higher decision making skills. The parceling procedure was adopted to reduce the number of comparisons across the mediators (consequently generating a more parsimonious model). The summing variables for drug use, violence and decision-making are often referred to as parcels and are based on the Aggregation Principle (Matsunaga, 2008; Nunnally, 1978; Rushton et al., 1983) and on the Law of Large Numbers (Little et al., 2002; Matsunaga, 2008). A given parcel will have a larger proportion of true-score variance to unique variance than any item used to build it (Little et al., 2013). As a consequence, the higher the number of items summed, the higher the proportion of true-score variance. Major details about the measurement model underlying school-violence and decision-making skills can be found in Supplemental Material, where an item-level analysis was conducted using confirmatory factor analysis.

To pair (link) the questionnaires of each subject at the three data collection time points (baseline and the two follow-up time points), students filled in a secret code created from their personal information. These codes protected the participants, offering anonymity and confidentiality, and at the same time allowed researchers to link the individual questionnaires collected at the different time points of the study (Galanti et al., 2007). The secret codes were matched using the Levenshtein algorithm, which identifies similarities among a set of characteristics. School and class codes were included in the matching process (Levenshtein, 1965).

2.5. Statistical analysis

We used the potential outcomes method proposed previously (Robins and Greenland, 1992) and further elaborated by Preacher (Preacher et al., 2007) to evaluate the indirect effects of the #Tamojunto prevention program on drug use and violence in adolescence through decision-making skills. In traditional mediation models, the indirect effect is a product of two slopes: one from exposure to the mediator (a) and one from the mediator to the outcome (b). In addition, the potential outcomes method decomposes indirect and direct effects allowing interaction between exposure and mediator in predicting the outcome (Judd and Kenny, 1981; Preacher et al., 2007). For details of the causal effect formulas see Vanderweele and Pearl (Pearl, 2001; Vanderweele and Vansteelandt, 2009).

In this manuscript, we focused on the total natural indirect effect (TNIE) and pure natural direct effect (PNDE), which were used to calculate the proportion of the mediated effect as follows: TNIE/(TNIE + PNDE). PNDE is the average difference in drug use if everyone was randomized to the control group compared to the intervention group at the population level, but decision-making took the value it would have had if everyone was in the intervention group. TNIE is the average difference in drug use if decision-making took the value it would have taken at the population level if everyone was randomized to the control group compared to if everyone was allocated to the control group, with the direct effect estimated as if everyone was in the control group (Vanderweele and Vansteelandt, 2009). Because of the cluster structure (i.e., children nested in 72 schools), the standard errors and chi-square test of the model fit were adjusted for the children's non-independence. To that aim, we used the COMPLEX option in Mplus, as proposed by Asparouhov (2006, 2005), by specifying *schools* as a cluster variable.

To deal with missing data related to adolescent drug use (follow-up), violent episodes (baseline e follow-up), and decision-making skills (baseline e follow-up), we used multiple imputation through a sequential imputation approach (Muthén and Muthén, 2010). The following variables were used in the unrestricted model: group, school, gender, age, past-year drug use at baseline (alcohol, binge drinking, cigarettes, inhalants, marijuana), and ABEP classification (baseline). Five imputed data sets were generated, and the estimates shown in Table 2 are the pooled estimates of TNIE and PNDE.

Lastly, sensitivity analyses were performed based on the works of Imai et al. (2010b, 2010a) to understand the possible violations of the assumption of no confounding by unmeasured confounders in the mediator-outcome association. This analysis allows us to answer questions about how large the indirect effect needs to be for the confidence intervals to not include zero, which allows a certain degree of mediator-outcome confounding. In this approach, different values of the residual covariance between the mediator and the outcome are fixed, but the outcome is not regressed on the exposure (Muthén and Muthén, 2017).

All the analysis were ran in Mplus 8.2 (Muthén and Muthén, 2010), being the adopted significance level of 5%.

3. Results

Table 1 presents the characteristics of the students participating in the study (N = 6391). Both groups (i.e., the intervention and control groups) were homogenous with respect to sex, age and socioeconomic classification by the ABEP scale at baseline.

Fig. 1 shows the conceptual mediation model with an interaction between the exposure and mediator. The main routes (paths a, b and c') are equivalent to the ones represented in traditional mediation analyses. The additional effects present in the potential outcomes model account for an exposure-mediator interaction, which showed to be significant. The effect of the mediator was statistically significant for both outcomes: drug use ($\beta = 0.120$, 95%CI = 0.076; 0.164), and violent behavior ($\beta = 0.062$, 95%CI = 0.023; 0.101).

Table 2 shows the direct and indirect effects of randomization group on drug use and episodes of violence through decision-making skills. Both PNDE was not statistically significant. When controlling for all covariates, the TNIE was significant for past-year drug use (TNIE = 0.003, 95%CI = 0.001; 0.007), however it was not significant for school-violence (TNIE = 0.005, 95%CI = -0.001; 0.010). In the adjusted models, 37.5% of the effect of the intervention on drug use was mediated by decision-making skills (Table 2).

The sensitivity analyses showed that we would need a small effect (rho > 0.1) of unmeasured potential confounders on the mediator and outcome (drug use) variables concomitantly to completely explain away the indirect effect observed (Fig. 3). For the school violence outcome, once again, a small effect (rho > -0.05) would be enough to bring the confidence interval of the indirect effect to zero (Fig. 4). In other words, the conclusion that the indirect effects is positive (for drugs) and negative (for violence) and significant is in question. It was found that the positive indirect effect was significantly different from zero at residual correlation values less than 0.1 for drug use to have

Table 1
Outcomes, mediator and sociodemographic characteristics of the participating students in the evaluation of the #Tamojunto school-based program for drug use prevention (N = 6.391).

	Total (N = 6.391)		Group			
			Intervention Arm (N = 3.148)		Control Arm (N = 3.243)	
	N	% or mean + SD	N	% or mean + SD	N	% or mean + SD
Gender						
Boys	3,130	48.98	1.600	49.34	1.530	48.60
Girls	3,261	51.02	1.643	50.66	1.618	51.40
Age Distribution						
	6391	12.62 ± 0.82		12.64 ± 0.83		12.60 ± 0.82
SES[a]						
A (35-42)	244	3.78	125	3.86	119	3.79
B (23-34)	2467	36.64	1.261	38.98	1.206	38.40
C (14-22)	3343	53.98	1.704	52.67	1,639	52.18
DE (0-13)	322	5.6	145	4.48	177	5.64
Baseline Past-Year Drug Use[b]						
	6.191	0. 62 ± 0.01	3.128	0.63 ± 1.02	3.063	0.62 ± 0.99
Baseline School-Violence[c]						
	6.166	0.40 ± 0.79	3.131	0.41 ± 0.82	3.035	0.37 ± 0.76
Baseline Decision-Making Skills						
	5.361	3.39 ± 1.96	2.709	3.36 ± 2.01	2.652	3.40 ± 1.89
9 months Follow-up Decision-Making Skills						
	3.786	3.73 ± 1.87	1.799	3.80 ± 1.88	1.987	3.67 ± 1.86
21 months Follow-up Past-Year Drug Use						
	3.537	0.98 ± 1.22	1.730	1.00 ± 1.23	1.807	0.96 ± 1.20
21 months Follow-up School-Violence						
	3.560	0.50 ± 0.85	1.743	0.52 ± 0.88	1.817	0.47 ± 0.82

[a] socioeconomic classification according to the ABEP.
[b] number of drugs used in the past 12 months.
[c] number of episodes of school violence in the past 30 days.

positive indirect effects and higher than -0.05 to generate negative and significant effects on because the lower confidences limits do not crosses the y = 0 further than these values. (Fig. 4).

Regarding the results related to the fidelity of the implemented intervention, a total of 87% of the schools completed the 12 program lessons. The other 13% ended the program between lessons 4 and 11 for two main reasons: the teachers went on medical leave or were not comfortable implementing the program. 72% of classes taught were given in full, with the execution of all activities provided in the protocol.

4. Discussion

The present study used a mediation analysis with a potential outcomes approach to test the hypothesis that the #Tamojunto prevention program changed decision-making skills at 9 months, which in turn would reduce drug use and violent behavior after 21 months. The evidence suggests that #Tamojunto didn't affected directly the outcomes, once the PNDE was not statistically significant (path C). The program act indirectly decreasing decision-making skills and then these effects increase drug use, since we found a significant indirect effect (TNIE) from #Tamojunto program on drug use though adolescents' decision-making skills (path A*B). This paper also shows that there is a significant association between decrease in decision-making skills and increase in drug use and violent behavior (path B).

Our results regarding the mediation analysis, contradicts the expected results proposed by the program's theoretical model which indicated that #Tamojunto might operate on outcomes via increasing in decision-making skills (Faggiano et al., 2010; Pedroso et al., 2015). This finding also contradicts the results found in previous studies (McNeal et al., 2004; Stephens et al., 2009) which showed that prevention programs can help adolescents learn to make decisions about their behavior by engaging them in the cognitive process of decision-making (Sussman et al., 2004). So, it is important to highlight that the interventions does not always impact the mediators as expected (in the direction and also in terms of magnitude) carrying consequences to programs outcomes.

Considering that the decision-making process helped adolescents

Table 2
Counterfactual-derived direct and indirect effects, regression coefficients, and confidence intervals based on multiple imputation analysis.

	Non-adjusted			Adjusted with covariates		
	Estimate	95%CI	p-value	Estimate	95%CI	p-value
Past-Year Drug Use[a]						
Total Natural Indirect Effect (TNIE)	0.019	[-0.006; 0.045]	0.132	0.003	[0.000; 0.007]	0.037
Pure Natural Direct Effect (PNDE)	0.015	[-0.125; 0.154]	0.835	0.005	[-0.042; 0.052]	0.834
Proportion Mediated	55.88%			37.5%		
School-Violence[b]						
Total Natural Indirect Effect (TNIE)	0.006	[-0.002; 0.015]	0.161	0.005	[-0.001; 0.010]	0.127
Pure Natural Direct Effect (PNDE)	0.035	[-0.029; 0.098]	0.286	0.008	[-0.102; 0.118]	0.892
Proportion Mediated	14,63%			41.67%		

[a] number of drugs used in the past 12 months.
[b] number of episodes of school violence in the past 30 days.

ponder the information about drug use (Sussman et al., 2004) and evaluate the consequence involved in the decision (Kreeft et al., 2009a), this unexpected effect of the program on the mediator could be hypothesized to result from the change in the theoretical model of the program. The cultural adaptation of the program made important changes in the "Alcohol, Risk and Protection" lesson. Phrases that emphasized the importance of abstaining from alcohol use were excluded, and reflexive questions about how to avoid alcohol abuse were added (Madruga and Quirino, 2018; Sanchez et al., 2017); this change could have reduced the adolescents' risk perception, which would be associated with the decrease in decision-making skills that may have led to a perception of greater safety of drug use. Another possible explanation for this result is that students' previous knowledge and beliefs about drug use impact their decision-making skills in deciding to use drugs, as found in a previous study (Sanchez et al., 2019). These results have a significant impact on the prevention program literature since they provide evidence of the importance of the program content on drug use and the adolescents' previous knowledge and beliefs and not only on the mechanism and mediators involved.

Despite these findings for mediation, this paper shows that there is a clear association between decrease in decision-making skills and increase in drug use and violent behavior independent of the group allocation. As we can see in Fig. 2 we found that the path B (mediator effect on outcomes) was statistically significant. These results show that investigation in decision-making skills as mediator is valuable for reducing drug use and violent behavior, as there is a clear association, corroborating the international guidelines [7]. This findings also corroborated the idea that the components of the drug use prevention programs can also improve school violence, reinforcing that training in decision-making skills can affect both outcomes (drug use and violence) (Botvin et al., 2006; Cox et al., 2016; Fagan and Catalano, 2013). One possible explanation for this mediation effect is that violence is associated with impulsive behavior (Jiménez-Barbero et al., 2016) and the decision-making process can help to deal with impulsiveness. By practicing communication skills, empathy and interpersonal relationships (Vadrucci et al., 2016), the program can also help people avoid violent behaviors.

From the sensitivity analysis, we might note that there were unmeasured variables that might have influenced both the mediator and the outcomes with correlations higher than 0.1 for drug use and -0.15 for violence. Predictors of the mediator and outcomes beyond those controlled for could render the observed indirect effect nonsignificant, such as parenting styles (Wolff and Crockett, 2011) and household composition (Hecht et al., 2008). Therefore, the conclusion that the indirect effects are statistically significant is questionable.

A limitation of this study was the excessive amount of missing data, especially from follow-up measures. However, it is worth noting that attrition is an expected limitation in longitudinal studies, especially among those with long follow-up (Ariza et al., 2013; Newton et al., 2010; Shope et al., 1992). Despite the fact that imputation processes offer excellent solutions to these missing data problems by estimating the missing values (Dong and Peng, 2013), missing data will always be a limitation when interpreting trial results, once the missing data will result in loss of statistical power. Considering that, this trial results should always be interpreted with caution (Jakobsen et al., 2017).

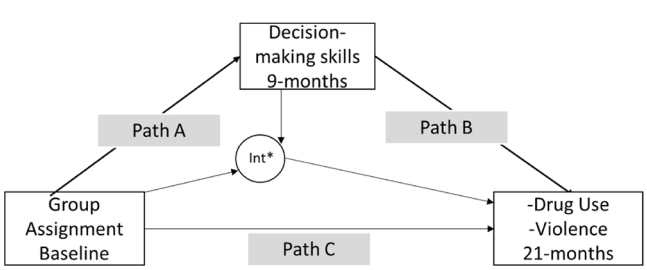

Fig. 2. Conceptual model of the mediation tested.
Vertical axis: Total Natural Indirect Effect of Group on Drugs.
Horizontal axis: RHO

5. Conclusion

In conclusion, this study showed that decrease in decision-making skills due to the #Tamojunto program potentially mediated the increase in drug use in schools through 21 months. These results suggest this program changes decision-making skills but in the opposite direction proposed by the theoretical model of the program. The inability of the program to increase the decision-making skills mediator as expected may be partially responsible for the #Tamojunto negative outcomes. Lack on decision-making skills seem to be a potential risk factor for drug use and violent behavior, suggesting that drug prevention programs with decision-making skill components can also act in violent behaviors. The lessons of the program aimed at affecting decision-making skills should be changed.

Contributors

The submitted manuscript has been read and approved by all authors. All authors acknowledge that they have exercised due care in ensuring the integrity of the work. JYV was responsible for drafting the article and literature review; wrote introduction, results and discussion of the manuscript. HCM performed the analysis and interpretation. ZMS designed the study, wrote the grant protocol and was responsible for the final approval of the version to be published.

The authors declare that has listed everyone who contributed significantly to the work.

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Clinical trial registration

Brazilian Register of Clinical Trials - REBEC, of the Brazilian Federal Government, is #RBR 4mnv5g.

Declaration of Competing Interest

The authors declare none conflict of interest.

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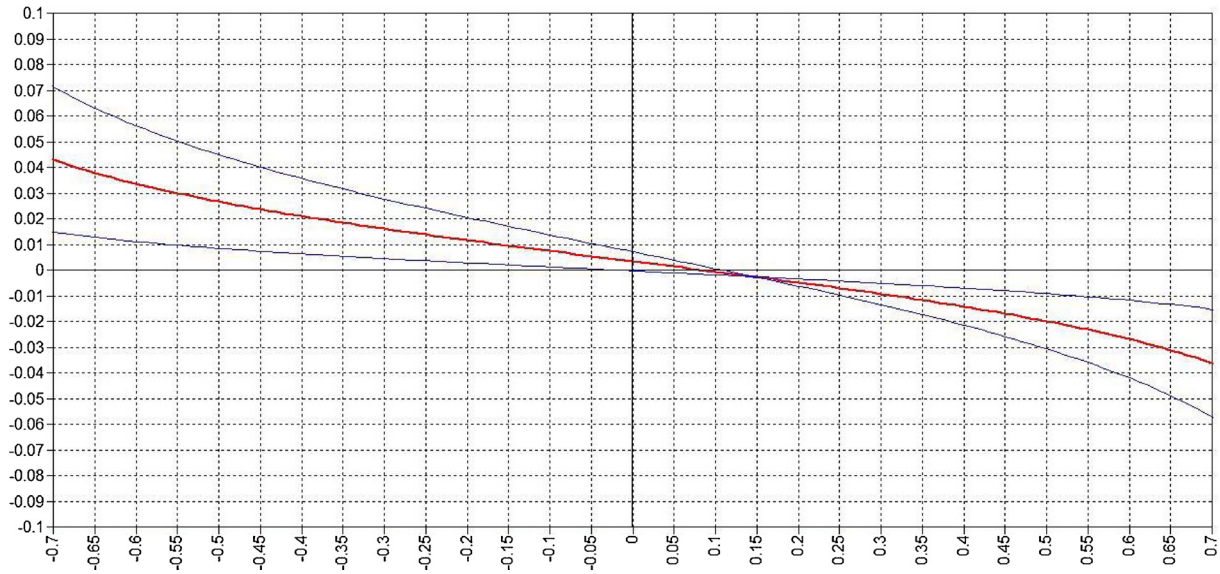

Fig. 3. Sensitivity analysis of Total Natural Indirect Effect (Group to Drugs). Mean of the Total Natural Indirect Effect (red); 95% confidence interval for the Total Natural Indirect Effect (blue). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article).
Vertical axis: Total Natural Indirect Effect of Group on Violence.
Horizontal axis: RHO.

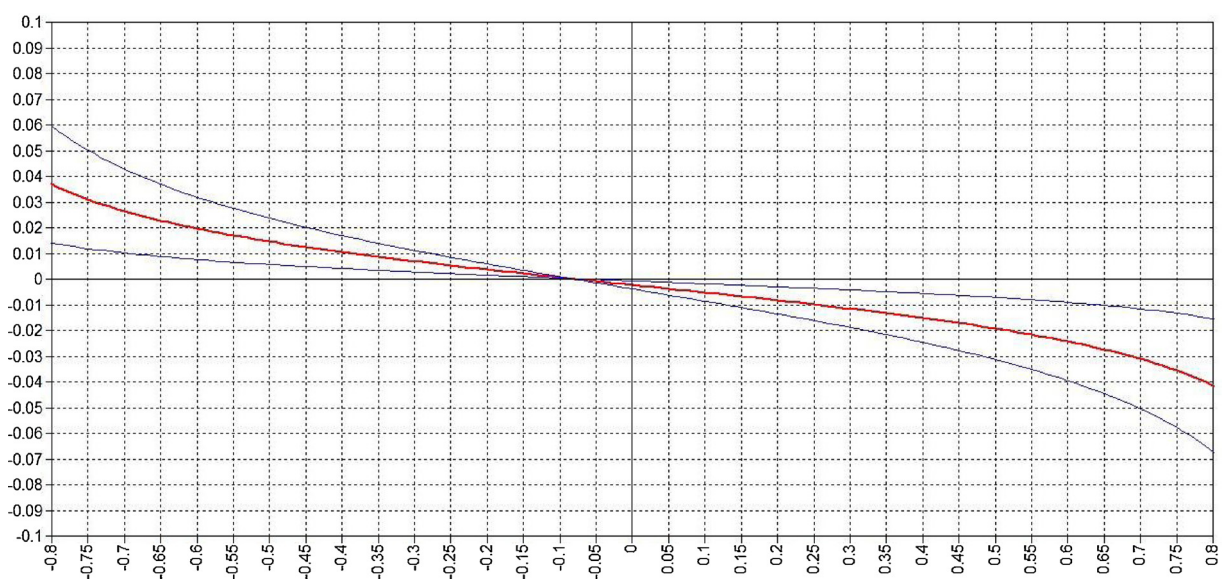

Fig. 4. Sensitivity analysis of Total Natural Indirect Effect (Group to Violence). Mean of the Total Natural Indirect Effect (red); 95% confidence interval for the Total Natural Indirect Effect (blue). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article).

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.drugalcdep.2019.107718.

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UNIVERSIDADE FEDERAL DE SÃO PAULO - HOSPITAL SÃO PAULO UNIFESP-HSP

PARECER CONSUBSTANCIADO DO CEP

DADOS DA EMENDA

Título da Pesquisa: Avaliação do processo de implantação de programas de prevenção ao uso de drogas para crianças e adolescentes em ambiente escolar

Pesquisador: Zila van der Meer Sanchez

Área Temática:

Versão: 7

CAAE: 19944213.5.0000.5505

Instituição Proponente: Universidade Federal de São Paulo - UNIFESP/EPM

Patrocinador Principal: Ministério da Saúde

DADOS DO PARECER

Número do Parecer: 1.705.111

Apresentação do Projeto:

Trata-se de emenda ao protocolo original.

O abuso de álcool e outras de drogas é um das grandes questões da saúde pública na atualidade, sendo o álcool e o tabaco as drogas que mais contribuem para a mortalidade da população e para os anos de vida perdidos por incapacidade (WHO, 2008). A abordagem preventiva nas escolas é a ação de melhor custoefetividade no enfrentamento da problemática de diversos comportamentos de risco à saúde, como o abuso e dependência de drogas, pois aposta na capacidade de discernimento dos adolescentes bem formados e

mostra melhores resultados do que o tratamento posterior ao problema estabelecido: abuso e dependência de drogas (FOXCROFT & TSERSVADZE, 2011; OHINMAA et al, 2011; NIDA,2003).

Objetivo da Pesquisa:

Objetivo geral:

O objetivo do presente projeto é o de avaliar o processo de implantação de dois programas de prevenção ao uso de álcool e outras drogas para crianças e adolescentes, nas cidades de São Paulo e São Bernardo, em escolas públicas de ensino fundamental I e II.

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Avaliação dos Riscos e Benefícios:
conforme descrito no parecer inicial.

Comentários e Considerações sobre a Pesquisa:
Este projeto visa dar suporte ao Plano Integrado de Enfrentamento ao Crack e Outras Drogas do governo Federal, cobrindo a lacuna dos estudos em prevenção junto às crianças e os adolescentes brasileiros adaptando e avaliando a implantação de programas eficazes de prevenção em escolas.

DETALHAMENTO DA EMENDA

Inclusão das alunas JULIA DELL SOL PASSOS GUSMÕES, JULIANA YOURGEL VALENTE e LARISSA FERRAZ REIS, do Programa de Pós-Graduação em Saúde Coletiva da UNIFESP, no projeto de pesquisa "Prevenção ao uso de drogas nas escolas brasileiras: diagnóstico da situação atual e fatores associados à implantação do programa", parecer CAEE 14332813.8.0000.5505.

Parte dos dados obtidos neste projeto serão utilizados pelos alunos como base para suas teses para obtenção do títulos de pós-graduação (mestrado e doutorado).

Subprojeto da aluna Júlia Dell Sol Passos Gusmões (mestrado): Violência nas escolas brasileiras: fatores associados e avaliação de um programa de prevenção.

Subprojeto da aluna Juliana Yurgel Valente (doutorado): Influência dos Estilos Parentais na Efetividade do Programa de Prevenção ao Uso de Drogas #Tamojunto.

Subprojeto da aluna Larissa Ferraz Reis (doutorado): Comportamento Sexual de Risco entre Adolescentes Brasileiros: Avaliação da efetividade do Programa #Tamojunto e do consumo de drogas como moderador.

O pesquisador declara que nenhuma alteração foi realizada no projeto aprovado pelo CEP e serão realizadas análises secundárias dos dados coletados em 2014 através de questionários aplicados entre os estudantes.

Considerações sobre os Termos de apresentação obrigatória:
Encaminhamento de emenda ao projeto para inclusão de pesquisador.

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Conclusões ou Pendências e Lista de Inadequações:

emenda aprovada

Considerações Finais a critério do CEP:

- O parecer do relator foi acatado pelo colegiado.

Este parecer foi elaborado baseado nos documentos abaixo relacionados:

Tipo Documento	Arquivo	Postagem	Autor	Situação
Informações Básicas do Projeto	PB_INFORMAÇÕES_BÁSICAS_772676_E4.pdf	17/08/2016 12:02:04		Aceito
Outros	solicitacao_emenda_inclusao_pesquisadores.docx	17/08/2016 12:00:37	Zila van der Meer Sanchez	Aceito
Outros	carta emenda rct.pdf	29/04/2015 17:19:11		Aceito
Outros	justificativa de emenda.doc	02/09/2014 17:52:56		Aceito
Outros	Solicitação de emeda ao CEP - 16.07 ASSINADA.pdf	16/07/2014 11:29:17		Aceito
Outros	carta sobre pendências.doc	22/11/2013 16:41:16		Aceito
Outros	termo assentimento criança.doc	22/11/2013 16:29:43		Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	TCLE professores.doc	22/11/2013 16:29:21		Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	TCLE diretores.doc	22/11/2013 16:29:12		Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	TCLE pais.doc	22/11/2013 16:29:05		Aceito
Outros	resposta CEP - MS (1).pdf	23/09/2013 19:12:44		Aceito
Outros	CEPUNIFESP564639.pdf	30/07/2013 09:52:36		Aceito
Folha de Rosto	folha de rosto projeto prevencao.pdf	22/07/2013 17:42:37		Aceito
Projeto Detalhado / Brochura Investigador	Projeto piloto UNODC.pdf	17/07/2013 22:21:14		Aceito

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Situação do Parecer:
Aprovado

Necessita Apreciação da CONEP:
Não

SAO PAULO, 31 de Agosto de 2016

Assinado por:
Miguel Roberto Jorge
(Coordenador)

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Anexo 10

Lista de Artigos produzidos como colaboradora durante o período do doutorado:

1. REIS, LARISSA F.; SURKAN, PAMELA J.; **VALENTE, JULIANA Y.**; BERTOLLA, MARCIA H.S.M. ; SANCHEZ, ZILA M. . Factors associated with early sexual initiation and unsafe sex in adolescents: Substance use and parenting style. JOURNAL OF ADOLESCENCE, v. 79, p. 128-135, 2020.

2. SANCHEZ, ZILA M. ; **VALENTE, JULIANA Y.**; FIDALGO, THIAGO M. ; LEAL, ANA PAULA ; MEDEIROS, POLLYANNA FAUSTA DE PIMENTEL DE ; COGO-MOREIRA, HUGO . The role of normative beliefs in the mediation of a school-based drug prevention program: A secondary analysis of the #Tamojunto cluster-randomized trial. PLoS One, v. 14, p. e0208072, 2019.

3. SANCHEZ, ZILA M.; **VALENTE, JULIANA Y.**; PEREIRA, ANA PAULA DIAS; COGO-MOREIRA, HUGO ; MELO, MÁRCIA H. S. ; CAETANO, SHEILA C. ; MARI, JAIR J. . Effectiveness evaluation of the school-based drug prevention program #Tamojunto2.0: protocol of a cluster randomized controlled trial. BMC PUBLIC HEALTH, v. 19, p. 750, 2019.

4. CONEGUNDES, LARA; **VALENTE, JULIANA Y**; COGO-MOREIRA, HUGO ; BERTINI MARTINS, CAMILA ; ANDREONI, SOLANGE ; SANCHEZ, ZILA M. . Transition from nonuse to use of alcohol or binge drinking among adolescents: secondary analysis of a randomized controlled trial. ADDICTIVE BEHAVIORS, v. 102, p. 106159, 2019.

5. GUSMÕES, JÚLIA D.S.P.; SAÑUDO, ADRIANA ; **VALENTE, JULIANA Y.** ; SANCHEZ, ZILA M. . Violence in Brazilian schools: Analysis of the effect of the #Tamojunto prevention program for bullying and physical violence. JOURNAL OF ADOLESCENCE, v. 63, p. 107-117, 2018.

6. SANCHEZ, ZILA M.; **VALENTE, JULIANA Y.**; SANUDO, ADRIANA; PEREIRA, ANA PAULA D. ; SCHNEIDER, DANIELA RIBEIRO ; ANDREONI, SOLANGE . Effectiveness evaluation of the school-based drug prevention program #Tamojunto in Brazil: 21-month follow-up of a randomized controlled trial. INTERNATIONAL JOURNAL OF DRUG POLICY, v. 60, p. 10-17, 2018.

7. CONEGUNDES, LARA SILVIA OLIVEIRA; **VALENTE, JULIANA Y.** ; MARTINS, CAMILA BERTINI ; ANDREONI, SOLANGE ; SANCHEZ, ZILA M. . Binge drinking and frequent or heavy drinking among adolescents: prevalence and associated factors. Jornal de Pediatria, v. 94, p. x, 2018.

8. SANCHEZ, ZILA M.; **VALENTE, JULIANA Y.** ; SANUDO, ADRIANA ; PEREIRA, ANA PAULA D. ; CRUZ, JOSELAINE I. ; SCHNEIDER, DANIELA ; ANDREONI, SOLANGE . The #Tamojunto Drug Prevention Program in Brazilian Schools: a Randomized Controlled Trial. Prevention Science, v. Mar 31, p. 1-11, 2017.