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Intervention to reduce adolescent hookah pipe use and satisfy basic psychological needs

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Abstract: Background: Hookah pipe use is a public health concern and threat to adolescents' health. self-determination theory asserts that satisfaction of basic psychological needs (BPN) will contribute to adolescents developing optimally. Purpose: The purpose of this study was to design an intervention to reduce adolescent hookah pipe use and satisfy their BPN. Methods: A modified delphi approach was implemented using a two-phased approach. Phase 1 included reviews and empirical research that formed part of the needs analysis. Phase 2 was the development of the intervention in collaboration with stakeholders from academia, policy and practice (n = 25). The stakeholders formed the sample for this study. Phase 1 informed phase 2. Phase 2 was implemented through a 4-hour workshop with the stakeholders. The workshop was audio recorded, transcribed verbatim and thematically analysed. Principal Results: The results indicated that a holistic four-pronged approach focusing on (1) the hookah pipe user, (2) the family, (3) after school recreation activities and (4) the teacher and community was needed as a model to intervene in adolescent hookah pipe use and satisfy their BPN. The intervention was described using the RE-AIM framework which considers reach, efficacy, adoption, implementation and maintenance of the intervention. An intervention has been co-created by the researchers and the stakeholders. Conclusions: This intervention is valuable because it can support the healthy development of adolescents by

Zainab Kader

ABOUT THE AUTHOR

Zainab Kader is a Registered Counsellor with the Health Professions Council of South Africa and PhD Candidate at the University of the Western Cape. Zainab completed her BPsych in 2012 where she was awarded the Deans Merit Award. She obtained her MA in Child and Family Studies in 2015 where she was also awarded the Deans Merit Award. Zainab has published research locally and internationally focusing on family conflict and SDT, behavioural interventions and systematic reviews related to hookah pipe smoking. Zainab has research and practical experience working with children, adolescents and adults in resource-constrained environments who are exposed to an array of social ills. Her work focuses on designing and implementing interventions. Furthermore, she is a supervisor for students pursuing their Postgraduate Diploma in Child and Family Studies and she is practicing as a Registered Counsellor focusing on trauma at the local municipality.

PUBLIC INTEREST STATEMENT

Adolescent hookah pipe smoking is harmful and a growing public health concern. According to self-determination theory (SDT), adolescents are motivated to pursue behaviours that fulfil their needs of autonomy, competence and relatedness. Sometimes, smoking the hookah pipe is used as a way to cope when these needs are not met. The aim of this study was to design an intervention to reduce adolescent hookah pipe use and satisfy their basic psychological needs. The design of the intervention required the researchers to co-create an intervention with stakeholders that had expert knowledge and skills. A four-pronged intervention focusing on the adolescent, their family, school and community was designed. This intervention is valuable because it can raise awareness, contribute to healthy physical and mental development of adolescents, and because it incorporates the school, family and the community so that adolescents are supported at all these levels.

reducing hookah pipe use, ease the pressure on health systems, raise awareness and potentially serve as a preventative measure for younger children who may want to experiment. Furthermore, it provides opportunities for families, school and community structures to encourage satisfaction of BPN.

Subjects: Health Psychology; Applied Social Psychology; Motivation; Community Health

Keywords: adolescent; hookah pipe; tobacco; self-determination theory; basic psychological needs; family environment; physical/social environment; delphi

1. Introduction and review of literature

Hookah pipe use is a major public health concern that affects adolescents' physical and mental health (Currie & Bray, 2019; Kintz et al., 2020). The hookah pipe is a mechanism used for tobacco consumption (World Health Organisation (WHO), 2015). Smoking the hookah pipe is hazardous as it contains toxic substances that are linked to lung and heart disease, increased lung inflammation, bronchitis, emphysema, elevated heart rate and blood pressure, periodontal disease, addiction, decreased exercise capacity as well as cancer (World Health Organisation [WHO], 2015; Mays et al., 2016; Bashirian et al., 2019). Hookah pipe smoking exposes adolescents to nicotine, which is addictive and dangerous because it causes a rapid release of adrenaline from the cortex of adrenal glands. This release causes concerning symptoms such as shortness of breath as well as increased blood pressure, heart rate and blood sugar levels. Symptoms of nicotine toxicity could also cause nausea, sweating, diarrhoea, difficulty breathing and abdominal pain (Moghaddam et al., 2019). However, hookah pipe smoking remains popular amongst adolescents because of the flavoured tobacco, social acceptability, lack of hookah pipe specific policy and regulations, promotion using the Internet and social media to advertise the products and perceived harmlessness (WHO, 2015; Pashaeypoor et al., 2019). Lopez et al. (2017) assert that now is the time to advocate for interventions designed specifically to prevent and control hookah pipe smoking since adolescent hookah pipe use is spreading rapidly globally.

There has been an increase in intervention studies focused on reducing hookah pipe use globally in the last decade but a systematic review by Kader et al. (2019) revealed that there were limited quality interventions in terms of reach, efficacy, adoption, implementation and maintenance and only a small number of interventions that were effective in reducing hookah pipe use. This view was supported by reviews done by Maziak et al. (2015) and Jawad et al. (2016) who found that few studies showed promising results in favour of hookah pipe cessation. However, these interventions did show promise for prevention, altering perceptions of harm, increased knowledge and self-efficacy. These interventions are important as they form the foundation of future interventions by highlighting important design and content issues that should be considered (Jawad et al., 2016; Kader et al., 2019; Maziak et al., 2015). Furthermore, all three reviews found minimal studies focusing specifically on adolescents and only one study in Africa (Egypt) (Mohlman et al., 2013).

Peer (2018) argues that current strategies are inadequate to curb the rise of tobacco use in Africa because of the weaker smoke-free policies, lower rates of tobacco taxation, and fewer restrictions on tobacco advertising compared with high-income countries. Since the rise of tobacco use is common amongst males and females, tax adjustments, smoking rules and price hikes of tobacco could deter males and females from smoking (Kipkorir et al., 2019). Income status is an important consideration for tobacco smoking since the majority of the world's smokers (81%), are in low-and middle-income countries (Cambron et al., 2018; WHO, 2006). This is evident in where Kenya, Kipkorir et al. (2019) highlights that approximately 6000 Kenyans die of tobacco-related diseases, while more than 220 000 children continue to smoke each day where smokers. The majority of this population is living in low-income households. Smoking can be attributed to increased poverty and social ills, adjusting or coping with serious illnesses, diagnoses of depression and anxiety disorders as well as smoking-specific work and family contexts (Cambron et al., 2018;

Rokach, 2019). Despite the challenges, countries such as Mauritius, Uganda and South Africa have accomplished significantly more in their efforts to curb tobacco use, there is a need to urgently strengthen efforts to implement effective tobacco control policies (Peer, 2018).

Tobacco use in Africa extends beyond cigarette smoking but little emphasis is given to other tobacco products such as the hookah pipe even though hookah smoking is prevalent in many African Countries (Marigi et al., 2008; Omotehinwa et al., 2018). South Africa is of particular concern as Reddy et al. (2015) reported that, in South Africa, 20.1% of adults are hookah pipe smokers, almost two-thirds of university students in the Western Cape reported having ever smoked a hookah pipe (Kruger et al., 2016) and 21% of school learners were found to be current hookah smokers, with 6.8% having initiated smoking before the age of 10 years old. So, there is a need for the design of an intervention to reduce adolescent hookah pipe use for resource-constrained countries such as South Africa.

Real-life problems, such as adolescent hookah pipe use are—by definition—complex; otherwise, they would already have been solved without the need to involve researchers. It follows, then, that a multi-theory approach is required (Bartholomew Eldredge et al., 2016) in order to further understand and solve real-life problems. This is also why intervention studies do not necessarily lead to improvements in a single theory (Prestwich et al., 2015). From this perspective, applying theory to real-life problems can be likened to completing a jigsaw puzzle with various theories fitting together to provide an explanation or answer to a planning question (Peters & Crutzen, 2017). The argument that one theory—for example, the self determination theory—cannot explain all the possible variances in behaviour or behaviour change is, therefore, no reason to discard the theory altogether (Kok & Ruiter, 2014). Not being able to explain all variance in behaviour could only be held against a "Theory of Everything", and there are good reasons why such a theory is undesirable (Peters & Crutzen, 2017). Therefore, when trying to understand a problem and planning interventions it is important to follow the core processes (Ruiter et al., 2018). These core processes include the systematic process of asking a question, brainstorming possible answers, looking for empirical evidence and theoretical support, conducting new research, and coming to a final list of answers to the question (Ruiter et al., 2018). This process allows for an understanding of the problem, selecting methods of change, creating aims and objectives as well as designing and implementing evaluable interventions (Bartholomew Eldredge et al., 2016; Ruiter et al., 2018). This study and intervention focus was particularly interested in the understanding the motivation and basic psychological needs of adolescents who smoke the hookah pipe in an attempt to reduce adolescent hookah pipe use. In order to understand these variances of adolescent hookah pipe use, self-determination theory was deemed the most appropriate theory to understand and intervene in adolescent hookah pipe use.

self-determination theory (SDT) posits that one needs to have an understanding of adolescents' needs fulfilment and needs frustration because it is the pursuit of need satisfaction that motivates one to pursue or not pursue a behaviour, in this case, hookah pipe use (Deci & Ryan, 2000). Since motivation exists on a continuum, one can be intrinsically motivated (behaviour is executed as a result of enjoyment, interest and inherent satisfaction for the action itself), extrinsically motivated (behaviours that are controlled by external rewards and peer pressure) or amotivated (lack of motivation) when engaging in behaviours that will satisfy the needs (Ryan & Deci, 2017). SDT proposes that there are three basic psychological needs which are necessary to fulfil in order to thrive and develop optimally. These needs are essential for everyone, including adolescents but the goals for satisfaction differ, for example, an adult may satisfy the need for competence through their career but some adolescents may satisfy this need through sport (Deci & Ryan, 2000). The three psychological needs are autonomy (experienced sense of freedom and volition), competence (experienced sense of mastering) and relatedness (experienced sense of attachment and belonging). Contexts such as the family, school and peer environment can either allow or hinder satisfaction of these needs (Williams et al., 2000). When needs are satisfied, one will experience health and well-being and when needs are frustrated, physical or psychological distress and ill-being will manifest

(Williams et al., 2000). In order to adequately intervene in adolescent hookah pipe use, it is important to understand adolescents' motivations for using the hookah pipe and gain insight into how the needs are satisfied when smoking. This would allow practitioners to seek alternative ways of satisfying that need without smoking the hookah pipe (Moore & Hardy, 2019).

Since the aim of the paper was to describe the intervention, the authors have focused on how SDT is used in the development of this intervention and not have a theoretical debate on its own. SDT connects to adolescent hookah pipe use because it allows for the internal exploration of why adolescents smoke the hookah pipe that extends beyond the common reasons that are recognized as determinants of adolescents' hookah pipe use such as sweet smell, escape boredom, relaxation, etc. (Pashaeypoor et al., 2019). SDT is interested in the psychological motivators of the behaviour. It is hypothesized that adolescents are motivated to smoke the hookah pipe in an attempt to satisfy their basic psychological needs. Smoking the hookah pipe allows adolescents to experience autonomy by believing that they are choosing to smoke, competence because they may experience a sense of mastery when they are able to perform tricks with the smoke and relatedness by experiencing social connections when they are spending time with their friends while smoking. Moreover, the school, community and family environment, which is regarded as important in SDT, has an influencing role in adolescent hookah pipe use as it may condone or condemn the behaviour and satisfy or thwart need satisfaction (Ryan & Deci, 2017). When needs are not satisfied in these contexts, adolescent may be geared towards seeking needs fulfilment elsewhere, for example, through hookah pipe smoking. These factors are typically not considered when intervening in hookah pipe use because the focus is mainly on providing education programmes about the harm of smoking and/or adapting tobacco smoking cessation interventions to address hookah pipe use (Kader et al., 2019; Sadeghi et al., 2019). This is not sufficient because smoking the hookah pipe a different experience compared to cigarette smoking because of its social element (Siddiqi, 2016). Therefore, the desire to intervene from an SDT perspective is novel.

In an attempt to design an intervention that reduces hookah pipe use and satisfies basic psychological needs, literature and adolescents were consulted as a first phase. Thereafter, in Phase 2, a planning group including stakeholders from the academic, policy and practice landscape with vast knowledge and experience was established. It was deemed valuable to gain input from an expert panel regarding the subject matter in order to incorporate first-hand experiences, be cognisant about existing strategies to address the problem and to gain the necessary critique to improve the initial ideas. The planning group was expected to provide insights about the design, content and process of the intervention. Including the planning group in the development of the intervention allowed for a collaborative approach to co-create the intervention. The benefit of co-creation allows for maximising the acceptability, feasibility and quality of the intervention within various contexts because these stakeholders either have first-hand knowledge and experience with the target population, the implementation context, frontline practitioners and resources. As such they will not only be able to comment on what will be effective and adequate, but also identify which elements will not work. Having this knowledge allows challenges and risks to be mitigated at the design phase already (Hawkins et al., 2017). Co-creation also stimulates an element of "buy in" to the intervention and creates a sense of ownership and commitment amongst those involved in its development as well as effective collaboration between frontline practitioners, researchers, government and civil society in order to reduce adolescent hookah pipe use and support with satisfying their basic psychological needs through harnessing the expertise of key stakeholders (Hawkins et al., 2017).

Since adolescent hookah pipe use is a public health concern, it was intended that the intervention should have a public health impact. The RE-AIM framework is a planning and evaluation model that has been used in an array of contexts to address programmatic innovations for improving public health. The RE-AIM framework focusses on addressing reach, efficacy, adoption, implementation and maintenance of interventions. This framework allows for flexibility to address different public health concerns in a practical manner understandable by practitioners and

policymakers (Harden et al., 2018). Therefore, this intervention was described using the RE-AIM framework which extends beyond the efficacy paradigm to effectiveness and assesses the degree of reach, adoption, implementation and maintenance of effects (Kessler & Glasgow, 2011). The RE-AIM framework was used in order to describe an intervention that was feasible, scalable and replicable. In this paper, we present the process, intervention and insights from the stakeholders in order to satisfy the aim of designing an intervention to reduce hookah pipe use and satisfy basic psychological needs.

This paper is deemed necessary and innovative because it addresses a health hazard in a way that has not been done before. Traditional tobacco cessation interventions and existing hookah pipe interventions provide brief interventions focusing only on the user (Kader et al., 2019), this study is interested in the different factors and environments influencing adolescent hookah pipe use. Furthermore, it studies hookah pipe use from an SDT needs perspective because the experience of needs satisfaction and needs frustration serves as a motivating factor to pursue behaviours (or not pursue behaviours) such as hookah pipe use. This article incorporates ideas from literature, adolescents and stakeholders with expert knowledge and experience through the modified delphi approach methodology.

A comprehensive background emphasising the importance of intervening in adolescent hookah pipe use from an SDT perspective has been provided. This is followed by describing the methodology of how the intervention was developed and how stakeholders were consulted. Thereafter, the intervention and the feedback from the stakeholders are presented. Lastly, this article provides a discussion about the intervention and highlights the limitations and recommendations for future studies.

2. Methods

2.1. Research paradigm

Traditional delphi designs utilise a group communication process focused on reaching consensus through rounds of questionnaires which are presented to expert panels (Avella, 2016). Modified delphi's, on the other hand, do not consult experts to generate ideas by means of questionnaires. Instead, the researcher (a) collects the initial answers through local and international sources by means of reviews, self-administered questionnaires and interviews, (b) summarises the findings and then (c) presents it to the expert panel for input (Avella, 2016). This study employed a modified delphi method which included a combination of systematic reviews, self-administered questionnaires, in-depth interviews and a physical meeting of experts to discuss the results. The meeting served as a consensus method that allowed experts to generate ideas based on their expertise about the intervention to reduce to adolescent hookah pipe use and satisfy basic psychological needs. This study, therefore, used a two-phase model whereby Phase 1 focused on collecting data prior to the workshop in order to answer the initial questions and Phase 2 focused on the co-production of the intervention. This process is depicted in Figure 1. This study forms part of a larger project which aims to design an intervention to reduce hookah pipe use and satisfy basic psychological needs, therefore, Phase 1 will be briefly discussed and emphasis will be placed on Phase 2—the consensus workshop.

2.2. Phase 1: evidence review, self-administered questionnaires and in-depth interviews

The core processes framework was used to assimilate the evidence, theories and research in this intervention to understand the problem and intervention development. First, questions were posed and the possible answers were attained in stage one (systematic reviews), then empirical evidence and theoretical support were established in the form of conducting research in stage 2 and 3 whilst using SDT as a theoretical framework. Currently, this study is focused on conducting new research, and coming to a final list of answers to the intervention design by using a Delphi Approach where co-creation occurred with stakeholders (Phase 2). Table one identifies three stages in Phase 1 and provides detail about the aim, method and results of each stage.

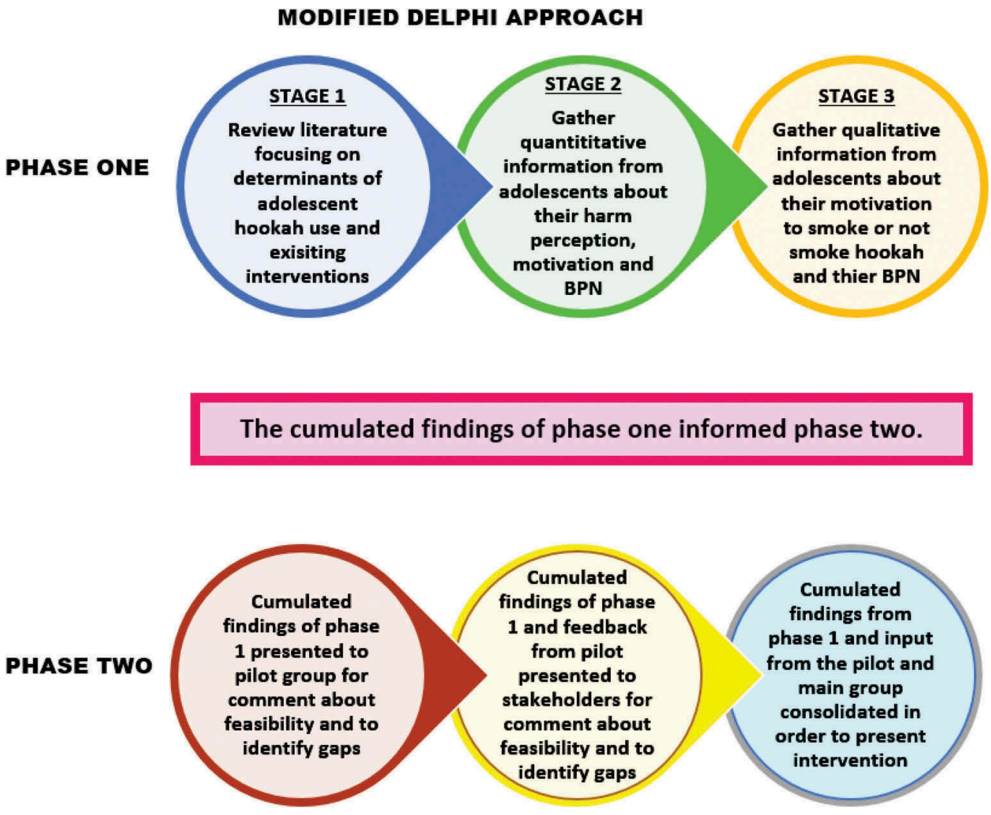

Figure 1. Flowchart demonstrating research methodology.

The findings of each stage in Phase 1 were consolidated and a summary of the results was presented to the expert panel in Phase 2 by means of an MS PowerPoint Presentation.

2.3. Phase 2

2.3.1. Participants

Okoli and Pawlowski (2004) describe the need to have an expert panel that represents different lenses. Therefore, academics, practitioners, local and provincial government officials, non-profit organisations (NPO's), faith-basedorganisations (FBO's) and research organisations were approached to be a part of the expert panel. Participants were required to have experience and knowledge about hookah pipe use, substance use, adolescents, intervention development or self-determination theory. Participants were purposively recruited on the basis of their knowledge and experience via the researchers' professional network and via the mailing list of SACENDU (South African Community Epidemiology Network on Drug Use). Thirty-five people were invited to participate in the pilot workshop hosted 14 October 2019 of which 15 confirmed attendance and 10 people attended the workshop. Five people emailed apologies due to unforeseen circumstances 1–2 days before the workshop. Seventy-Eight people were invited to participate in the main workshop, hosted 13 November 2019 of which 20 confirmed attendances and 15 people attended the workshop. Five people emailed apologies due to work or family emergencies 1–2 days before the workshop. Participants started responding immediately after the invitation was sent and the last email was sent on the RSVP date.

2.3.2. Procedures

Emails were sent to prospective experts in the field of substance abuse, Self-Determination Theorists and intervention developers 1 month before the workshop. A reminder was sent 2 weeks before for the RSVP date (1 week before the intervention) and 1 day before the RSVP date. Participants had to respond to the email in order to confirm attendance. A 4-hour workshop

Table 1. The stages of the problem identification

Stage	Aim	Method	Results
Stage 1 *Systematic review*: Determinants	Understand why adolescents smoke the hookah pipe	• 12 databases with 22 search variations related to determinants and hookah pipe • 3 levels of review (title, abstract and full text) • Full text was appraised to assess quality for inclusion • Data extraction • Data were analysed using narrative synthesis	• Total of 25 studies included • Participants in studies: Preadolescents and adolescents aged 10–19 • Study samples were on average 46% female • 96% of the population was school students • Determinants included peer/friends, individual, school and family factors as well as other factors such as taste, smell and seeing advertisements of hookah
Stage 1 *Systematic review*: Interventions	Determine existing interventions and their properties using the REAIM framework	• 12 databases with 26 search variations related to interventions and hookah pipe • 3 levels of review (title, abstract and full text) • Full text was appraised to assess quality for inclusion • Data extraction using RE-AIM (reach, efficacy, adoption, implementation and maintenance) framework • Data were analysed using narrative synthesis	• 10 studies included in review • 60% Asia, 30% North America and 10% Europe • Details about the REAIM stages and full article based on this stage can be accessed using the following link: http://www.samj.org.za/index.php/samj/article/view/12,618/8867

(*Continued*)

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Table 1. (*Continued*)

Stage	Aim	Method	Results
Stage 2 *Quantitative quantitative questionnaire used to obtain the information for stage two can be viewed in Appendix A*	Investigate adolescent hookah pipe use and compare users and non-users knowledge of hookah, basic psychological needs, motivation for use or non-use and the role of family in hookah use and non-use	• Simple random sampling • 1201 participants—12 schools • The following measures were used: demographics self-constructed questionnaire, family hookah pipe use and acceptability of hookah pipe use self-constructed questionnaire, family functioning scale, balanced measure of psychology needs scale and satisfaction with family scale • Data analysed using SPSS	• 21% Users and 76% non-users • The majority of hookah pipe users were female (57.6%), coloured (84.7%), Afrikaans speaking (54.4%) adolescents living with both their parents (49.6%) who were married (45.5%) • Age ranged from age 13–19 and education level ranged from grade 5–12 • Age of onset for hookah smoking also ranged from 1 year old–19 years old but the mean age was 13.25. Whilst this may seem strange and is only a minority, a similar finding was found in a previous qualitative study where a participant indicated that her nephew is age 2 and "smokes". This is a result of watching older family members smoke • Hookah pipe users and non-users have relatively similar views related to harm • No significant differences between users and non-users' satisfaction or frustration of needs. However, users and non-users revealed that their decision to smoke or not smoke is a result of perceived choice and autonomous motivation, respectively • Family substance use, families' attitudes and experiences in families play an important role in adolescent hookah pipe use. Whilst family permissiveness, family sociability, family conflict and family satisfaction does not show to have a significant impact on the choice to smoke the hookah pipe or not. However, parents as role models, family members' approval or disapproval of use and family members' substance use seems to encourage use or non-use

(*Continued*)

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Table 1. (*Continued*)

Stage	Aim	Method	Results
Stage 3 *Qualitative qualitative interview schedule used to obtain the information for stage three can be viewed in Appendix B*	Comparing hookah pipe users and non-users experience of BPN, motivation to smoke or not to smoke, the role of family in hookah use and non-use and intervention ideas	• Purposive sampling • 30 participants—4 schools • Interview schedule • One on One interviews • Audio-recorded and transcribed • Analysed using Braun and Clarkes 6 stages of thematic analysis	• 30 adolescents aged 13–19 • The study revealed that satisfaction or frustration of autonomy does not impact the choice to smoke or not smoke the hookah pipe. However, this study revealed that frustration of competence and relatedness is common amongst hookah pipe users and plays an important role in the choice to smoke or not • Adolescents are intrinsically and extrinsically motivated to smoke or not smoke • Family behaviour and attitudes contribute to the choice to smoke or not smoke the hookah pipe

was hosted from 09h00 to 13h00. Prior to the workshop, participants provided written consent and completed a demographics form. The workshop followed the following format: Introduction, activity exploring participants' ideas of truths, myths and question marks about the hookah pipe, presentation about Phase 1's results, overview of the intervention, tea break, group discussions about the intervention and findings of the research, feedback to the plenary and questions, answers and comments about the intervention and the workshop. The focus of the workshop was to (a) provide feedback to participants about the Phase 1 (b) present suggested themes, aims and activities for the intervention and (c) discussion additional input from the expert panel.

2.3.3. Pilot workshop

A three-pronged intervention was presented for input, critique and scrutiny. During the pilot workshop, it was discovered that the overview of the three-prong intervention should not be done immediately after the presentation of the results because it was too much information provided at once. Groups were assigned after tea for the group discussion. This left the group confused about what needs to be done in the group discussions so the overview of the intervention and the purpose of the group discussions had to be explained again. For the pilot, there were two groups (one focusing on the three prongs and one focusing on the REAIM properties of the intervention). During the pilot, it was identified that three prongs (individual prong, family prong and aftercare prong) were not sufficient and an additional prong should be added encompassing teacher, community and social media intervention. This would become the fourth prong.

2.3.4. Main workshop

Based on the findings of the pilot workshop, the tea break occurred after the results presentation. After the tea break, participants were placed into groups, the overview of the intervention and the purpose of the group discussions were explained and then the group discussions occurred. As suggested in the pilot workshop, the fourth prong was added to the intervention. The participants were divided into four groups (one group focused on prong 1, one group focused on prong 2, another group focused on prongs 3 and 4 and one group focusing on the REAIM properties of the intervention). Each group provided feedback and the plenary could provide input. An overview of the intervention and the group feedback will be discussed in the results section of this paper.

2.3.5. Data analysis

The full duration of the workshop was audio recorded and transcribed verbatim. During the group discussions, the groups made notes on large pieces of paper that they used to present. During the presentations, the researcher (ZK) made detailed notes to ensure accurate reflections of the groups' ideas. The transcriptions, participant's notes and the researcher's notes were thematically analysed using Braun and Clarkes' (2006) six-step approach to thematic analysis which included (1) becoming familiar with the data, (2) assigning preliminary codes to describe data, (3) searching for patterns and themes from the codes, (4) reviewing themes, (5) defining and naming themes and (6) generating a report.

2.4. Ethics

The University of the Western Cape's ethics review board provided ethics approval for the larger project. Confidentiality was maintained at all times. When emailing participants, they were BCC'd therefore they had no knowledge of who else was recruited or their response. Similarly, their anonymity was protected. Informed consent was obtained prior to the workshop from all participants and they knew that participation was voluntary so they could withdraw at any point. If the event of uncomfortability or distress, a Registered Counsellor that was not a participant in the study was available for debriefing.

3. Results

The participants were asked to comment on the preliminary results of the larger study (Phase 1—Stage 1, 2 and 3) as well as the proposed layout of the intervention. Participants received a handout of the intervention and they were asked to scrutinise and critique the intervention.

3.1. Participants

Table 2 provides the demographic details of the participants of the pilot workshop. The demographics questionnaire can beviewed in Appendix C. Ten people participated in the pilot workshop. Sixty percent of the participants were female. The majority of the participants (90%) were of coloured race (also referred to as mixed race). The participant's age ranged from 25 to 67 years old. Their education levels ranged from completing high school (Grade 12) to PhD. The participants were from academia (50%), faith-based organisations (30%) and NPO's (20%). The number of work experience years ranged from 2 to 45 years. Experience in substance use ranged from 1 to 12 years, experience working with adolescents ranged from 0 to 26 years, experience in intervention development ranged from 0 to 12 years and experience in SDT ranged from 0 to 14 years. All participants were from the Western Cape, South Africa.

Table 3 provides the demographic details of the participants of the main workshop. Fifteen people participated in the main workshop. The majority of the participants were female (60%). Eighty percent of the participants were of coloured race (also referred to as mixed race). The participant's ages ranged from 27 to 58 years old. All participants indicated having tertiary education ranging from a diploma to a master's degree. The participants were representatives from academia (13.3%), research organisations (6.7%), provincial government (46.7%), local government (6.7%) and non-profit organisations (26.6%). Participants varied in terms of total years of work experience, they reported between 0 and 35 years' work experience. Their experience in substance abuse management ranged from 0 to 35 years, their experience working with adolescents ranged from 0 to 35 years, their experience in intervention development ranged from 0 to 35 years and their experience in SDT ranged from 0 to 30 years. All participants were from the Western Cape, South Africa.

3.2. Programme outcome considerations (prongs)

The intervention comprised of four prongs as depicted in Figure 2. The four prongs were established by consolidating the results from Phase 1, consulting with expert stakeholders in Phase 2 and considering the theoretical underpinning of SDT. The results from both phases of the study indicated that the intervention should not only focus on the adolescents and that there is a need for the family be included in the intervention because families can deter hookah pipe use and contribute to needs satisfaction or frustration. SDT emphasises that the environment, such as school and community is integral in encouraging or discouraging behaviours and can contribute to need satisfaction and frustration. Having an afterschool and weekend programme allows for needs to be satisfied because adolescents can choose to which activities interest them (autonomy), they can experience a sense of accomplishment when doing well in their selected activity (competence) and they can experience a bond with their peers at the afterschool and weekend programme (relatedness). This will not only encourage need satisfaction but it will also keep adolescents occupied so that they will not be bored or feel the need to resort to hookah pipe smoking.

Each prong will be described below in Tables 4–7. The participants' feedback of each prong will be presented below each table (prong). This is followed by Table 8 which describes the intervention format and logistics according to the RE-AIM Framework.

3.2.1. Prong one: individual/group prong

3.2.1.1. The need to consider non-school going children. Participants agreed with the modules and the aims. However, they indicated that the activities were appropriate for children who attended school but the intervention activities may not be appropriate for adolescents who do not attend school such as street children. It was suggested that the activities must be more practical and creative so the content could be remembered easily and everyone can participate in the intervention. Including everyone in the intervention would allow for improved mood, purpose, self-concept and coping/social skills hereby serving as a motivating factor to avoid hookah pipe use. Coholic and Eys (2016) emphasize the importance inclusion and of creative interventions for vulnerable children, including but not limited to children that are not able to attend school due to social ills,

Table 2. Demographic details of pilot workshop participants

							No of years' experience			
No.	**Gender**	**Age**	**Race**	**Highest level of education**	**Sector**	**No of years' work experience**	**Substance use/hookah pipe**	**Adolescents**	**Interventions: plan, develop, implement, M&E**	**SDT**
1	Female	57	Coloured	PhD Human Ecology	Academia	36	1	1	1	1
2	Female	41	Coloured	Masters in Occupational Therapy	Academic	18	2	10	8	8
3	Female	25	Coloured	MA Research Psychology	Academic	2	1	3	0	0
4	Male	67	Coloured	NQF 4—Grade 12	FBO	10	1	0	0	0
5	Female	50	Coloured	PhD Psychology	Academia	26	6	26	12	14
6	Male	31	Coloured	B.Psychology	NPO	10	5	10	5	5
7	Male	44	Black	B.Social Work	NPO	8	2	2	0	0
8	Female	66	Coloured	B.Cur Nursing	FBO	45	12	12	12	0
9	Male	53	Coloured	Church Ministry Certificate	FBO	6	6	6	0	0
10	Female	50	Coloured	PhD Psychology	Academia	26	10	23	0	0

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Table 3. Demographic details of main workshop participants

							No of years' experience			
No.	**Gender**	**Age**	**Race**	**Highest level of education**	**Sector**	**No of years' work experience**	**Working with substance use/Hookah Pipe**	**Working with adolescents**	**Planning, developing, implementing, monitoring or evaluating interventions**	**SDT**
1	Female	53	Coloured	MSc	NPO	30	20	30	0	0
2	Male	58	Coloured	Master's in Public Administration	NPO	35	35	35	35	30
3	Female	28	Black	PGDip Child and Family Studies	Academia	0	0	0	0	0
4	Male	33	Black	BA (Health Science and Social Science)	Provincial Government	1	1	0	0	0
5	Male	31	Coloured	B.Psychology	Academia	10	10	10	10	3
6	Female	27	Coloured	PGDip Child and Family Studies	NPO	2	2	2	2	0
7	Female	31	Coloured	B.Social Work	NPO	3	3	3	0	0
8	Male	32	Coloured	B.Social Work	Provincial Government	7	7	7	7	7
9	Male	29	Coloured	B.Social Work	Provincial Government	3	2	0	2	0
10	Female	39	Coloured	BA Psychology	Local Government	3	3	1.5	3	3
11	Male	30	Coloured	Masters Sport, Recreation and Exercise Science	Research Organisation	11	2	10	5	5
12	Female	36	Coloured	MA Child and Family Studies	Provincial Government	8	0	5	0	5

(*Continued*)

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Table 3. (*Continued*)

							No of years' experience			
No.	**Gender**	**Age**	**Race**	**Highest level of education**	**Sector**	**No of years' work experience**	**Working with substance use/Hookah Pipe**	**Working with adolescents**	**Planning, developing, implementing, monitoring or evaluating interventions**	**SDT**
13	Female	32	Black	B.Social Work	Provincial Government	5	0	0	0	0
14	Female	35	Coloured	B.Social Work	Provincial Government: Street Children	6	6	13	6	10
15	Female	49	Coloured	Diploma: Social Work	Provincial Government	22	22	22	22	0

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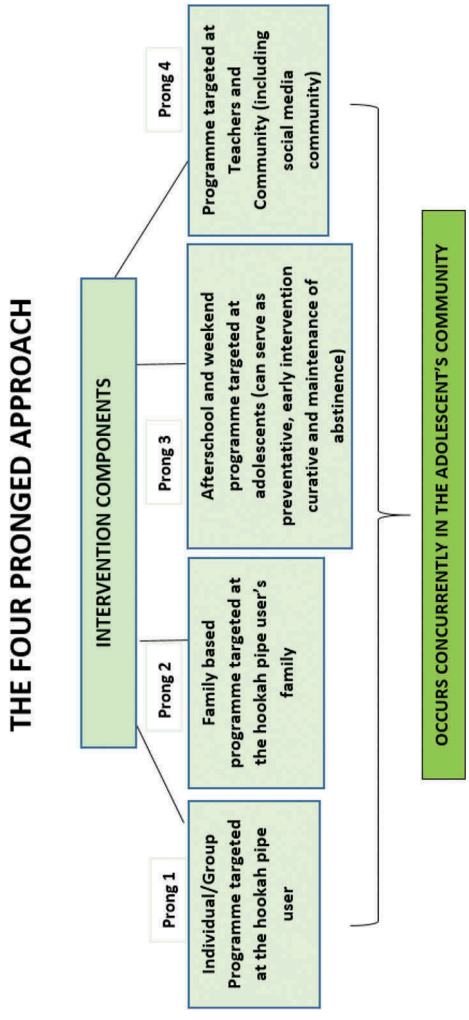

Figure 2. The four-pronged approach.

Table 4. Individual/group prong

Session number	Module	Aim	Activities
1	Who am I as an adolescent and what is the role of my family	• Adolescents understand their phase of development and why they behave or feel the way they do • Adolescents understand how their family impacts their development and choices	• Ice breakers • Discussion • Life skills • Psycho-education
2	Perceptions about hookah use	• Modify perceptions and encourage a reduction in hookah pipe use	• Games • Role plays • Debates
3	Harm, gateway and addiction	• Adolescents have improved knowledge about the harms of hookah pipe use and they understand how and why it is a gateway substance • Adolescents have improved knowledge about addiction and how they can become addicted to using the hookah pipe	• PPT presentation, quiz and prizes • Invite past users to talk
4	Hookah, cigarette, alcohol and cannabis use	• Adolescents will have improved knowledge about hookah, cigarette, alcohol and cannabis use • An acknowledgement of use and concerns will lead to a reduction of use • Enhance social skills needed to avoid substance use	• Develop a magazine • Radio shows • Diary of cravings/triggers
5	Decision making	• Adolescents will have improved decision-making skills specifically about hookah pipe use or non-use • Improve self-efficacy	• Vision board • Pros and cons • Motivational interviewing

(*Continued*)

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Table 4. (*Continued*)

Session number	Module	Aim	Activities
6	Understanding and fostering motivation	• Adolescents' will have improved knowledge about the types of motivation and identify what motivates them to engage in hookah pipe use	• Reflection • Role plays • Discussions
7	Understanding and fostering autonomy	• Adolescents will have an improved understanding about autonomy and how it is satisfied or frustrated	• Psychoeducation • Therapy • Choice jar
8	Understanding and fostering competence	• Adolescents will have an improved understanding about competence and how it is satisfied or frustrated	• Dream box • Life skills • Games
9	Understanding and fostering relatedness	• Adolescents will have an improved understanding about relatedness and how it is satisfied or frustrated	• Trust and relatability activities • Therapy
10	Relaxation and coping mechanisms	• Adolescents will be better equipped to manage challenging situations by exploring relaxation techniques and improved coping mechanisms	• Mindfulness • Pamphlet design • Therapy

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Table 5. Intervention for the family members of hookah pipe users

Session number	Module	Aim	Activities
1	Understanding adolescence and the role of family in adolescent hookah pipe use	• Families have improved understanding of the phase of development and why adolescents or feel the way they do • Family understand how they impact adolescents development and choices	• Role plays • Workshops • Psycho-education • Group support
2	Perceptions, harm, gateway and addiction of hookah pipe	• Modify perceptions and encourage a reduction in adolescent hookah pipe use	• Games • Myths and truth activity • Discussions
3	Hookah, alcohol and cannabis use in the family	• A reduction of hookah, alcohol and cannabis use in the family, particularly in the presence of adolescents	• Therapy • Reflection • Pamphlets • Referrals
4	Hookah as a means of socialisation/ alternatives to socialising	• A reduction of hookah pipe use in the family as a means of socialising • Families identify alternative ways of socialising with the absence of substances	• Socialising experiences • Games • Discussions
5	Accepting hookah in the family	• Families are less accepting of the hookah pipe	• Arts and craft • Consequence charts
6	Understanding and fostering motivation	• Families will have improved knowledge about the types of motivation and identify what motivates them and their adolescents to engage in hookah pipe use	• Presentation, reflection and discussion • Practice strategies
7	Understanding and fostering autonomy	• Families will have an improved understanding about autonomy and how it is satisfied or frustrated	• Role play • Reflection • Discussion

(*Continued*)

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Table 5. (*Continued*)

Session number	Module	Aim	Activities
8	Understanding and fostering competence	• Families will have an improved understanding about competence and how it is satisfied or frustrated	• Games • Discussion • Parenting skills training
9	Understanding and fostering relatedness	• Families will have an improved understanding about relatedness and how it is satisfied or frustrated	• Trust and relatability exercises
10	Family Day focused on bonding and fostering relatedness	• Adolescents and family members attend a family day where they will learn more about each other, bond, learn communication strategies and experience a sense of relatedness	• Picnic • Creative activities or games together

Table 6. Afterschool and weekend prong

Module	Aim	Activities
Afterschool and weekend programme to keep adolescents occupied and foster basic psychological needs	• Reduce hookah pipe use and foster satisfaction of basic psychological needs through fun, interesting and engaging activities	• Sport • Arts and craft • Chess, darts • Chill Lounge • Movies • Woodwork • Sewing • Volunteering

Table 7. Teachers, community and social media prong

Module	Aim	Activities
Teachers workshop focusing on risks, reasons for hookah pipe use and BPN.	• Teachers will have improved understanding about hookah pipe use, BPN, motivation and development. This will enable teachers to support and advise adolescents appropriately	• Workshop • Icebreakers • Games • Discussion • Case studies
Community awareness and education about the hookah pipe and BPN	• Encourage a reduction and create a sense of disapproval towards the hookah pipe in the community and in homes	• Community walk • Speeches • Community event
Social media campaigns	• Reduce adolescent hookah pipe use and increase awareness of basic psychological needs • Distribute accurate and desensationalised information	• Memes/animations • Hashtags • Videos • Filters and borders • Chain messages

mental health challenges and child welfare challenges. They also identify the merits of strengths-based and arts-based mindfulness group methods as a manner of engagement, help and support.

"Non-school going children, their cognitive ability may not be on par with their biological age. Consider more picture based therapeutic activities and also role playing and drama therapy (Line 604–606)"

3.2.1.2. Cravings and relapse. There was also a recommendation to add a session about managing cravings and planning for relapse. This was deemed important because cravings and relapse are common in substance abuse management. It is therefore important to explore triggers and obstacles and plan ways to overcome them by developing skills such as assertion, decision-making, conflict management and so forth. This view was consistent with Chatterjee et al. (2019) who asserts that identifying what may cause cravings and relapse is important as each person has different individual, environmental and emotional influencing factors. Understanding what may trigger cravings and relapse allows adolescents to manage and prevent it.

"Adolescents must be aware that a craving only lasts a couple of seconds and it is what they do in these couple of seconds that is crucial. If they do not divert their attention, they will use (Line 49–650)"

Table 8. Intervention format and logistics (REAIM)

Reach	• Recruited via. word of mouth, advertisements, social media, schools, community programmes, substance abuse facilities, religious institutions and hospitals • Any adolescents aged 13–19 who currently use the hookah and have at least one family member who will commit to attending the family component of the programme will be included. • Adolescents who are involved in gangs, use of any substance besides hookah, alcohol, cannabis or cigarettes and/or severe medical or psychological condition that does not allow the individual to interact with the other adolescents' or understand consent procedures will be excluded • Participants and their family must complete at least 80% of sessions or they will not successfully complete the programme • When adolescents' and their family members attend the intervention, it is expected that younger siblings and other family members benefit indirectly
Efficacy	• The programme will have monitoring and evaluation processes in place to ensure that the intended objectives will be achieved. A Pre and Post design will be used
Adoption	• The intervention is intended to occur either at a school or a community hall/centre that is safe and accessible for most of the participants and their family • Consultations will be held with community leaders and school management. Train community members as community officers to implement the programme • The intervention is developed in conjunction with adolescents and a host of experts and community leaders
Implementation	• Resources will include PowerPoint presentation, role plays, pamphlets, sport equipment, arts and craft materials, books, computers, play stations, diaries, stationery, sewing machines, couches and vehicles • Registered Counsellors, social workers, teachers, media and communication officers, child and youth care workers, social auxiliary workers, nurses, clinical psychologists, trained community officers, volunteers, community people who have a specific skill, such as woodwork, sewing, business skills, etc., will conduct the sessions. Everyone working in the programme will receive training so that they have a thorough understanding of adolescent hookah pipe use and basic psychological needs • Sessions will occur weekly for 10 weeks. Thereafter, they may still attend afterschool activities and community interventions
Maintenance	• Telephonic calls for the first 4 months fortnightly thereafter monthly, school visits, interviews and questionnaires. Home visits could occur when there is a challenge with telephonic contact. A database will contain information about the participant which will make tracking progress easier

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3.2.2. Prong 2: family prong

3.2.2.1. Family assessment, complexities of families and family environment after the programme. Participants indicated that it is necessary to conduct a family assessment which explores roles in the family, parenting styles, attachment styles, assessing family functioning either in session one or prior to the commencement of sessions. Also, families should have a clear understanding about how their actions and attitudes influence adolescents' behaviour and choices. Assessing the family is important because it may provide insight into the challenges the adolescents face and it could provide new perspectives on how to intervene with the adolescent effectively. Gaining information about the family is also helpful in ascertaining the type of support the adolescent will have during and after the intervention. Stormshak et al. (2011) identify the value of including families in interventions aimed at adolescents because they can have an impact not only on problem behaviours and adolescent needs but also influence substance use. However, it is important that the intervention allows for flexibility when including families because of their commitments, childcare constraints, willingness and attitudes toward their adolescent's behaviour or the intervention.

"By understanding families, we can establish rapport. This can be achieved by using family mapping activities (Line 699–700)". When implementing the family prong, practitioners must be aware that family may differ from person to person and family does not necessarily refer to the nuclear family.

"There is a lot of guilt, trauma that the children face and are exposed to. A lot of them are withdrawn. Also with regards to family, it may not be the biological family (line 662–663)"

Most importantly, participants indicated that the environment must change, once an adolescent completes the hookah cessation programme, he/she cannot be exposed to the same triggers as before in the family environment otherwise the adolescent would inevitably relapse. Families should be cognisant about the challenges adolescents may encounter as a result of adjusting from a being hookah pipe user to a non-user. Families should support adolescents effectively by encouraging abstinence and striving for positive engagement. This will allow for open communication should the adolescents experience triggers, have cravings or consider relapse. Gibbons (2019) asserts that it is important that adolescents receive continuous support so that they can continue to refrain from smoking the hookah pipe, they do not start or continue using other substances, they experience personal growth particularly through having their basic psychological needs met, they enhance self-reliance and they experience appropriate social functioning within their environment.

"Parents cannot smoke in front of the children or allow other family members to smoke in the home. The adolescents need role models, especially the boys (line 720–721)"

3.2.2.2. Denial, avoidance and practical strategies (added intervention components). When discussing perceptions, harm, gateway and addiction of hookah pipe, participants thought it was important to explore avoidance and denial. Furthermore, participants indicated that all sessions must have practical strategies which family members can practice between sessions. Denial is a common characteristic among families of adolescents who use substances. Often the hookah pipe is not considered a substance by families as it is perceived as harmless. Therefore, when parents believe that their child is experimenting with alcohol and other drugs they are more likely to intervene to ward off future substance use. This is concerning considering that hookah pipe use is a gateway to other substances therefore it requires the necessary attention from family members, especially parents (Curtis et al., 2019). Implementing practical strategies between sessions such as rules and consequences, monitoring activities and open communication about hookah pipe smoking and other substances is important to reduce adolescent hookah pipe use (Curtis et al., 2019).

"Parental skills must flow out of the SDT sessions. There should be tips that parents can apply at home (Line 716–717)"

3.2.3. Prong 3: afterschool and weekend prong

3.2.3.1. Inclusion of younger children. There is a need to include younger children into this component of the programme because the previous phase of this study indicated that children are smoking the hookah pipe from a very young age. Participants also provided anecdotal accounts of witnessing children younger than 10 years old smoking the hookah pipe. This finding is confirmed by Combrink et al. (2010) who found children younger than 10 years old were smoking the hooking pipe as a result of boredom and a lack of recreational opportunities.

"Include young children, like grade 2. Start discussing the awareness and consequences of the problem. Make it known that it is a danger. So at age 13 they are well aware of the consequences (line 725–726)"

3.2.3.2. Opportunity to relax. Besides the mentioned activities, participants felt that a space is needed where adolescents can simply relax. Often the reason for use is to relax; therefore, the intervention place should create an environment which is stress-free and allows the adolescents to simply relax or calm down after a challenging day. Having an opportunity to relax is very important as smoking the hookah pipe is considered a source of stress relief by adolescents (Roohafza et al., 2015). Therefore, if adolescents are provided an opportunity to relax and have fun, this could replace their need to smoke as a source of stress relief.

"The after school activities must be fun, educational and provide an opportunity to relax. This is important to prevent the use of the hookah pipe (line 732–733)"

3.2.3.3. Creation of opportunities related to sport and recreation. For the participants that are interested in structured activities such as chess, create opportunities for competitions with other clubs. Local competitions can be created in preparation for larger competitions, this will not only divert the desire to smoke, but it will also contribute to the satisfaction of needs as one chooses which activity to participate in, one feels competent when one is chosen to play or wins a competition and one experiences a sense of relatedness with fellow team members. When the common interest is no longer hookah pipe smoking but an activity, adolescents may be deterred from smoking and focus on their new hobby. Common interests irrespective of whether it is chess, sport, internet games or study play a pivotal role in the internal connection of a group. The common interest allows for the group to experience a sense of cohesion and for meaningful friendships to form from these opportunities (Xiao et al., 2018).

"Competitions can be created and an environment can be created not to go smoking the hookah pipe. Their days will be filled with school, after school activities and on weekends they can look forward to competitions (line 735–737)"

3.2.4. Prong 4: teachers, community and social media prong

3.2.4.1. Banning hookah pipes. Participants felt that this prong should focus on banning hookah pipes in schools and in the community. Hookah pipe smoking should be banned in public spaces such as schools and in the community because it encourages more adolescents to smoke and it is a health and safety hazard. This view is consistent with other countries such as the Costa Rico, Israel, Turkey and Ukraine who have banned hookah pipe smoking in public spaces (Jawad et al., 2015). Furthermore, policies related to tobacco control have been enforced in many countries; such as smoke-free environment, restrictions on sales of tobacco products to minors, ban on the advertising and increasing taxes of tobacco products (Al-Bakri et al., 2015).

"Communities must be taken to task through community awareness campaigns. Hookah in public spaces should be fined. We also challenge the communities to get involved and also start banning it from their community. We need to tighten our laws and when you have broken the law, it should be taken seriously (line 746–749)"

3.2.4.2. Partnering with government. They also indicated that there is a need to partner with Government departments such as Department of Social Development, Department of Health, Department of Education and the Department of Communications who can ensure that accurate information is distributed. Partnering with the government is an effective way to actively participate in the shaping of policy and its implementation. Intervention studies have shown that partnering with the government allows for a mutually dependent and mutually beneficial relationship that allows for improved service delivery and greater reach (Jose et al., 2017; Kader & Roman, 2019).

"The Department of Communication should put out accurate information and parents and adolescents will know that this is a reliable source. This notion of hookah pipe use being less harmful is not true so the correct information must be provided to avoid miscommunication and skewed perceptions (line 756–758)".

3.2.4.3. Portrayal of hookah pipe use. The participants identified the media as a cause for concern especially when smoking the hookah pipe is considered cool or prestigious. Media has a powerful role in how the hookah pipe can be perceived by adolescents. When the hookah pipe is portrayed as fun, a stress reliever and/or a social activity, adolescents are lured towards it. Similarly, if the hookah pipe is portrayed as dangerous or harmful, more people would guard against it. It is important that when media is considered, one must recognise what type of media adolescents is exposed to. For this reason, there is a need to raise awareness not only through traditional mediums such as the television, billboards and radios but also social media, Netflix and other mediums that could reach adolescents (Barker et al., 2019; Len-Ríos et al., 2016).

"Adolescents are constantly exposed to hookah pipe use and their accompanying substances. It is also concerning when the person on TV that is smoking the hookah pipe is wearing a suit and appears successful because it will be assumed that in order to be successful, you must smoke the hookah pipe or this is how successful people relax. We must be mindful about what plays on our television. Same applies with the use of billboards. We must use it to raise awareness (line 759–764)"

3.3. Intervention format and logistics (REAIM)

Participants approved of the RE-AIM framework but included seven points to consider (1) consider accessing adolescents through fitness clubs and allow fitness instructors or sport science students to facilitate some of the afterschool and weekend activities, (2) add a membership element to the intervention to entice the participants. In other words, make it cool to attend, (3) clarify to what extent of gang involvement will be allowed into the intervention and consider referrals for the excluded participants, (4) host the intervention where adolescents would like to be, for example, a community centre or a gym, (5) consider implementing the intervention using apps and websites and have WhatsApp and face to face support groups, (6) implementers should not only have knowledge and skills, they should be able to lead, facilitate group activities, be comfortable with public speaking, be relatable, be approachable, be open-minded and empathic, and (7) regular participant feedback which assesses not only their progress but recommendations to improve the intervention too.

Furthermore, two important gaps were identified in the intervention design (1) how to motivate adolescents and their families to attend the sessions and continue attending the sessions and (2) there should be another element after the 10-week intervention as a form of maintaining of abstinence. Failure to have this phase may result in relapse.

3.3.1. Participants general sense of the intervention

Overall, the stakeholder panel found the intervention valuable and feasible. They indicated the intervention was holistic and that is important because the adolescent does not live in isolation, he or she is impacted by the school, family and home environment. A major consideration would be the inclusion of a support phase after the 10 week programme to encourage continued abstinence.

"I think that this was very insightful and amazing what you invested so far. Our communities need this. (line 508)"

4. Discussion

This study aimed to design an intervention to reduce adolescent hookah pipe use and satisfy basic psychological needs in collaboration with those working and contributing to the field of substance abuse with a specific interest in adolescents, the hookah pipe and SDT. Overall, the panel was in favour of the layout of the intervention and the four-pronged approach because of the holistic nature. The intervention provides support, education, counselling and practical skills that can facilitate a reduction in adolescent hookah pipe use and contribute the satisfaction of their basic psychological needs. However, the panel made seven noteworthy suggestions to enhance the intervention. The feasibility and acceptability of these enhancements will be discussed in this section.

(1) **Adding a session about managing cravings and relapse prevention for the adolescents**: This is a good proposition because cravings are associated with relapse (Ferguson & Shiffman, 2009; Livingstone-Banks et al., 2019). Cues or temptations can provoke cravings and highlight individual differences in how users respond to cues therefore an element of reflection and journaling can occur in order to identify the cues, manage the craving and prevent relapse. Activities could focus on exercising, changing location, taking part in a distracting activity or employing a "buddy system" where a friend from the group can support during the cravings or thoughts of relapse (Ferguson & Shiffman, 2009; Livingstone-Banks et al., 2019). It may not be necessary to add a session to the programme as this topic can be covered in session 10 in prong one which focuses on relaxation and coping mechanisms. An aim can be added to make reference to cravings and relapse.

(2) **Adding a session about avoidance and denial for family members**: Family members may adapt to protect and accommodate the user. Often this adaption involves denial to avoid addressing the issue (Gruber & Taylor, 2016). As a result, family rules and boundaries are reduced in intensity. This denial and avoidance allows for the masking of the dependency behaviour (Gruber & Taylor, 2016). Therefore, it is necessary to address family members' feelings and behaviours related to denial and avoidance of their adolescent hookah pipe users. For these reasons, it would be essential to add another session to prong two which will focus on families' denial and avoidance. The session can extend beyond the adolescent hookah pipe use and discuss denial and avoidance of one's own hookah use or other family members use. Activities could include reflective worksheets and discussions.

(3) **Family assessment using family mapping**: The Family Map Inventory is used to assess family strengths and needs. It allows for an assessment of the family and parenting context. Furthermore, it facilitates a process to talk about important family topics that influence adolescents' healthy development. The process often happens during a home visit (Kyzer et al., 2016). Since the nature of the programme is not a family functioning programme which allows for extensive family therapy or home visits, including this assessment may not be appropriate. However, the idea of an assessment before the commencement of sessions has merit as it can provide valuable insight before working with the adolescents and the families. This could tie in with the recommendation participants had about changing the environment where the adolescents will be after the intervention. The insights of the assessment could be incorporated into the existing intervention to encourage an environment that would support adolescents after the intervention. If further family intervention is needed, adolescents and families can be referred.

(4) **Including younger children**: It would be beneficial for younger children to have adequate knowledge about hookah pipe smoking and have the skills to decline when offered to experiment as studies have found children younger than 10 years old using the hookah pipe (Roman et al., 2017). However, it may not be suitable to include children younger than 10 years old in this particular intervention as their developmental levels are different to that of an adolescent. This means that the way they learn, their interests and attention span are significantly different

from adolescents (Pulkkinen, 2017). An adapted programme would need to be developed that would cater specifically to younger children at risk of hookah pipe smoking.

(5) **Sport and recreation competitions**: Sport and recreation is important for adolescent's health, socialisation and civic engagement (Rotolo et al., 2020). SDT recognises the positive impact of sport on adolescents' satisfaction of basic psychological needs. For most adolescents, sports and recreation activities create opportunities for successfully competing tasks and adapting to the demands of the environment, having meaningful input into decisions and acting in accordance with one's interests and values and an opportunity to feel valued, connected and important to others. The more autonomous, competent and related individuals feel, the more likely they are to be self-determined and intrinsic in their motivation (Bejar et al., 2019). Since competitions are more intense than playing recreationally, Amorose et al. (2009) investigated changes in athletes' need satisfaction and well-being throughout a competitive season and found that increases in athletes' need satisfaction corresponded to improved well-being. The motivation and satisfaction of needs can be channelled to engage more in these sport and recreation behaviours and less in hookah pipe smoking; therefore, the addition of competitions will be added in this intervention to enhance the outcomes of prong 3.

(6) **Partnering with Government**: Collaboration with government departments was noted as this would add a valuable aspect to the intervention especially partnering with the Department of Communications who is able to educate via various channels. They can also influence how the hookah pipe is portrayed within various mediums of communication. Collaboration provides a constructive way to share responsibility, deliver more salient decision-making processes which incorporate the needs of those affected and widen the reach (Howarth & Morse-Jones, 2019). Partnering should not only include government departments but also non-governmental organisations, research organisations, faith-based organisations and community leaders (Howarth & Morse-Jones, 2019). Therefore, this recommendation is noted and will be utilised for the success of this intervention. A memorandum of understanding would need to be established in order to define the roles and responsibilities of the various stakeholders.

(7) **Using apps and websites as a mode for the intervention**: The number of adolescents participating in on-line activities is increasing with the rapid rise of the internet age worldwide (Liu et al., 2016). Therefore, the idea of having a digital intervention is promising. However, this may not be feasible in the South African context because of the high poverty rates (Posel & Rogan, 2016). Lack of access to the internet and exorbitant data charges would affect many adolescents and their families access to the intervention. Even if adolescents have access for short periods, they may not be able to have access to all the sessions or even the full session. Manduna (2016) refers to these experiences as digital poverty that results from broadened socioeconomic and political gaps. Although a large number of middle- to high-income adolescents and their families may have access. Initially, it may not be appropriate to digitise the intervention but information, podcasts, activities and videos could be uploaded on an app and website as an extension to the four-pronged intervention for adolescents and families who have access or prefer a digital intervention.

The other minor suggestions to enhance the intervention appear feasible and can, therefore, be incorporated into the intervention. The minor suggestions include providing a space to relax, banning hookah pipes by educating community members through community awareness activities, having intervention practitioners who are relatable and able to intrigue adolescents and families, having a support group via WhatApp and face to face, hosting the intervention at a place where adolescents (and families) enjoy, adding a membership element as well as monitor and evaluate adolescents, families and programmes success and challenges.

The main contribution of our study can offer is an intervention to reduce adolescent hookah pipe and at the same time strive to provide contexts where their basic psychological needs can be

satisfied. The intervention is unique as it offers a holistic approach to intervening in hookah pipe use by including the adolescent, their family, their teachers and their community. This study was also the first known study to intervene in hookah pipe use from an SDT perspective. SDT mainly focuses on the individual but it recognises the important impact the environment has. This is why SDT is the most suited theoretical underpinning for this intervention as it allows the focus of the intervention to be on the adolescent hookah pipe user but also considers the school, family and community context because these contexts are where adolescent's needs are either satisfied or frustrated. Since family members, teachers and community members are involved in the intervention, by default, they also benefit from the intervention by becoming more aware of the dangers of hookah pipe smoking and the need to foster satisfaction of needs within the context they coexist with the adolescent. They also learn important strategies on how to encourage a reduction in hookah pipe use and how to satisfy needs. These new ideas can be implemented within their own contexts hereby increasing the reach of the intervention. This intervention can be applicable to resource-constrained communities because the resources and intricacies are minimal, especially if implementers collaborate with Government and other organisations that are focused on improving health and promoting social development. The range of implementers can include volunteers, paraprofessionals and professionals in order to reduce personnel costs. In higher-income contexts, the resources may differ (for example, in low socioeconomic contexts, a recreational community hall can be used for the intervention whereas in high socioeconomic contexts, a gym dedicated to this intervention could be bought or hired). Irrespective of the socioeconomic contexts, the layout and content of the intervention should remain. The manner of implementation would naturally be context specific as implementers would need to consider cultural, religious, gender, political, community and other dynamics. As a result of its flexibility, this intervention can be a contribution or stepping stone to practitioners, policymakers, researchers and teachers who endeavour to reduce hookah pipe use and satisfy basic psychological needs.

5. Limitations

Whilst the perspectives of adolescents and stakeholders were incorporated, this study was not able to acquire the perspective of teachers and family members. This would have added value as the intervention prongs cater to families and teachers. Another limitation was that this study did not explicitly create an "aftercare programme" which would support adolescents after the intervention. It was implied that adolescents can participate in prong 4 and this will serve as a safety net and "aftercare programme". Having the support of an intervention would have been helpful to prevent relapse but the intervention makes allowance for partnering with stakeholders in the community and with the government. This means that adolescents are able to join these programmes so that they are occupied and receive some form of support. The programme staff conducting the four-pronged intervention could formally partner with community stakeholders to ensure that the adolescent receives the necessary continuity of care and support. The third limitation of this study was that only one theory was considered to understand a part of the problem. Using a different theory would have yielded different or additional insights, but the authors agree that SDT was valuable in proving an understanding of basic psychological needs, motivation and the importance of ensuring that the adolescent's context provides opportunities to thrive or be hindered. Lastly, even though the inputs from the adolescents were considered based on their responses in the qualitative and quantitative components of the larger project, the intervention was not presented to them to determine if it would attract them. Although this could still occur. This study was conducted in South Africa which may limit the potential generalizability of the results but this work is significant because interventions specifically aimed at reducing hookah pipe use are scarce globally. Therefore, the results could be useful to an international audience as it brings a new perspective on intervening in hookah pipe use.

6. Future research

Future research should focus on obtaining perspectives from families and teachers. The intervention could be presented to adolescents and they could provide feedback indicating whether this intervention would attract adolescents and whether they would find the activities and messages

interesting and valuable. The four-pronged intervention could be done as a randomised controlled study to determine the impact the intervention may or may not have as well as the intended and unintended benefits and outcomes of the intervention. This intervention could be implemented in a number of different contexts and/or countries and the results could be compared in terms of effectiveness and challenges. Future research could extend on this study by designing an aftercare programme would cater to adolescents and families who require added support after the four-pronged intervention.

7. Conclusion

This study has presented the design of an intervention to reduce adolescent hookah pipe use and satisfy basic psychological needs. It has highlighted the value of not only intervening with the adolescent hookah pipe user but including their parents, teacher and community members as well. Moreover, it has provided guidance on how to recruit adolescents for the intervention and how to encourage cooperation from the community to adopt the intervention. An outline has been provided on how the intervention should be implemented. The importance of measuring the impact and effectiveness of the intervention is also articulated by emphasising the need for monitoring and evaluation. This article has provided a comprehensive design of the intervention. The next step would be to obtain feedback from a group of adolescents to gain their input. Community leaders and stakeholders should be consulted because they have important information about existing interventions, the target population and the setting where the intervention is expected to be delivered. It is vital for the intervention to fit the implementation context. Community members need to "buy in" to the intervention in order to support and have a sense of ownership. The intervention must be able to meet the specific needs of the community and target audience without changing the focus of the intervention aims. Once the intervention has been considered favourable, manuals for implementation should be written and the intervention should be piloted to test for feasibility. After challenges have been identified and rectified, the intervention should be replicated in a host of communities to determine adaptions for various contexts and increase reach. Monitoring and evaluation strategies should be employed throughout the process.

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Competing interest

The authors declare no competing interest.

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Appendix A. Quantitative Questionnaire

Please complete the following information about you by ticking the correct response or writing the response in the block provided.

No.	Item	Response					
	Please tick the correct block						
1	Are you a boy or a girl?	Boy			Girl		
2	What is your race?	White	Coloured	Black	Indian	Other	
3	What language do you speak at home?	English	Afrikaans	IsiXhosa	Other		
4	Who do you live with?	Both Parents	Mother Only	Father Only	Sisters and brothers only	Other family (grandparents/ aunt/uncle/ cousin etc.)	
5	Are your parents	Married	Divorced	Separated	Living together	Single because one parent died (widow)	
	Write the answer in the block next to the question						
6	How old are you?						
7	Which school do you attend?						
8	Which grade are you in?						
9	Which area do you live?						
10	How many people work (have jobs) in your house?						
11	Are any of these substances used in your family?	Dagga	Yes	No	I Don't Know		
		Mandrax	Yes	No	I Don't Know		
		Heroin	Yes	No	I Don't Know		
		Cocaine	Yes	No	I Don't Know		
		Alcohol	Yes	No	I Don't Know		

SECTION B: PREVALENCE

The following questions are interested in your use of tobacco. Please answer carefully and honestly. No one will see your answers besides the researcher and her supervisors. You will not get in trouble for the answers you provide. Please tick the box with the answer that is true for you.

No.	Item	Response				
Please tick the correct block						
1	Do you smoke cigarettes	Yes		No		
2	How old were you when you started smoking cigarettes?					
3	Have you ever smoked hookah pipe?	Yes		No		
4	How old were you when you started smoking the hookah pipe?					
5	Do you still smoke the hookah pipe?	Yes		No		
	Only complete questions below if you said YES to number 3 otherwise continue to Section C					
6	Have you smoked hookah pipe in the past month	Yes		No		
7	Have you smoked hookah pipe in the past week	Yes		No		
8	How often do you smoke (please tick ONE box that is most true for you)	Daily	Weekly	Monthly	Once in a while	Experimentation
		1–2 times a day	1–2 times a week	1–7 times a month	Once every 3 months	Only tried once
		3–5 times a day	3–4 times a week	8–15 times a month	Once every 6 months	Only tried twice
		More than 5 times a day	5–6 times a week	More than 15 times a month	Once a year	Tried more three or more times
9	What age did you start smoking the hookah pipe	0–5	6–9	10–12	13–15	16–19

(*Continued*)

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(Continued)

No.	Item	Response				
Please tick the correct block						
10	Have you ever smoked a hookah pipe with dagga inside	Yes			No	
11	Have you ever smoked a hookah pipe with alcohol inside	Yes			No	
12	Will you ever stop smoking hookah pipe	Yes			No	
13	If yes, at what age?	10–19	20–29	30–39	40–49	50–59

Adapted from the hookah pipe questionnaire
SECTION C: HOOKAH PIPE

The following questions are interested in how much you know about the hookah pipe. Please answer carefully and honestly. No one will see your answers besides the researcher and her supervisors. You will not get in trouble for the answers you provide. Please tick the box with the answer that is true for you for all the questions.

	No.		Item	Response	
What do you know about the hookah pipe?					
Please tick the correct block					
1	Have you heard about the hookah pipe?	True		False	Don't know
2	The hookah pipe is a problem.	True		False	Don't know
3	The hookah pipe is harmful.	True		False	Don't know
4	The water in the hookah pipe filters out the tobacco toxins.	True		False	Don't know
5	Children can smoke the hookah pipe.	True		False	Don't know
6	You can get cancer from the smoking the hookah pipe.	True		False	Don't know
7	Children (aged 10–12) can smoke the hookah pipe	True		False	Don't know
8	Children (aged 13–19) can smoke the hookah pipe	True		False	Don't know
9	Where do you smoke the hookah pipe? (Please tick ONE box that is most true for you)	Public spaces		Family members house	At a friend's house
		Parks		Restaurant	At home
		School		Party	Other
10	Smoking the hookah pipe will lead to becoming an addict.	True		False	Don't know
11	Smoking the hookah pipe is a safer alternative to smoking cigarettes?	True		False	Don't know
12	Smoking the hookah pipe helps people relax	True		False	Don't know
13	The dangers of smoking the hookah pipe are exaggerated.	True		False	Don't know
14	Sharing the hookah pipe is harmful to one's health	True		False	Don't know
15	Hookah pipe smokers can easily quit	True		False	Don't know
16	Does your parents accept the use of the hookah pipe by family members?	Yes		No	
17	Does your parents accept if people use the hookah pipe in your family home who are not family members?	Yes		No	

(*Continued*)

	No.		Item	Response						
What do you know about the hookah pipe?										
Please tick the correct block										
18	Do you smoke the hookah pipe together with any of these substances?	Tik	Always		Sometimes		Never			
			I don't know							
			Heroine	Always			Sometimes			
		Never								
			I don't know					Dagga	Always	
		Sometimes		Never						
	I don't know		Cocaine	Always			Sometimes			
Never			I don't know							
	Alcohol	Always					Sometimes			
Never			I don't know							
	Other substances	Always					Sometimes			
Never			I don't know							
19	Who uses the hookah pipe in your house? (Select more than one)		Mother	Father			I use it			
		Brother						Sister	Other (who):	
20	Where is the hookah pipe smoked in your family?	Inside our house		Outside our house			Both			
21	Are there children present when the person smokes the hookah pipe?	Yes		No			Don't know			
22	Are there any children (2–6 years) who smoke the hookah pipe in your family?	Yes		No			Don't know			
23	Are there any children (7–10 years) who smoke the hookah pipe in your family?	Yes		No			Don't know			
24	Are there any children (11–15 years) who smoke the hookah pipe in your family?	Yes		No			Don't know			
25	Are there any children (16–17 years) who smoke the hookah pipe in your family?	Yes		No			Don't know			
26	Are there any persons aged 18–25 years who smoke the hookah in your family?	Yes		No			Don't know			
27	Are there any persons aged 26–35 years who smoke the hookah in your family?	Yes		No			Don't know			
28	Are there any persons older than 36 years who smoke the hookah in your family?	Yes		No			Don't Know			
29	Is the hookah pipe used in your family as a means of communicating between family members?	Yes		No			Don't Know			
30	Is the hookah pipe used in your family as a means of socializing in your family?	Yes		No			Don't Know			
31	Do family members talk easier with each other when they are smoking the hookah pipe?	Yes		No			Don't Know			

Hookah pipe questionnaire adapted from the College Health Behaviour Survey (2010–2011).

SECTION D: MOTIVATION (HOOKAH PIPE USERS)
ONLY ANSWER THESE QUESTIONS IF YOU SMOKE THE HOOKAH PIPE. Tick the box that is true for you.

No	Item	Not true at all	Not true	Some times true	True	Very true
	Interest/Enjoyment					
1	I enjoy smoking the hookah pipe very much.					
2	Smoking the hookah pipe is fun.					
3	I think smoking the hookah pipe is boring. (R)					
4	Smoking hookah pipe does not hold my attention at all. (R)					
5	I would describe smoking the hookah pipe very interesting.					
6	I think smoking the hookah pipe is enjoyable.					
7	While I do smoke the hookah pipe, I think about how much I enjoy it.					
	Pressure/Tension					
8	I feel nervous while smoking the hookah pipe.					
9	I feel stressed while smoking the hookah pipe.					
10	I feel relaxed when smoking the hookah pipe. (R)					
11	I am nervous while smoking the hookah pipe.					
12	I feel pressured to smoke the hookah pipe.					
	Perceived Choice					
13	I believe I have some choice about smoking the hookah pipe.					
14	I feel like it is my own choice to smoke the hookah pipe.					
15	I did not really have a choice about smoking the hookah pipe. (R)					
16	I felt like I had to smoke the hookah pipe. (R)					
17	I smoke the hookah pipe because I had no choice. (R)					
18	I smoke the hookah pipe because I want to.					
19	I smoke the hookah pipe because I have to. (R)					

Adapted from the Intrinsic Motivation Inventory
SECTION E: MOTIVATION (HOOKAH PIPE NON – USERS)

ONLY ANSWER THESE QUESTIONS IF YOU DO NOT SMOKE THE HOOKAH PIPE. Tick the box that is true for you.

No	Item	Not true at all	Not true	Some times true	True	Very true
	The reason I would not smoke the hookah pipe is:					
1	Because I feel that I want to take responsibility for my own health.					
2	Because I would feel guilty or ashamed of myself if I smoked.					
3	Because I personally believe it is the best thing for my health					
4	Because others would be upset with me if I smoked.					
5	Because I want others to see I can do it (not smoke).					
6	Because I have carefully thought about it and believe it is very important for many aspects of my life.					
7	Because I would feel bad about myself if I smoked.					
8	Because it is an important choice I really want to make.					
9	Because I feel pressure from others to not smoke.					
10	Because it is easier to do what I am told than think about it.					
11	Because it is consistent with my life goals.					
12	Because I want others to approve of me.					
13	Because it is very important for being as healthy as possible.					
14	I really don't think about why I would not smoke the hookah pipe.					
15	I don't really know why I would not smoke the hookah pipe.					

Adapted from the Treatment Self-Regulation Questionnaire (smoking)
SECTION F: BASIC PSYCHOLOGICAL NEEDS SCALE

Please tick the response that suits you best. Consider your feelings **during the last week**.

Please read each of the following items carefully, thinking about how it relates to your life, and then indicate how true it is for you.

No	Item	Not true at all	Not true	Some times true	True	Very true
Relatedness						
1	I feel a connection with people who care for me, and whom I care for.					
2	I am lonely. (R)					
3	I feel close and connected with other people who are important to me.					
4	I feel unappreciated by one or more important people. (R)					
5	I feel a strong sense of closeness with the people I spend time with.					
6	I have disagreements, fights or arguments with people I usually get along with. (R)					
Competence						
7	I am successful in completing difficult tasks and projects.					
8	I experienced some kind of failure, or I am not good at something. (R)					
9	I took on and did well in hard challenges.					
10	I did something stupid, that made me feel incompetent (hopeless/useless) . (R)					
11	I did well even with the difficult things.					
12	I struggled to do something I should be good at. (R)					
Autonomy						
13	I am free to do things my own way.					
14	I have a lot of pressures that I did not need (R)					
15	My choices express what I want.					
16	There are people telling me what I must to do. (R)					
17	I really do what interests me.					
18	I have to do things that I do not want to. (R)					

Adapted from the Balanced Measure of Psychological Needs Scale

SECTION G: ROLE OF THE FAMILY

The following questions are about your family. There are no right or wrong answers, only your opinions. Please tick the option which suits your situation the best.

No	Item	Not true at all	Not true	Some times true	True	Very true
Cohesion						
1	My family members really help and support one another.					
2	There is a feeling of togetherness in our family.					
3	Our family does not do things together. (R)					
4	We really get along well with each other.					
5	Family members seem to avoid contact with each other when we at home. (R)					
Conflict						
6	We fight a lot in our family.					
7	Family members sometimes get so angry they threw stuff					
8	Family members hardly ever lose their tempers. (R)					
9	Family members sometimes hit each other.					
10	Family members rarely criticize each other. (R)					
Laissez-Faire Family Style						
11	Members of our family could get away with almost anything.					
12	Family members are not punished or reprimanded when they did something wrong.					
13	It is unclear what would happen when rules are broken in our family.					
14	It is hard to know what the rules are in our family					
15	There is strong leadership in our family					
Family Sociability						
16	We are full of life and good spirits					
17	Our family enjoys being around other people.					
18	Socializing with other people often makes my family uncomfortable. (R)					
19	As a family, we have a large number of friends.					
20	Our family likes having parties.					

Adapted from the Family Functioning Scale
SECTION H: FAMILY SATISFACTION SCALE

Below are five statements with which you may agree or disagree. Using the 1–5 scale below indicates your agreement with each item by placing the appropriate number in the line preceding that item.

Be open and honest in your responding.

1— Strongly Disagree

2—Disagree

3— I Don't Agree or Disagree

4—Agree

5—Strongly Agree

_____1. In most ways, my family is close to my ideal

_____2. The conditions of my family are excellent

_____3. I am satisfied with my family

_____4. So far I have gotten the important things I want in my family

_____5. I would change almost nothing in my family

SECTION I: NEED FOR AN INTERVENTION TO REDUCE HOOKAH PIPE USE
Please tick yes if you think people who smoke hookah pipe needs help and tick n if you think they do not need help. Please comment in the box below – what do you think will make people that smoke hookah pipe stop smoking?

Do you think people who smoke the hookah pipe need help?	**Yes**	**No**
Please explain why		
What do your think will make people stop smoking the hookah pipe?		

Appendix B. Qualitative Interview Schedule

Age	**Grade**	**Name of School**
Gender	Race*	Which area do you live?
Language	How many people live in your house?	How many people work in your home?

**Race is requested purely for demographic reasons*

Hookah Pipe use has become very popular over the last 10 years and some people seem to like it. Some people say that it is fun and other people say it is dangerous. I would like to know more about the hookah pipe and what you think. There are no right or wrong answers. I am interested in your opinion. Can I ask you some questions so that you can help me learn more about this new fashion? No one will know what we speak about because this conversation is confidential and no one will be able to link you to this study. I need to record the information so that I can listen to our conversation again because it is important that I get all the facts right when I transcribe and write a report. The recording will be destroyed after the information has been transcribed (written). Is this ok?

Please tick

Yes	No	Sign	Date

Knowledge, Attitude and Perception

(1) What do you know about the hookah pipe?

(2) What do you think about hookah pipe use (or what comes to mind when you think of the hookah pipe, good thing, bad thing, etc.)?

(3) What do you think are the advantages and disadvantages of smoking hookah pipe?

(4) What do you think are the advantages and disadvantages of not smoking hookah pipe?

(5) What do you think, why do some people smoke the hookah pipe and others do not smoke hookah pipe?

(6) If you smoke hookah, would the important people in your life (such as family and friends) think it is good or bad. Please explain.

(7) ***How true is this statement***: You can stop using the hookah pipe for the next 3 months (if the person says that they do not smoke, generalise the statement by saying people can stop using …). Please explain

(8) ***How true is this statement***: You can stop using the hookah pipe forever (if the person says that they do not smoke, generalise the statement to saying people can stop using …). Please explain.

(9) ***How true this statement is***: The choice to smoke or not smoke the hookah pipe is completely up to you (if the person says that they do not smoke, generalise the statement by saying people can choose to use or stop using the hookah pipe). Please explain.

Prevalence

(10) Who do you think uses the hookah pipe (what type of people, e.g., age, race, status, etc.)?

(11) At what age do you think people start using the hookah pipe? (ask participant: why this age)

(12) What do you think about this age of use (too young, too old; explain)?

(13) When should people start smoking the hookah pipe?

(14) When should they stop smoking the hookah pipe?

(15) What do you think about people younger than you that smoke the hookah pipe?

(16) What do you think of adults that smoke the hookah pipe?

(17) What do you think of family members that smoke the hookah pipe?

(18) Do you have any family members that smoke the hookah pipe?

(19) Who do you know that uses the hookah pipe? (explore relationship, e.g., mother, friends, cousin)

(20) Sometimes, when we are not sure about a decision, we look to others. Who would you look at to help you decide if you should smoke the hookah pipe or not (explore relationship not names)?

(21) Why this person/people?

(22) Do you smoke the hookah pipe? Why or why not?

(23) IF YES: At what age did you start? Why did you start?

(24) Do you use it with other substances? If yes, ask which substances?

(25) IF NO: Have you ever experimented with hookah pipe and if so at what age.

(26) What made you start and stop?

Motivation FOR SMOKING the hookah pipe use

(27) Why do you smoke the hookah pipe?

(28) How do you feel when you smoke (the good and the bad? Probe physical and emotional)

(29) What do you enjoy most about smoking the hookah pipe?

(30) Who do smoke with and how do you feel when you smoke with these people?

(31) How does smoking the hookah pipe help you?

(32) Where do you smoke? Why here?

(33) Who knows that you smoke?

(34) How does or would your family feel about you smoking?

(35) Do you think people choose to smoke the hookah pipe out of their free will? Why do you say this? (ask: do you smoke because it is your choice, reflect on peer pressure)

(36) Do you think people feel proud about smoking the hookah pipe? Why?

(37) What about smoking the hookah pipe makes you feel *good?*

Motivation FOR NOT SMOKING the hookah pipe

(38) Why don't you smoke the hookah pipe?

(39) What benefits do you experience from not smoking?

(40) How do you feel when the people around you smoke?

(41) How do you feel when you are with people that do not smoke?

(42) Have you been offered a chance to smoke? How do you respond to this?

(43) How do your friends and family feel about you not smoking?

(44) Do you think people choose to not to smoke the hookah pipe out of their free will? Why do you say this? (ask: do you not smoke because it is your choice, reflect on feeling forced not to)

(45) Do you think people that do not smoke the hookah pipe feel proud about not smoking? Why?

(46) What about not smoking the hookah pipe makes you feel *good?*

Thank you for this information, you are really helping me understand so much more about the hookah pipe. I have a few more questions about learning about you. Are you still ok to continue? (If yes continue, if no, ask the person if they would like a short break and then ask if they ready to continue).

Basic Psychological Needs

Autonomy(47) In life, how free do you feel to do the things you like to do? (After response probe: for example, smoke hookah)

(48) How free do you feel to make important choices about your life? (After response probe: for example, smoke hookah)

(49) When do people tell you what to do and who are these people? (After response probe: about hookah)

(50) Do you sometimes feel forced to do things? Like what? (After response probe: for example, smoke hookah)

Competence

(51) What makes you feel successful or proud? (After response probe: Does smoking hookah (or not smoking) ever make you feel successful?)

(52) When do you feel successful or proud?

(53) Do you master difficult tasks? Tell me about that. (After response probe: Do you master it better if you smoke?)

(54) Do you sometimes feel useless and hopeless like you cannot do something right? (After response probe: Like smoke hookah—please explain)

(55) How do you respond to a difficult task? (After response probe: What do you do when something is difficult, e.g., maths, saying no to smoking hookah)

Relatedness

(56) What people do you consider close to you? (After response probe: Do you smoke hookah with these people?)

(57) How do you feel when you are with these people? (After response probe: How do you feel when you are smoking (or not smoking in the case of non-users) with these people?)

(58) How do you think these people feel when they are with you? (After response probe: When they smoke with you)

(59) How often do you feel lonely? Please explain (After response probe: Do you feel lonely When you smoke hookah?)

(60) Have you ever felt like the important people in your life do not appreciate you? Please Explain

(61) Are you able to talk to people about things that are important to you? (After response probe: Such as your hookah pipe use (or non-use))

(62) Are there people in your life who you feel close and connected with? Tell me a bit more about why you say this. (After response probe: What do they think about you smoking hookah?)

Family

(63) Tell me about your family?

(64) What do you like and what don't you like about your family?

(65) Are there people in your family that like to fight or use drugs? (ask what kind of drugs)

(66) How does this affect you?

(Particularly interested in close family such as parents/siblings or people living in the home)

Behaviour Change

(67) Do you think people can change their hookah pipe smoking behaviour? How?

(68) What will encourage teenagers to stop smoking the hookah pipe?

(69) **ONLY FOR HOOKAH PIPE USERS**: Would you be willing to stop hookah pipe smoking. Why or why not?

(70) **ONLY FOR HOOKAH PIPE USERS**: What situations will make it easy for you to not smoke hookah?

(71) **ONLY FOR HOOKAH PIPE USERS**: What situations will make it difficult for you to not smoke hookah?

(72) **ONLY FOR HOOKAH PIPE USERS**: What will encourage you to stop smoking the hookah pipe?

(73) What can hookah pipe users do instead of smoking the hookah pipe?

(74) What will make teenagers feel free to do the things they enjoy?

(75) What will make teenagers feel successful?

(76) What will make teenagers feel connected and close to the important people in their lives?

(77) If you could design a programme that would makes teenagers feel great, what would that look like?

Thank you so much for your time. This is really important information that you gave me

TO BE COMPLETED BY THE INTERVIEW CONDUCTOR

Name and Surname Signature Date

This interview schedule is based on the principles of self-determination theory and theory of reasoned action/planned behaviour.

Appendix C. Delphi Workshop Participant Demographic Details Form

Project title: The development of an intervention to meet the basic psychological needs and reduce adolescent hookah pipe use

Please complete demographics table below. This table provides the researcher with some background information about each participant and their expertise. All information is treated with the strictest confidentiality.

Name and Surname								
Gender			Race*			Age*		
Highest Level of Education (indicate course)								
Organization/Institution								
Department								
Role/Title								
Sector Please Tick √	Government/Policy Development		NGO/NPO/ CBO/FBO		Academia/ Research		Other Please indicate below	
OTHER:								
Number of years' work experience								
Number of years of experience with:		Substance use/Hookah pipe						
		Adolescents						
		Interventions: Plan/develop/implement/monitor/evaluate						
		Self-Determination Theory						
Please describe the focus of your work in relation to the focus of this workshop								

*Age and race is requested in order to demonstrate a representative and diverse participant group.

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