ACT for behaviour change in adults with poor oral health

Helene Werner

Department of Behavioral and Community Dentistry
Institute of Odontology
Sahlgrenska Academy, University of Gothenburg

UNIVERSITY OF GOTHENBURG

Gothenburg, 2021

ACT for behaviour change in adults with poor oral health

helene.werner@gu.se

ISBN 978-91-8009-268-5 (PRINT)
ISBN 978-91-8009-269-2 (PDF)
http://hdl.handle.net/2077/68052

Printed in Borås, Sweden, 2021
Printed by Stema Specialtryck AB

To my family, always in my heart

“The secret of change

is to focus all of your energy,

not on fighting the old,

but on building the new”

- Socrates

ACT for behaviour change in adults with poor oral health

Helene Werner

Department of Behavioral and Community Dentistry, Institute of Odontology
Sahlgrenska Academy, University of Gothenburg, Sweden

ABSTRACT

The aim of this thesis is to contribute to the knowledge about psychological methods for behaviour change in adults with poor oral health. Study I is a systematic review of behavioural interventions for individuals (≥ 13 years of age) with poor oral health. Study II presents an adaptation of the modern behavioural intervention of Acceptance and Commitment Therapy (ACT) to young adults with poor oral health. Studies III and IV are based on a randomized controlled trial (RCT) including 135 caries-active 18-25-year-olds in public dental care and evaluate the effect of the intervention developed in Study II. The intervention included two individual ACT sessions provided by a licensed psychologist in addition to oral health information, whereas the control group only received oral health information. The outcomes were oral health-related behaviours +2w and +18w after baseline, health attitudes and psychological flexibility +18w after baseline. Results: Study I included eleven publications based on nine RCTs in the review. The meta-analyses found little to no effect of the psychological interventions on oral health, oral health-related behaviours and attitudes. The statistically significant findings found in favour of psychological interventions were on plaque index, oral hygiene behaviours and toothbrushing self-efficacy. Studies on adolescents and patients with dental caries were missing in the literature. Study II presents the treatment rationale and manual for a brief ACT intervention for young adults with poor oral health. Study III found the intervention group to have improved significantly with regard to more oral hygiene behaviours than the control group, immediately after the intervention. Study IV found the intervention group to have significantly improved in more oral health-related behaviours than the control group, after 18 weeks. However, there were no significant differences between the study groups in the measured outcomes after 18 weeks. Psychological interventions have the potential to be effective at changing behaviours, but new and current behavioural interventions need to be developed and tested further in adult individuals with poor oral health.

Keywords: Behavioural interventions, Acceptance and Commitment Therapy, Oral health, Oral health behaviours, Attitudes, Young adults, Meta-analysis, Treatment manual, Randomized controlled trial

ISBN 978-91-8009-268-5 (PRINT)
ISBN 978-91-8009-269-2 (PDF)
http://hdl.handle.net/2077/68052

ACCEPTANCE AND COMMITMENT THERAPY OCH ANDRA BETEENDEINTERVENTIONER FÖR VUXNA MED DÅLIG ORAL HÄLSA

Den orala hälsan i Sverige är generellt god, även om karies, gingivit och parodontit är vanligt förekommande bland vuxna i befolkningen. Det finns ett flertal orsaker till oral ohälsa och beteenden, så som sockerkonsumtion och bristande oral hygien, är välkända riskfaktorer för dessa tillstånds uppkomst och utveckling. Som del i förebyggande och behandlande insatser behövs effektiva sätt att förändra beteenden. Psykologiska metoder kan tänkas vara användbara i det arbetet. Denna avhandling består av fyra delarbeten. Studie I var en systematisk litteraturöversikt som syftade till att undersöka effekten av psykologiska interventioner vid bristfällig oral hälsa. Studie II innefattade en metodutveckling av psykologisk behandling. Syftet var att ta fram en behandlingsmanual för Acceptance and Commitment Therapy (ACT) vid oral ohälsa. Studierna III-IV baserades på en randomiserad kontrollerad studie (RCT) vars syfte var att utvärdera effekten av interventionen som tagits fram i Studie II. Utfallsmått var orala hälsobeteenden (Studie III-IV) samt hälsorelaterade attityder och psykologisk flexibilitet (Studie IV). RCT-studien utfördes på två allmäntandvårdskliniker i Västra Götaland. Deltagarna var 18-25år och hade minst två manifesta kariesangrepp. Interventionsgruppen fick två individuella ACT samtal hos psykolog på kliniken, utöver standardiserad munhälsoinformation. Kontrollgruppen fick enbart standardiserad munhälsoinformation. Resultat: Studie I inkluderade 11 artiklar baserade på nio RCT studier och fann mindre eller inga effekter av psykologiska interventioner på oral hälsa, orala hälsobeteenden och attityder. De relativt låga, men statistiskt signifikanta effekter som fanns till fördel för psykologiska interventioner gällde plackindex, orala hälsobeteenden och tilltro till egen förmåga (self-efficacy) att borsta tänderna. Studie II presenterar en behandlingsmanual, med en kort version av ACT, för unga vuxna med dålig munhälsa. Studie III fann fler orala hygienbeteenden statistiskt signifikant förbättrade i interventionsgruppen än i kontrollgruppen direkt efter avslutad intervention. Studie IV fann inga signifikanta skillnader mellan grupperna efter 18 veckor, men analyserna inom grupperna visade att interventionsgruppen hade fler signifikant förbättrade orala hälsobeteenden än kontrollgruppen efter 18 veckor. Psykologiska beteendeinterventioner har potential att vara effektiva för att förändra beteenden, men såväl nya som gamla interventioner behöver utvecklas vidare och testas ytterligare för vuxna individer med dålig oral hälsa.

LIST OF PAPERS

This thesis is based on the following studies, referred to in the text by their Roman numerals.

I. **Werner, H.,** Hakeberg, M., Dahlström, L., Eriksson, M., Sjögren, P., Strandell, A., Svanberg, T., Svensson, L., & Wide Boman, U. (2016). Psychological interventions for poor oral health: A systematic review. *Journal of Dental Research, 95*(5), 506-514.

II. **Werner, H.,** Young, C., Hakeberg, M., & Wide, U. (2020). A behavioural intervention for young adults with dental caries, using acceptance and commitment therapy (ACT): treatment manual and case illustration. *BMC Oral Health, 20*(1), 233.

III. Wide, U., Hagman, J., **Werner, H.,** & Hakeberg, M. (2018). Can a brief psychological intervention improve oral health behaviour? A randomized controlled trial. *BMC Oral Health, 18*(1),163.

IV. **Werner, H.,** Hakeberg, M., & Wide, U. (2021). Long-term effect of a psychological intervention on oral behaviors and attitudes: a randomized trial. Manuscript.

CONTENT

ABBREVIATIONS

AAQ	Acceptance and Action Questionnaire
ACBS	Association for Contextual Behavioral Science
ACT	Acceptance and Commitment Therapy
ACT-FM	Acceptance and Commitment Therapy Fidelity Measure
APA	American Psychological Association
BCTs	Behaviour Change Techniques
CBT	Cognitive Behavioural Therapy
DAS	Dental Anxiety Scale
FDI	FDI World Dental Federation
GRADE	Grading of Recommendations Assessment, Development and Evaluation
HTA	Health Technology Assessment
ITT	Intention-to-treat
LoC	Locus of Control
MHLoC	Multidimensional Health Locus of Control
MI	Motivational Interviewing
NICE	National Institute for Health and Care Excellence
OCD	Obsessive-Compulsive Disorder
OHRQoL	Oral Health-Related Quality of Life
PICO	Population Intervention Comparison and Outcome
PP	Per Protocol
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PTSD	Post-Traumatic Stress Disorder
RCT	Randomized Controlled Trial
RevMan	Review Manager

RFT	Relational Frame Theory
SCMs	Social Cognition Models
SOC	Sense of Coherence
SPSS	Statistical Package for the Social Sciences
TDF	Theoretical Domains Framework
VLS	The Valued Living Scale
WHO	World Health Organization

INTRODUCTION

A healthy and meaningful life; how can that be achieved? Unfortunately, there is no right or simple answer. We can, however, strive for a healthy and meaningful life, even though it is not always an easy task. As humans, we have thoughts, emotions, behaviours and social contexts that sometimes enables healthy choices and sometimes lead to unhealthy ones, over and over again.

The majority of adults living in Sweden today are likely aware of important behaviours for their oral health. They have been informed at their dental visits that they should brush their teeth twice a day, eat sweets only once a week and not drink excessive amounts of sugary drinks. When I meet them in my clinical work, they are also often aware that using additional fluorides and interdental brushes or floss could be good for their oral health. However, the list of "what to do" is quite long, especially if general health is taken into consideration. You should exercise, eat healthy, stay away from smoking and too much alcohol, minimize stress and get enough sleep. Some of the unhealthy choices are also enjoyable in the moment, and I think most of us can identify at least one behaviour that we could potentially improve.

In this thesis I will look at oral health, behaviour change and interventions in dental care from a psychological perspective. As a clinical psychologist and researcher, I find so many possibilities to help and treat patients with oral disease inter-professionally, especially since behaviour change is often needed, which we as psychologists are trained to work with. Patients with depression, addiction or oral disease all have behaviours that can be altered in favour of health and wellbeing. I also believe that clinical work needs to be combined with research to improve the care of our patients. Clinical experiences need to be lifted from the individual treatment room to a context where it can aid other clinicians and patients. Furthermore, we need to find and implement effective interventions, as patients deserve the best available help. In this thesis I have focused on adults, in particular young adults, with poor oral health. They provide opportunities to not only treat disease, but to promote health, and in addition they are so much fun to work with!

After you have read my thesis, I hope you have a clearer picture of the psychological aspects on oral health, behavioural interventions and the potential of using psychologists for behaviour change in dental care.

Helene Werner

BACKGROUND

Unhealthy habits and behaviours, such as diets high in sugar, underusage of fluorides, use of tobacco and overuse of alcohol, are common and contribute to the development of oral diseases (WHO, 2020). Some of these behaviours are also well-known risk factors for other public health issues (e.g., diabetes, cardiovascular diseases, respiratory diseases and cancer). By modifying behaviours, oral diseases can be prevented or stopped from progressing (Chapple et al., 2017). Early stages, of for example dental caries, may even be reversed. Thus, behavioural interventions are needed in addition to other dental treatments (e.g., restorative treatment and mechanical cleaning), and also in addition to societal and political efforts (e.g., taxes and age limits for buying tobacco and alcohol products). Socialstyrelsen [National Swedish Board of Health and Welfare] (2011), acknowledges that there is a need for improved and extended use of behavioural interventions in dental care, and have among others called for additional research in this field.

Psychology, the scientific study of mental and behavioural processes (Morrison & Bennet, 2011), can support the dental and health care services with knowledge and new insights into how to improve prevention and treatment, where the individuals' habits and behaviours play a major role in the disease's aetiology and progression.

At the time of Study I available literature on behavioural interventions had focused on adults with periodontal disease (Renz, Ide, Newton, Robinson, & Smith, 2007). Although, untreated dental caries is reported as being the most common oral disease in the world (Bernabe et al., 2020). It is also relevant to intervene early, to stop these diseases from progressing (Chapple et al., 2017; WHO, 2017). Young adults could therefore be one important group to target. In Sweden, young adults have free access to dental care until they are 23 years old, and they are called for regular check-ups (Tandvårdslag [the Swedish Dental Services Act] (1985:125)). This provides unique opportunities to intervene and to empower young adults with tools of relevance for their future health. To help young adults develop healthy eating habits, for example, are of relevance both for their oral and their general health as adults (WHO, 2021).

This thesis explores the psychological methods used in dental care for behaviour change in individuals with poor oral health. It focuses on adults, in particular young adults, and dental caries, and describes the development and results of a new behavioural intervention for young caries-active adults.

ORAL HEALTH AND DISEASES AND THEIR DETERMINANTS

In 1946, the World Health Organization (WHO) defined health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity," and this definition has been intact and commonly used ever since (WHO, 1946). Over time, there has been a paradigm shift, from a biomedical model with the focus on disease, to a social model with an increased interest in health (Daly, Batchelor, Treasure, & Watt, 2013). The FDI World Dental Federation (FDI) has published a modern definition of oral health: "Oral health is multi-faceted and includes the ability to speak, smile, smell, taste, touch, chew, swallow and convey a range of emotions through facial expressions with confidence and without pain, discomfort and disease of the craniofacial complex" (FDI, 2021). This definition comprises a broad view of the mouth, including tissues, its function, and social and psychological aspects of health. It takes diseases affecting the mouth into consideration, but also recognizes that oral health means more than freedom from the oral diseases of caries and periodontitis, which most people commonly think of as conditions affecting the teeth.

Dental caries and periodontitis are prevalent diseases, and a large proportion of children, adolescents and adults are affected worldwide (Bernabe et al., 2020). The WHO (2020) has estimated that some 3.5 billion people are affected by an oral disease, of which dental caries and periodontitis account for the vast majority of cases. In the EU, oral diseases are the third most expensive diseases to treat, after diabetes and cardiovascular diseases (Peres et al., 2019).

Most adults are affected by dental caries and need treatment during the course of their lives (Bernabe et al., 2020). Around 10% of adults (middle-aged or older individuals) are diagnosed as having periodontitis. Both dental caries and periodontitis are more or less chronic conditions and share many risk factors with other non-communicable diseases (e.g., diabetes, obesity and cardiovascular diseases) (Peres et al., 2019). It is important to recognize this fact, as prevention of dental caries and health promotion work may also have some positive influence on these other diseases (Watt et al., 2019). For example, sugary foods and drinks are well-known aetiological factors for dental caries, especially in the case of frequent and heavy consumption. Such a diet is also linked to obesity and diabetes (Peres et al., 2019).

In Sweden, 60% of all 19-year-olds have dental caries (Socialstyrelsen [National Swedish Board of Health and Welfare], 2020). Another common oral health issue is gingivitis, an inflammatory disease of the oral mucosa surrounding the teeth that can lead to periodontitis (Peres et al., 2019). The prevalence of gingivitis among young adults in Sweden has over time been around 20% (Norderyd et al., 2015). In these oral conditions (dental caries, gingivitis and periodontitis), multiple factors are involved in the aetiology of the respective condition. They share this multifactorial model of aetiology with most non-communicable diseases. One model that attempts to describe the structure of the factors associated with health and disease that influence people's lives is the Dahlgren and Whitehead (1991) model (Figure 1).

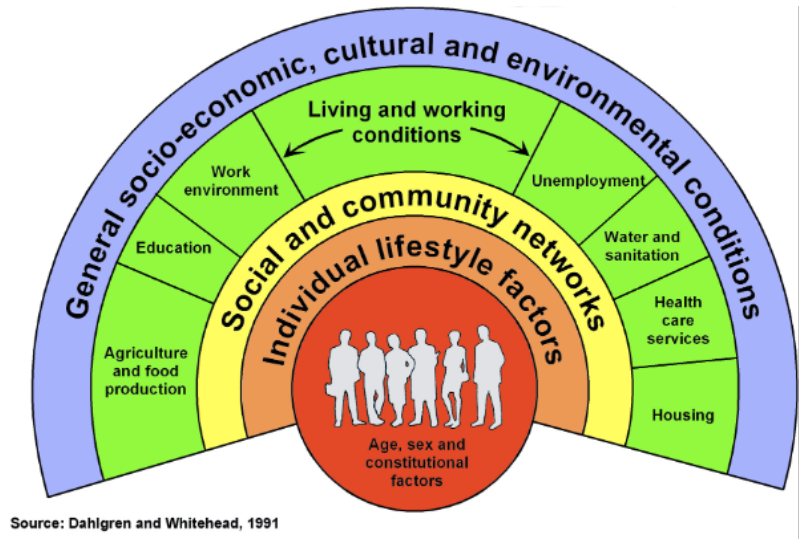

Figure 1. Colour version of the figure "The main Determinants of Health", by Dahlgren and Whitehead (1991), page 11 in the publication Policies and Strategies to Promote Social Equity in Health. Reproduced with permission from the Institute for Futures Studies, Stockholm, Sweden.

When this model is adapted to oral health and disease it is obvious that dental caries, gingivitis and periodontitis are multifactorial diseases with risk factors on different levels; individual, behavioural, social and factors pertaining to living conditions.

A more recent model of the structural determinants of health is the model by Watt and Sheiham (2012), found in Figure 2, which highlights biological, behavioural and psychosocial factors besides political and socioeconomic factors, in the causal chain for different diseases, such as dental caries and gingivitis.

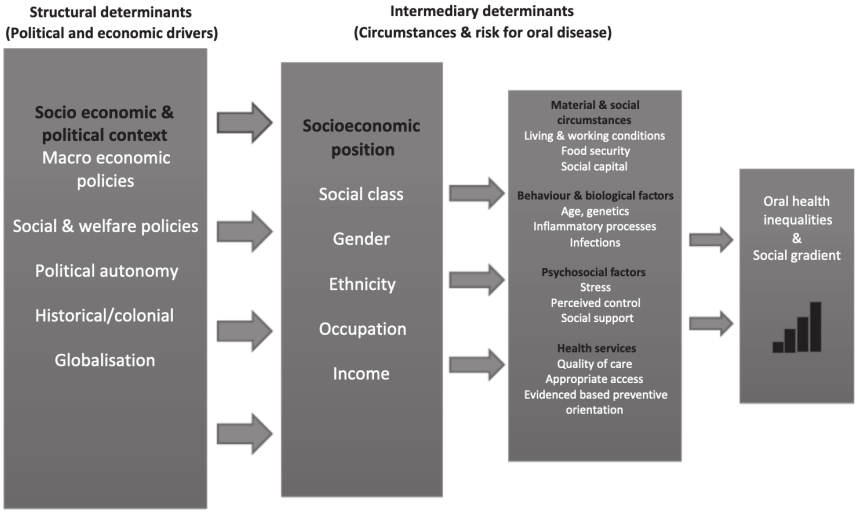

Figure 2. Integrating the common risk factor approach into a social determinant framework, by Watt and Sheiham (2012), page 293 in Community Dentistry and Oral Epidemiology. Reproduced with permission from John Wiley and Sons.

Applying this conceptual model may mean that different approaches and interdisciplinary collaborations are needed to tackle and prevent diseases. With regard to dental caries, effective behaviour change would be one important contribution to preventing and treating oral diseases.

When someone is affected by a disease, his/her everyday life may change. Dental caries, for example, may lead to suffering, including pain, limitations of functional aspects such as sleeping or eating, prevent social interactions, work or school activities (WHO, 2017). The perspective of the patient can be assessed through measurements of subjective experiences of oral health, and/or the multidimensional construct oral health-related quality of life (OHRQoL) (Locker & Allen, 2007). The answers to questions about subjective oral health provides subjective descriptions of the oral status (such as “poor” or “good”). Whereas OHRQoL is taking different consequences of

the oral status into consideration, through assessing the patient's own experiences and evaluations of these consequences. There is no consensus about how to define OHRQoL, but Inglehart and Bagramian (2002) have proposed a model (Figure 3) illustrating the relevance of OHRQoL for the individual's wellbeing and everyday life, through four groups of factors.

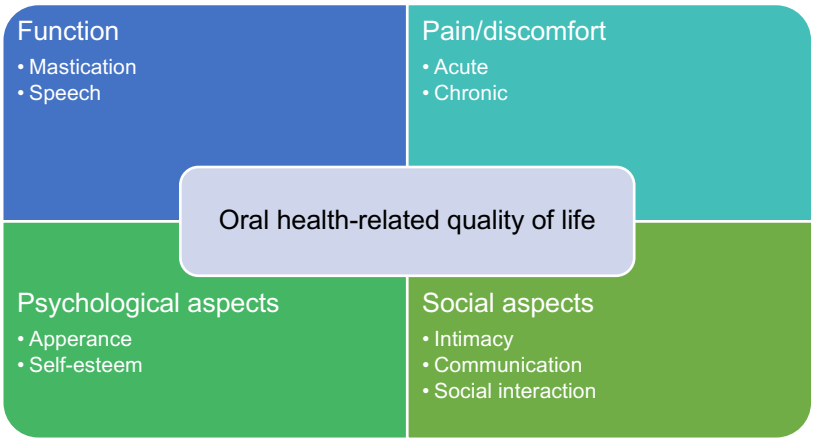

Figure 3. Colour version of the model of the main factors of oral health-related quality of life, by Inglehart and Bagramian (2002), page 3 in Oral health-related quality of life. Reproduced with permission from Quintessence Publishing.

OHRQoL has gained increasing attention and recognition over the last decades, in line with the shift in focus from treating disease to promoting health. A search in PubMed on "oral health-related quality of life" articles published until 2011 generates 600 articles, whereas a search until April 2021 generates over 2700 articles. Perhaps not surprisingly, research has found oral diseases, such as dental caries and periodontal disease, to be associated with poorer OHRQoL (Masood, Younis, Masood, Bakri, & Christian, 2019; Ng & Leung, 2006; Sischo & Broder, 2011).

Taking all the above into account, effective behavioural interventions for patients with oral diseases, such as dental caries, may not only improve their oral health, but also their general health, subjective experiences of oral health and OHRQoL. And for society, healthier individuals mean lower costs and more available resources (WHO, 2017).

BEHAVIOURAL FACTORS OF ORAL HEALTH

Behaviours can be protective of health, or increase the risk of disease (Chapple et al., 2017). The behaviour itself is rarely enough to cause a disease, but some behaviours clearly contribute to oral diseases and may even be necessary for a disease to develop. Different combinations of determinants may cause a disease, which Rothman (1976) illustrates in his "Pie model". In this model, a risk behaviour may be "a piece of a pie," combined with other determinants causing a disease, or combined with protective determinants limiting its consequences on, for example, oral health. Relevant health behaviours for oral health include a healthy diet, performing oral hygiene behaviours, attending dental care and refraining from tobacco and too much alcohol (WHO, 2020). At least half of all women and two thirds of all men in Sweden have at least one risk behaviour (Socialstyrelsen [National Swedish Board of Health and Welfare], 2018). There can also be a synergy effect, for those with multiple risk behaviours, where the total risk may be bigger than just adding up the risks from each behaviour.

Dietary habits, especially the intake of sugars influence oral health (WHO, 2020). A sugary diet is for example a necessary, although not the only cause, for caries initiation and progression (Chapple et al., 2017). A longitudinal study by Bernabé, Vehkalahti, Sheiham, Lundqvist, and Suominen (2016), found a dose-response relationship between the intake of sugars and dental caries in adults; the higher the consumption of sugars, the more dental caries. A high consumption of soft-drinks and sweets have in adolescents been found to increase the risk of dental caries (Chapple et al., 2017). In an epidemiological study in Jönköping in Sweden, about 20% of the 20-year-olds reported consumption of soft drinks ≥ several times/week (Norderyd et al., 2015). The WHO recommends a maximum intake of 10%, preferably 5%, of free sugars (found in sweetened beverages, cereals, cakes etc.) of our energy intake per day, to minimize the risk of dental caries (WHO, 2020). According to the national guidelines for dental care in Sweden, adults attending dental care should be supported to change habits involving excessive intake of sugar (Socialstyrelsen [National Swedish Board of Health and Welfare], 2011).

Performing oral hygiene behaviours regularly, is of great relevance to prevent oral diseases such as periodontitis and dental caries (Jepsen et al., 2017). In Sweden, Socialstyrelsen [National Swedish Board of Health and Welfare] (2011) recommends improved oral hygiene behaviours for patients with, for example, gingivitis or chronic periodontitis. To prevent dental caries, toothbrushing twice a day with fluoridated toothpaste is

recommended, and patients with an increased risk of developing dental caries are also recommended different types of additional fluorides. In addition, dental cleaning devices are often recommended in clinical practice, to clean approximal (between) sites effectively. A Cochrane review (Worthington et al., 2019) found low-certainty evidence of flossing reducing gingivitis when the patients already brush their teeth, and inconsistent results when it came to the effect of flossing on plaque. They also found the certainty of evidence for interdental brushes or toothpicks in addition to toothbrushing to be very low. Thus, interdental tools may have a positive effect on oral health, but more research is needed. An epidemiological study in Jönköping, Sweden, found that 85% across different age groups reported toothbrushing twice a day or more, and that 3-14% among the 20-40-year-olds regularly used toothpicks (Norderyd et al., 2015).

Almost 80% of adults in Sweden *attend dental care* on a regular basis (Socialstyrelsen [National Swedish Board of Health and Welfare], 2011). However, 20% do not attend dental care on a regularly, potentially increasing the risk of poor oral health, and socioeconomical factors, gender, age and ethnicity are seen as possible reasons for this. Hakeberg and Wide Boman (2017), for example, found low socioeconomic position to be associated with irregular dental care attendance among adults in Sweden.

Refraining from tobacco is another important oral health-related behaviour. Smoking is a major cause for oral cancer and a well-documented risk factor for periodontal diseases (Bernabe et al., 2020; Duarte et al., 2021). There is even a dose-response relationship between tobacco usage and periodontitis; the higher the consumption of tobacco the higher the risk for periodontitis (Chapple et al., 2017). The onset for tobacco usage is most common during adolescence (WHO, 2021).

Another risk factor for oral health is *alcohol consumption.* Heavy alcohol consumption increase the risk for oral cancer (Sheiham & Watt, 2000), and alcohol consumption has been positively associated with periodontal diseases (Ramseier & Suvan, 2015). Alcohol consumption also often co-occurs with other risk behaviours, and increases the risk of injuries (Sheiham & Watt, 2000). Worldwide, more than 25% of 15-19-year-olds drink alcohol regularly (WHO, 2021). In Sweden, alcohol consumption is one of the greatest risk factors for unhealth among 15-19-year olds (Socialstyrelsen [National Swedish Board of Health and Welfare], 2018).

PSYCHOLOGICAL FACTORS OF ORAL HEALTH

There is a growing interest in how psychosocial factors influence oral health and oral health-related behaviours (Peruzzo et al., 2007; Sheeran et al., 2016; Watt & Sheiham, 2012). However, research in this field is quite new and underdeveloped. The most common psychological factors are presented below, together with examples from the emerging evidence.

Knowledge, is often assumed to be needed in order to make the "right" choices (de Ridder, Kroese, Evers, Adriaanse, & Gillebaart, 2017). It makes sense: We need to know what we need to do in order to be able to do so. However, the narrative review of reviews by Watt (2005), found that improvements in oral health-related knowledge only was associated with limited changes in oral health-related behaviours and clinical outcomes. According to Cane, O'Connor, and Michie (2012), knowledge has also not been found to be a key factor in explaining the variance in the effects from behavioural interventions on health behaviours (e.g., dietary habits or smoking).

Intention ("plans to do so"), including motivation for a specific behaviour, has shown medium to large correlation with future eating behaviour (de Ridder et al., 2017). Correlations have also been found between intention and toothbrushing, and between intention and oral hygiene behaviours in 9-19-year-olds (Scheerman et al., 2016). However, intentions are unstable and change over time (de Ridder et al., 2017). In addition, habits can overrule intentions to change a health-related behaviour.

Emotions can trigger and influence behaviours, for example, not only hunger leads to eating, happiness and enjoyment can also trigger and influence eating behaviours (de Ridder et al., 2017). In addition, people have different preferences and are "drawn" to different actions (e.g., consuming particular foods). Negatively experienced emotions, such as fear, anxiety and shame, may also trigger behaviours. The dental phobic patient may, for example, avoid going to the dentist and risk deterioration in dental anxiety and oral health (Berggren, 1984). Emotional distress, in terms of depression, has been associated in systematic reviews with dental caries and tooth loss in adults (Cademartori, Gastal, Nascimento, Demarco, & Corrêa, 2018; Kisely, Sawyer, Siskind, & Lalloo, 2016). In Sweden, depression and anxiety has increased over time, and is expected to increase further among children (10-17-years-olds), and young adults (18-24-years-olds) (Socialstyrelsen [National Swedish Board of Health and Welfare], 2017).

Self-esteem is a concept that has to do with a person's evaluation of their self-worth, including beliefs and affect towards themselves (Scheerman et al., 2016). Self-esteem has been positively associated with self-rated oral health in adults (Finlayson, Williams, Siefert, Jackson, & Nowjack-Raymer, 2010). The systematic review by Scheerman et al. (2016), found low correlation between self-esteem and toothbrushing in 9-19-year-olds. The systematic review by Silva, Alvares de lima, and Vettore (2018) found mixed results regarding self-esteem and dental caries in 11-19-year-olds.

Other psychological aspects are *health-related attitudes, beliefs and perceptions.* According to the American Psychological Association dictionary (2020), an "attitude" includes how something is evaluated (a person such as the dentist, an object such as the toothbrush, an issue such as dental pain). The evaluation may be negative or positive, and based on our past behaviours, emotions and beliefs. A patient may for example have a positive attitude towards psychologists after being helped by one. A "Belief" can also be evaluative but includes associations with an object or attributes. Sweets, for example, may be associated with something delicious and cigarettes with stress relief. "Perception" includes our way of becoming aware of something, through processes such as observing and recognizing, in relation to previous and new knowledge.

Negative oral health *attitudes and perceptions* have been associated with higher levels of plaque and gingivitis in 19-year-olds (Ericsson, Östberg, Wennström, & Abrahamsson, 2012). The review by Scheerman et al. (2016) found a low correlation between attitudes and oral hygiene behaviour (except for toothbrushing) in 9-19-year-olds. The cohort study by Broadbent, Thomson, and Poulton (2006), found that stable positive oral health-related *beliefs*, from adolescence (15 years of age) through adulthood (18 and 26 years of age), was associated with better clinical and self-rated oral health. They also found that oral health beliefs could change over time, and that instability over time was associated with increased odds of poor oral health in terms of plaque, gingivitis and tooth loss due to caries.

Optimism, concerns our expectations of the future and to what degree we think the outcome will be positive (Scheier & Carver, 1985). In a Finnish cohort study of 31-year-olds, high optimism was related to better oral health behaviours and self-reported dental health (Ylöstalo, Ek, & Knuuttila, 2003). A study by Brennan and Spencer (2012), on adults (around 30 years of age), found high optimism to be associated with better quality of life and fewer missing teeth. They also found high optimism combined with high social support to be associated with less caries experience and fewer missing teeth.

Sense of coherence (SOC; Antonovsky (1987)) focuses on human resources for coping with stressors of various kinds. Such a stressor could be an oral disease with negative consequences for daily living. In adults, cross-sectional studies have found a strong SOC to be associated with better oral health behaviours (e.g., toothbrushing frequency and dental care attendance) (Elyasi et al., 2015), and better oral health (less dental caries and amount of periodontal pockets) (Bernabé et al., 2010; Jönsson, Holde, & Baker, 2020). In 9-19-year-olds, the review by Scheerman et al. (2016), found a very low correlation between SOC and oral hygiene behaviour. In a longitudinal study, Baker, Mat, and Robinson (2010) found SOC to be an important predictor for oral health (in terms of functioning and symptoms) and quality of life in adolescents (12-13 years of age). The systematic review by Silva et al. (2018), found mixed results from cross-sectional studies on SOC and dental caries in adolescents (11-19-years-of-age).

Locus of control (LoC) refers to the individual's belief in where the control of various health experiences and events lies (Rotter, 1966); if it has to do with the persons own actions, other people's actions or chance. The original hypothesis behind the measurements of LoC was that people high in internal LoC and low in chance and external LoC should have a greater tendency to carry out healthy behaviours (Wallston, 2005). However, the review by Scheerman et al. (2016) found a very low correlation between LoC and oral hygiene behaviour in 9-19-year-olds. Östberg and Abrahamsson (2013) found a significant association between internal LoC and self-perceived oral health in 19-year-olds in Sweden. The cross-sectional studies included in the systematic review by Silva et al. (2018), reported mixed results on LoC and dental caries in adolescents (11-19 years of age).

Self-efficacy refers to the individual's perception of his/her own capability to perform a certain behaviour (Bandura, 1977), such as toothbrushing, in a particular setting, and to reach specific goals or outcomes (e.g., clean teeth). Self-efficacy was early on found to be associated with changing and maintaining health behaviours (Strecher, DeVellis, Becker, & Rosenstock, 1986). High self-efficacy ("I can do this") has been associated in adults with a higher frequency of toothbrushing and better oral health (less decayed, missed and filled teeth) (Anagnostopoulos, Buchanan, Frousiounioti, Niakas, & Potamianos, 2011) and intake of healthier foods (de Ridder et al., 2017). High self-efficacy has also been associated with more toothbrushing and oral hygiene behaviour in 9-19-year-olds (Scheerman et al., 2016). Grey, Lobel, and Cannella (2013) found self-efficacy to be predictive of better oral health behaviours (including visiting the dentist, flossing and toothbrushing) in undergraduate students. The systematic review by Silva et al. (2018) found

higher self-efficacy to be associated with less dental caries in adolescents (11-19 years of age).

A considerable amount of the evidence, supporting the hypotheses that psychological factors are determinants of health and health-related behaviours, have come from correlational studies. Although, there are some experimental studies as well. For example, Sheeran et al. (2016) review of experimental studies found that interventions effective in modifying psychological factors (e.g., attitudes and self-efficacy), also improved health-related behaviours. There are a few experimental studies (Brand, Bray, MacNeill, Catley, & Williams, 2013; Heggdal & Lovaas, 2018; Kakudate, Morita, Sugai, & Kawanami, 2009; Nammontri, Robinson, & Baker, 2013; Tedesco, Keffer, Davis, & Christersson, 1992), that have evaluated the effect of behavioural interventions on psychological factors in relation to oral health. However, they have been carried out on different patient groups (periodontal patients and schoolchildren) and measured different outcomes (e.g., SOC and self-efficacy), with inconclusive and mixed results.

To conclude, there is a need for further research into all of the above psychological aspects and their relevance for oral health. It is clear that neither one of them alone can explain or predict oral health-related behaviours. There are also knowledge gaps in how effective behavioural interventions are in changing psychological factors of relevance for oral health. As a complement to these single psychological factors, there are more complex behavioural models and theories of change.

BEHAVIOUR CHANGE THEORIES WITH THE FOCUS ON DENTISTRY AND ADULTS

Theory, model, orientation and framework are often used interchangeably, and there are a number of behaviour theories, aiming to predict and understand the reasons behind different health behaviours (Davis, Campbell, Hildon, Hobbs, & Michie, 2014). Behaviour theories describe constructs and predictors of behaviour, and some of these theories overlap with some of the behaviour change theories. Behaviour change theories can be understood as assumptions being made *a priori* about behaviours with regard to antecedents and causal factors and the factors that mediate and moderate change.

An overview of possible theories and methods to use for behavioural interventions in dental settings is presented in Table 1.

Table 1. Overview of behavioural models and theories (by name, author/theorist and year) searched for in recent systematic reviews of behavioural interventions for patients with poor oral health.

Behavioural model/theory	Author/theorist, year
Behaviour Change Wheel (BCW)	Michie, Van Stralen & West, 2011
Behaviour Therapy	Skinner, Pavlov, Watson, 1900s
Cognitive Hypothesis Model of Compliance	Ley, 1982
Cognitive Therapy	Beck, 1960s
Cognitive Behaviour Therapy	Beck, 1960s
COM-B (Capabilities, Opportunities, Motivations, Behaviour) Model	Michie, Van Stralen & West, 2011
Health Action Process Approach (HAPA)	Schwarzer 1992
Health Belief Model (HBM)	Rosenstock, 1966
Health Locus of Control (HLoC)	Wallston & Wallston, 1982
Implementation Intentions	Gollwitzer, 1993
Motivational Interviewing (MI)	Miller, 1983
Operant and Classical Conditioning	Skinner, 1938
Outcome Expectancy	Bandura 1997
Precaution Adoption Process Model (PAPM)	Weinstein, 1998
Protection Motivation Model	Rogers, 1975
Self-Efficacy Model	Bandura, 1977
Sense of Coherence (SOC)	Antonovsky, 1987
Social Cognitive Theory	Bandura, 1986
Social Learning Theory	Bandura, 1986
Self-Regulatory Model	Leventhal, 1987
Theory of Reasoned Action (TRA)	Fishbein, 1975
Theory of Planned Behaviour (TPB)	Ajzen, 1988
Transtheoretical Model (Stages of Change)	Prochaska, 1983
Unrealistic Optimism Bias	Weinstein, 1980

The overview in Table 1 is based on the search strategies used in reviews of behavioural interventions for adults with poor oral health (Carra et al., 2020; Newton & Asimakopoulou, 2015; Renz et al., 2007; Werner et al., 2016). It is not a complete list of theories or models. In fact, Davis et al. (2014) made a review of reviews, evaluations, interventions and descriptive articles across behavioural and social sciences and found in the included articles as many as 59 theories of behaviour and behaviour change. The three most commonly used theories were the transtheoretical model of change, social cognitive theory, and the theory of planned behaviour. The number of existing behavioural theories and models show the complexity of behaviour change (Daly et al., 2013). Behaviours can clearly be understood from different perspectives. According to these theories, a patient's tendency to change can, for instance, be understood through their evaluations of the costs and benefits of changing, beliefs in their own ability to change, and if they feel in control or not. Many of the theories in Table 1 have similarities, including the same or similar constructs (e.g., experience of control).

"Social Cognition Models" (SCMs), include theories that consider individual thoughts, attitudes and beliefs related to behaviour, such as the health belief model, the protection motivation model, and the theory of planned behaviour (Conner & Norman, 2005). Efforts have also been made to develop common frameworks (Davis et al., 2014). The Theoretical Domains Framework (TDF; Michie et al. (2005) and Cane et al. (2012)) is one example, were 33 theories and 128 theoretical constructs were synthesized by implementation researchers and psychologists into a framework of fourteen categories from which behavioural problems can be understood and interventions developed.

Several studies have found a positive association between theory-based interventions and behaviour change (Davis et al., 2014). There are also examples of no associations, negative associations and mixed results. Thus, the evidence for theory-based interventions is not clear. However, there is an increased interest in the use of theoretical frameworks within the field of psychology and health (Michie & Prestwich, 2010). Unfortunately, the theoretical frameworks behind behavioural interventions are often poorly described and applied (Conner & Norman, 2017; Michie & Prestwich, 2010).

BEHAVIOURAL INTERVENTIONS

Behavioural interventions based on psychological theories can be referred to as "psychological interventions" or "psychotherapy". Psychotherapy has distinct characteristics that serve to bring about change to troublesome cognitions, attitudes, feelings and behaviours (Roth & Fonagy, 2005).

Furthermore, the therapist's actions are guided by a theory and/or model to understand and increase the patient's wellbeing. There is a great variety of psychotherapies. Two of the most common are psychodynamic therapies and cognitive and/or behavioural therapies. Cognitive Behavioural Therapy (CBT) is often used to understand and modify behaviours and cognitions, and can be given to individuals, families or groups. The format may vary greatly from very brief to longer formats. CBT can also be given separated from, or as an adjunct to, other treatments (e.g., medication in health care or restorative treatment in dental care).

Even though the words psychotherapy, psychological interventions and behavioural interventions sometimes can be used interchangeably, different authors may mean different things. It should, for instance, be kept in mind that when others write 'behavioural intervention', this does not mean *per se* that the intervention has a theoretical framework, or that the intervention comes from the field of psychology. The term 'psychological intervention' may therefore be more descriptive when the intervention has a psychological theory-base. However, in dental care and research 'behavioural intervention' is the most common term. In this thesis, behavioural interventions will therefor occur most frequently, and when the term is used it refers to behavioural interventions based on a psychological framework.

Behavioural interventions have been used to modify risk behaviours (e.g., smoking, alcohol and drug use, unhealthy eating, physical inactivity) (Conner & Norman, 2017; Davis et al., 2014), and to strengthen protective behaviours (e.g., having safe sex, participating in health screenings, adhering to medical prescriptions and advice) (Davis et al., 2014). Effectiveness studies have found support for behavioural interventions in individuals, communities and populations. On average interventions aiming at changing health-related behaviours (e.g., physical activity or binge drinking) have produced small effect sizes ($d = 0.20$) (Conner & Norman, 2017). However, even small effects can be of clinical relevance, due to the large gains in health that can follow (Davis et al., 2014).

Over time, there has not only been an interest in common factors across the theories behind the behavioural interventions, but also in the techniques that are used to deliver them. Michie et al. (2013) have developed the "Behaviour Change Technique Taxonomy", and Michie and Johnston (2013) have defined behaviour change techniques (BCTs) as "systematic procedure included as an active component of an intervention designed to change behaviour". The current version of the taxonomy includes 93 BCTs that can be used to specify the content of a behavioural intervention (Michie et al.,

2013). A Cochrane review that will assess the BCTs used in behavioural interventions in dental care is planned but has yet not been published. Although, Newton and Asimakopoulou (2015) found in their systematic review that interventions including goal-setting, planning and self-monitoring were effective with regard to oral hygiene improvement in adults with periodontal disease.

METHODS FOR BEHAVIOUR CHANGE IN DENTAL CARE

Providing patients with *oral health information and/or advice* has been the golden standard in dental care, but it has not been effective enough at changing patients' risk behaviours (Daly et al., 2013). The review by Watt (2005) on educational interventions in dental care found limited short-term effects on oral health-related behaviours, and no long-term effects. In the National Institute for Health and Care Excellence guidelines for oral health promotion, the following can be read: "no evidence was identified on effective methods to deliver oral health advice that will encourage people to change their diets" (NICE (2015), p. 16). In addition, a recent Cochrane review found insufficient evidence to draw conclusions regarding the effect of one-to-one oral hygiene advice on oral health (Soldani et al., 2018).

A Cochrane review on one-to-one *dietary interventions* in dental care, for patients in all ages, found some evidence in favour of dietary interventions (R. Harris, Gamboa, Dailey, & Ashcroft, 2012). However, the review only included five studies, with low quality and the study heterogeneity was high. One study only included children. The interventions provided varied, from information and/or advice to counselling based on stages of change or motivational interviewing. The limited evidence found in favour of dietary interventions mainly concerned consumption of alcohol and vegetables and not sugars. The evidence with regard to the consumption of sugars was poor. In a systematic review by Al Rawahi, Asimakopoulou, and Newton (2017), no studies on behavioural interventions, based on Social Cognition Models (SCMs), for adults in dental care in need of reduced sugary intake was found.

There is promising evidence regarding *tobacco cessation* in dental care. A Cochrane review found behavioural interventions in dental settings effective for tobacco cessation (Carr & Ebbert, 2012), and Ramseier and Suvan (2015) found brief behavioural interventions and/or counselling conducted within dental care to be effective. Noteworthy, both of these reviews included studies evaluating interventions with a psychological framework, but also behavioural interventions without such a framework.

When it comes to *oral hygiene interventions,* the systematic review by Renz et al. (2007) found some positive findings on oral hygiene behaviours from SCMs. However, the review only included four studies, where SCMs had been tested on adult patients with periodontal disease, and the quality of evidence was low. The systematic review by Carra et al. (2020) found that behavioural interventions appear to have a positive impact on patients' oral hygiene, but there were no significant differences in clinical outcomes between behavioural interventions and control conditions.

Motivational interviewing (MI) is a counselling technique, commonly used in health care and dentistry for patients feeling ambivalence towards health-related change (Miller & Rollnick, 2013). MI aims to strengthen the patients' motivation for change. In a supportive environment, the patient is helped to find his/her own reasons for change, plan for, and commit to, such change. Central, but not unique techniques for MI, are open-ended questions, reflective listening, acknowledging the persons strengths and efforts, and summarizations.

There are more than 200 randomized controlled trials (RCTs) with MI for various health issues, and the results are mixed (Miller & Rollnick, 2013). For example, a systematic review of reviews found low to very low quality of evidence regarding the effect of MI on various health issues (Frost et al., 2018). When meta-analyses were compared only 11 out of 155 meta-analysis comparisons found small statistically significant beneficial effects. These findings concerned patients with various alcohol-related issues, substance abuse, and patients in need of increased physical activity. The American Psychological Association (APA) Presidential Task Force on Evidence-Based Practice (2006) has classified MI as an evidence-based treatment for mixed substance abuse/dependence. A recent Cochrane review found less clear evidence for MI on alcohol-related outcomes in young adults (Foxcroft et al., 2016), and a recent Cochrane review found insufficient evidence on MI for smoking cessation (Lindson, Thompson, Ferrey, Lambert, & Aveyard, 2019).

When it comes to oral health, a systematic review by Kopp, Ramseier, Ratka-Krüger, and Woelber (2017) found five studies on MI for adults with periodontal disease. One of the studies found a positive effect on oral hygiene. Three of the five studies reported a significant effect in favour of MI on clinical outcomes, while two reported no difference between MI and control conditions. A significant effect on self-efficacy was found in one of the included studies. Carra et al. (2020), found one additional RCT on MI for adults with periodontal disease to include in their systematic review. The

included studies used MI as the only intervention or in combination with other theory-based interventions. The studies varied in number of participants, treatment duration (one to several sessions), treatment providers, and time for follow-up (six weeks to three years). Their review also found mixed results from MI on oral hygiene behaviours and clinical outcomes.

To summarize, other actions than just providing information and/or advice are needed to initiate change in oral health-related behaviours (NICE, 2015; Soldani et al., 2018; Watt, 2005). There are gaps in knowledge regarding how to effectively change dietary habits within the dental setting (Al Rawahi et al., 2017). The evidence from interventions for smoking cessation within dental care is promising (Carr & Ebbert, 2012; Ramseier & Suvan, 2015). There is mixed evidence from the studies evaluating MI for adult patients with periodontal disease (Carra et al., 2020; Kopp et al., 2017). There is some, but limited evidence in favour of behavioural interventions on oral hygiene in adult patients with periodontal disease (Carra et al., 2020; Renz et al., 2007). Additional support for behavioural interventions can be found for other patient groups, and in other settings than dental care. For example, CBT has been classified as an evidence-based treatment for various eating disorders by the APA Presidential Task Force on Evidence-Based Practice (2006), and the Transtheoretical model and the Theory of Planned Behaviour has been found effective in smoking cessation (Prochaska & DiClemente, 1983; Robinson & Vail, 2012; Webb, Joseph, Yardley, & Michie, 2010).

SWEDISH GUIDELINES FOR BEHAVIOUR CHANGE IN DENTAL CARE

Socialstyrelsen [National Swedish Board of Health and Welfare] (2011) identifies and defines three different ways to intervene when behaviour change is needed:

a) Standardized counselling (around 5 minutes), including standardized general advice and recommendations.
b) Counselling, including a dialogue adapted to the specific patient, sometimes including skills training or information in writing and a time for follow-up.
c) Qualified counselling, treatment or prevention (varying from brief to longer formats) is based on theory, delivered by someone who has knowledge of the disease at hand, special competence in behavioural medicine, training in both the method being used, and knowledge about the theories behind behaviours and the change of behaviours.

According to Socialstyrelsen [National Swedish Board of Health and Welfare] (2011), qualified counselling such as behavioural interventions should be provided to people with an oral disease during their treatment, primarily when poor oral hygiene or smoking are included among the risk factors. Their recommendations are also given priority scores ranging from 1-10, where 1 has the highest relevance for the issue and 10 is of little use or benefit, or of very little use in comparison to its cost. Providing qualified counselling for patients with poor oral health and poor oral hygiene or smoking as risk factors is given a priority score of 3 (the same priority level as operative treatment for the patients with dental caries in need of such treatment). Only providing standardized counselling for patients with poor oral hygiene is scored as a 10, meaning it should be avoided as it is ineffective, less effective than other treatments or generates more adverse events than benefits. Standardized counselling should also be avoided for patients with an oral disease and a risk behaviour in the form of a sugar-rich diet. Qualified counselling can also be provided to these patients, but is currently only given a priority score of 6.

CURRENT ISSUES AND KNOWLEDGE GAPS

There are some reoccurring issues in research on behavioural interventions for patients with oral and/or other health issues. There is a variability across studies, in terms of what interventions are used, how they are used, with what intensity and who the provider of the intervention is (Carr & Ebbert, 2012; Carra et al., 2020; Davis et al., 2014).

Not all interventions are theory-based, and some state that the intervention is theory-based but does not provide a reference to a specific theory or descriptions of how the intervention target specific constructs of that theory (Michie & Prestwich, 2010). Describing the behaviour change techniques (BCTs; Michie et al. (2013)) of an intervention could increase the opportunities to evaluate to what extent theory was applied and the effect of behavioural interventions with a theoretical framework.

It is also important to monitor that treatments are delivered as intended (Borrelli, 2011). However, fidelity checks are often missing in the current research, limiting the possibility to evaluate the interventions. Fidelity checks might for example be extra relevant for interventions including MI since the techniques have changed over time (Miller & Rollnick, 2013), and since counsellors trained in MI have been found to overestimate their skills in providing MI (Miller & Mount, 2001).

Another issue is the lack of long-term evaluation (Conner & Norman, 2017). Behavioural interventions need to be effective both in initiating and sustaining change. Then there is the issue of patients dropping out of treatment. Young adults have in previous studies been shown to have the highest dropout rates in psychotherapy (Swift & Greenberg, 2012). In a survey initiated by the WHO, the dropout rates (including both outpatient and inpatient groups) from mental health treatments were 30%-45% (Fernández et al., 2020). Most commonly patients dropped out of treatment within the first two treatment visits. One way to increase treatment adherence and completion could be to develop brief interventions.

Socialstyrelsen [National Swedish Board of Health and Welfare] (2011) acknowledges the potential of behavioural interventions to change oral health-related behaviours in patients with poor oral health. However, they point out that there is limited competence in dental care to provide such care. It is also a question of responsibility between dental care and health care, and changes may be needed in the current dental care payment system.

In conclusion, high-quality studies on behavioural interventions for adults with various oral health-related issues are needed (Al Rawahi et al., 2017; Carra et al., 2020; Renz et al., 2007; Socialstyrelsen [National Swedish Board of Health and Welfare], 2011). Recently, Albino and Tiwari (2020) have called for behavioural interventions (among other actions) for patients with dental caries, and Watt et al. (2020) have called for behavioural interventions in public dental care, where most people seek help for their oral health issues.

ACCEPTANCE AND COMMITMENT THERAPY

Acceptance and Commitment Therapy (ACT; S. C. Hayes, Strosahl, and Wilson (1999)) is a relatively new therapy, that has its origin in the tradition of Cognitive Behavioural Therapies, with influences from humanistic therapy and meditative approaches. ACT is a context-driven approach, where the social and psychological context of a situation is taken into consideration when health behaviour change is needed (Zhang et al., 2018).

ACT can be given individually or in group formats and may be given in one or several sessions (Ruiz, 2012). There is a brief format of ACT developed particularly for primary care settings (Strosahl, Robinson, & Gustavsson, 2012), including one or two sessions with the focus on a health issues and on bringing about change.

Relational Frame Theory (RFT) forms part of the theoretical basis of ACT (Barnes-Holmes, Hayes, Barnes-Holmes, & Roche, 2001). According to RFT, language forms the basis of cognition and has a central role in shaping how we relate to our emotions, thoughts, physical sensations and memories. This is especially evident when we experience such internal phenomena as unpleasant or unwanted. Patients in dental care may, for instance, experience unwanted emotions such as stress about symptoms, fear of treatment or shame about a habit that affects their oral health negatively. Their thoughts may include worst-case scenarios, and lack of faith in their own capacity to cope with potentially needed treatment or behaviour change. They may also have bad memories from dental and/or health visits or may have experienced set-backs in previous attempts to change risk behaviours.

From an RFT/ACT point of view, the way we relate through language and cognition, to internal and external events is often inflexible (S. C. Hayes et al., 1999). This may cause suffering and behaviour to be resistant to change, thereby preventing us from living our lives in a manner more consistent with our values (Louma, Hayes, & Walser, 2007). In ACT, the aim is increased psychological flexibility enabling behaviours that are functionally coherent with values to be sustained, while behaviours that form obstacles to valued living can be changed (S. C. Hayes, Luoma, Bond, Masuda, & Lillis, 2006).

In ACT, there are six pathological processes that can lead to human suffering (S. C. Hayes, Levin, Plumb-Vilardaga, Villatte, & Pistorello, 2013; S. C. Hayes et al., 2006). These are matched with six therapeutic processes to help patients increase their psychological flexibility and behaviours in valued life directions. Each therapeutic process also functions as a psychological skill for the patient to develop and practice. The pathological processes and their matched psychological skills are listed in Table 2.

Table 2. Pathological processes and psychological skills worked with in ACT

Pathological processes	Psychological skills
Experiential avoidance	Acceptance
Cognitive fusion	Defusion
Conceptualized past and present	Being present
Conceptualized self	Self as context
Lack of values	Values
Impulsivity or avoidant persistence	Commitment

Each pathological process, its psychological alternative according to ACT, and how these are worked with in therapy are briefly described in the sections below. Even though ACT is not a disease-specific intervention (S. C. Hayes, Pistorello, & Levin, 2012), examples of ACT processes often come from patients with mental health issues. Below, the examples are related to different health issues , where behaviours are important. For oral health-related examples specifically, please read Study II.

Experiential avoidance is when we are unwilling to be in contact with our experiences or try to alter or control our thoughts, emotions or memories (S. C. Hayes, Wilson, Gifford, Follette, & Strosahl, 1996; Louma et al., 2007). Such processes may give short-term relief, but risk causing long-term suffering; for example, someone who smokes may smoke to relieve stress but end up with other smoking-related problems that cause stress. *Acceptance* is the alternative, when thoughts, feelings and memories are embraced for what they are (S. C. Hayes et al., 2012; Louma et al., 2007). It has similarities with exposure, but without the goal of diminishing an emotion; instead the aim is to increase psychological flexibility (Louma et al., 2007). The psychologist can help the client try acceptance when faced with stressful content that has previously been controlled or avoided.

Cognitive fusion is when the literal content of our thoughts dominates the experience, when we see our interpretations of situations, ourselves and others as being the same as the situation, ourselves or others (Louma et al., 2007). It simplifies our way of living but can also trick us into missing alternative interpretations or opportunities to consider thoughts more objectively. For example, the thoughts, “I must have sweets!” or “I need that cigarette!” may feel very true in the moment and we act on them. Through *defusion*, thoughts are seen as thoughts and the mind as a function that can be used to observe thoughts and urges, without necessarily acting upon them (S. C. Hayes et al., 2013). There are several ways to work with defusion, including practical exercises (experience-based learning) and metaphors (S. C. Hayes et al., 1999; Louma et al., 2007).

Language makes us *conceptualize past and present* experiences (Louma et al., 2007). It is a way of navigating the world, but we risk acting upon previous interpretations of a situation or experience instead of the present moment. For example, the thought, “Walking is boring, and the gym is not for people like me,” will probably not inspire someone to perform such activities. When we are in the *present moment*, we are able to experience the situation without fusion or experiential avoidance (S. C. Hayes et al., 2012).

In ACT, for example, mindfulness exercises are used to strengthen the ability to be present and act in the moment in more flexible ways.

The *conceptualized self* is the stories we have conceptualized about ourselves (e.g., what we like/dislike and who we are), based on our own experiences and the actions of people around us (Louma et al., 2007). Unfortunately, these stories are not always helpful. For example, stories like "I am lazy" or "I always eat/smoke/drink too much", may not be helpful when behaviour change is needed. ACT therefore includes work with *self as context*, acknowledging the different stories we have about ourselves, but also distinguishing ourselves from them by training ourselves to adopt a stance where we can observe them and reflect upon them (S. C. Hayes et al., 1999).

Lack of values. It is possible, to get tangled up in our thoughts and lives and not reflect upon what we truly value (S. C. Hayes et al., 2012). Goals, such as "feeling good" or "being right," can be taken for values. Clarified *values* may guide us to live more like we would like to. However, by knowing what we truly value we also become vulnerable. Experiential avoidance can protect ourselves from being hurt, disappointed, etc., but risk leading us away from what we value. Fused material, based on what we think others would like us to value, may also hinder us from finding our true values. Clarifying values therefore often includes additional work with the other ACT processes (Louma et al., 2007). Values have been suggested to be of particular importance for health behaviour change, since they provide a constructive direction and motivation for behaviour change (Yildiz, 2020).

Avoidant persistence and impulsivity are processes that may feel right in the moment but often lead away from values (Louma et al., 2007). For example, "I was going to the gym, but I got stuck in front of the telly" or "I thought I would just have one cookie, but I ended up eating the whole packet," could lead away from valued directions such as "Being able to have children and play with them". In ACT, *commitment* to behaviours moves the individual in valued directions through traditional therapeutic techniques and through specific ACT therapeutic processes since commitment work also often evokes some of the other pathological processes mentioned above (S. C. Hayes et al., 2012).

In addition to the ACT-specific therapeutic processes described above, ACT includes traditional behaviour therapy and cognitive behaviour techniques such as behaviour analysis, metaphors, experiential processes, skills training, goal setting, etc. (S. C. Hayes et al., 1999). The therapeutic relationship is also central in ACT. The therapist works to create a context that is open,

mutual, accepting, and respectful, so that the patient can look at troublesome behaviours in a safe context, try new strategies and also learn from modelling by the therapist (S. C. Hayes et al., 1999).

Through the processes of ACT, health behaviour change are possible even in the presence of unwanted thoughts, feelings and bodily sensations (Louma et al., 2007). ACT does not like some other interventions aim at changing the content of unwanted sensations, but the way we relate to these sensations (S. C. Hayes et al., 1999). For a patient with poor oral health, it may be about finding ways to brush their teeth even when they feel too tired to do it, or use dental floss even if the gums bleed a little, or refrain from sweets or tobacco despite the urge to have a sweet or a cigarette.

For those interested in ACT beyond the scope of this thesis and the references provided here, the Association for Contextual and Behavioral Science (ACBS), can be accessed on www.contextualpsychology.org for additional information, networking, courses, conferences, etc.

STATE OF THE EVIDENCE FOR ACT

Recently, a review of meta-analyses of ACT was published and found 20 systematic reviews, including meta-analyses based on 133 RCTs (Gloster, Walder, Levin, Twohig, & Karekla, 2020). The evidence suggested that ACT is efficacious in chronic pain, depression, anxiety, substance abuse and transdiagnostic groups. The majority of the included meta-analyses showed small to medium effect sizes from ACT across conditions. ACT was found superior to treatment as usual, placebo, waitlist and other active interventions but not CBT. ACT was found to be as effective as CBT, consistent with the findings in previous reviews (A-Tjak et al., 2015; Powers, Zum Vörde Sive Vörding, & Emmelkamp, 2009).

Powers et al. (2009) found brief formats of ACT to be as effective as longer formats. Studies with different design have tested brief formats of ACT and found some promising effects in different patient groups (e.g., depressed) (Dindo, Marchman, Gindes, & Fiedorowicz, 2015; Dochat, Wooldridge, Herbert, Lee, & Afari, 2021; Kyllönen et al., 2018; Lappalainen et al., 2014; Livheim et al., 2020). However, the possibility to evaluate the efficacy of brief formats is limited due to the heterogeneity (e.g., in study design, patient groups, duration and format of the intervention, etc.) across studies.

The APA Presidential Task Force on Evidence-Based Practice (2006) has classified ACT as an evidence-based therapy for adults with depression, mixed anxiety, obsessive-compulsive disorder (OCD), psychosis and chronic

pain. The research support for chronic pain has been classified as strong, whereas the research support for the rest of the above diagnoses has been classified as modest. Strong support means that it is a well-established treatment for this patient group and efficacy proven in independent high-quality studies from different researchers. Modest support means that it is probably efficacious and the results support its efficacy in at least one or two well-designed studies.

When it comes to ACT and health behaviour change, a systematic review with a narrative synthesis found 30 RCTs and some promising effects from ACT on health behaviours related to substance abuse, smoking, overweight/obesity and physical inactivity (Yıldız, 2020). Other, more recent reviews support these findings with respect to weight management (Lawlor et al., 2020) and ACT to promote physical activity (Pears & Sutton, 2020).

The literature on ACT for adolescents and young adults is limited, but the review by Halliburton and Cooper (2015) found some initial support for ACT in youths with mental health problems. However, only one of the ten included studies had an RCT study design, and the studies generally had small sample sizes. In a recent systematic review on studies published after year 2015, E. Harris and Samuel (2020) found some promising results for ACT in young people (18 years old or younger) with mental health issues. However, only three of the included studies were RCTs, and the majority of the studies had small sample sizes.

Ong, Lee, and Twohig (2018) conducted a review of the dropout rates in ACT studies. The weighted mean for the dropout rates in ACT (only) therapies was 15.8%, and in ACT in combination with other therapies 16.0%. These were not statistically significant from the dropout rates in other therapies. They also found that masters-level therapists had higher dropout rates than psychologists, meaning that clinical experience may be of relevance when choosing a therapist for ACT interventions. Quite similar dropout rates (17.4% in ACT therapies and 18.6% in the control conditions) was found in the review by Karekla, Konstantinou, Ioannou, Kareklas, and Gloster (2019). Factors moderating dropouts were the recruitment setting, therapist experience, and type of disorder; even though these suggestions about moderating factors should be interpreted with caution since the heterogeneity across studies was high. Common reasons why treatment was ended in advance included personal issues, travelling difficulties and loss of contact.

ACT-RELATED MEASUREMENTS

There are more than 50 questionnaires assessing ACT aspects (Batink, Jansen, & Peeters, 2015). The Acceptance and Action Questionnaire (AAQ-II; S. C. Hayes, Strosahl, et al. (2004)) is the most commonly used measurement for psychological inflexibility (Ong, Lee, Levin, and Twohig (2019). The AAQ-II also aims to measure experiential avoidance, and since the opposite process is acceptance the AAQ-II can also be seen as an acceptance measurement. There are additional measurements for acceptance, although comparisons of the psychometrics of these have so far failed to find one measurement to be superior to the others (McAndrews, Richardson, & Stopa, 2019). Among the measurements of values, Reilly et al. (2019) found the strongest methodological support for the Valued Living Scale (VLS; Jensen, Vowles, Johnson, and Gertz (2015)). The fidelity measures in ACT have been adapted to specific settings or treatment manuals, limiting their usefulness. For that reason, the Acceptance and Commitment Therapy Fidelity Measure (ACT-FM; O'Neill, Latchford, McCracken, and Graham (2019)) was recently developed; a measurement that aims to be reliable across settings, but further testing of this measurement is needed.

POTENTIAL MEDIATORS OF ACT

Most studies on psychological interventions does not analyse how they bring about change (Holmes et al., 2018). Levin, Hildebrandt, Lillis, and Hayes (2012) performed a meta-analysis of the ACT components and found support for all the processes except one (self as context) working as mechanisms of change. A systematic review of ACT mediation studies by Stockton et al. (2019) found most support for ‘acceptance’ as a mechanism of change across studies. There was also support for ‘psychological flexibility’ as a mechanism of change in mental health outcomes, and some evidence for ‘committed action’ as a mechanism of change. In non-specific ACT studies, ‘values’ have shown to increase task persistence for various health-related behaviours (Chase et al. (2013); Jackson et al. (2016) referred to in Zhang et al. (2018)) and may therefore be of relevance for to interventions aimed at behaviour change.

BEHAVIOUR CHANGE TECHNIQUES IN ACT

The systematic review by Pears and Sutton (2020) addresses the Behaviour Change Techniques (BCTs; Michie et al. (2013)) in ACT. They found promising effects from ACT, but on average only 2.6 BCTs were identified in the ACT interventions included in their review. Out of 93 possible BCTs 20 were identified across the ACT interventions, with the most common BCTs being monitoring of emotional consequences, problem solving, goal setting, action planning and commitment.

KNOWLEDGE GAPS ABOUT THE USE OF ACT FOR HEALTH BEHAVIOUR CHANGE

ACT has proven to be effective across different health issues (Gloster et al., 2020). The emerging evidence on ACT for health behaviour change is also promising, but the number of studies limited, whereby the efficacy of ACT for patients in need of health-related behaviour changes is less certain (Lawlor et al., 2020; Pears & Sutton, 2020; Yıldız, 2020). There is also promising effects from brief formats of ACT (e.g., in Powers et al. (2009)). However, there is no consensus regarding the time needed for the treatment to be effective. The ACT interventions tested so far, for health behaviour change, have varied in how they have been delivered and with what intensity (Yıldız, 2020). For example, the ACT interventions for physical inactivity have varied from one 90-minute session to 12 times 15-25-minute sessions. Evidence is also emerging when it comes to ACT for adolescents and young adults. Although, the studies have focused on mental health issues and not on health-related behaviour change (Halliburton & Cooper, 2015; E. Harris & Samuel, 2020).

To improve future development of ACT interventions for health behaviour change, Pears and Sutton (2020) have called for ACT studies to include descriptions of the intervention techniques that are being used, in terms of ACT processes and behaviour change techniques (BCTs).

To conclude, more high-quality studies on ACT for health behaviour change are called for, including detailed descriptions of the tested ACT interventions (Pears & Sutton, 2020; Yıldız, 2020; Zhang et al., 2018). To our knowledge, ACT has not previously been used in patients with poor oral health.

AIM

The aim of this thesis was to increase the knowledge about psychological interventions for behaviour change in adults in dental care through evaluating the effect of behavioural interventions in individuals with poor oral health, and to develop and test the effect of a new behavioural intervention for young adults with poor oral health.

SPECIFIC AIMS

STUDY I

To study the efficacy of psychological interventions in adults and adolescents with poor oral health, defined as dental caries, periodontal disease or peri-implantitis.

STUDY II

To present the treatment rationale and manual for a brief behavioural intervention based on Acceptance and Commitment Therapy (ACT) for young adults with poor oral health.

STUDY III

To evaluate the direct effect of a brief ACT intervention on oral health behaviours in young adults with poor oral health.

STUDY IV

To evaluate the effect over time of a brief ACT intervention on oral health behaviours and health attitudes in young adults with poor oral health.

MATERIALS AND METHODS

STUDY I

DESIGN AND PARTICIPANTS

Study I was a systematic literature review including meta-analyses, following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Moher, Liberati, Tetzlaff, Altman, and Prisma Group (2009)) guidelines. The research question was defined prior to the study according to the Population, Intervention, Comparison, and Outcome (PICO; Richardson, Wilson, Nishikawa, and Hayward (1995)) format (Figure 4). The use of the PICO format was supported by the Cochrane handbook for systematic reviews (Higgins & Green, 2011). Besides fulfilling the PICO, the articles needed to cover RCTs, be written in English, Swedish, Danish or Norwegian, and published after 1 January 1990.

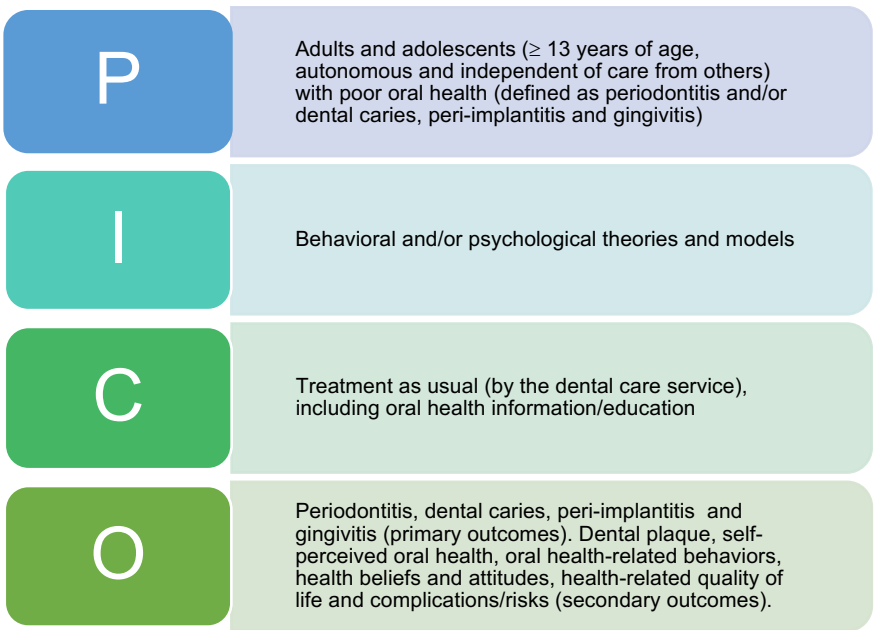

Figure 4. The review question of Study I defined according to the PICO format

Study I was carried out in collaboration with The Regional Health Technology Assessment Centre (HTA-centrum), Region Västra Götaland, a regional support organization for the health and dental care professions when evaluating new interventions.

The search strategies to find eligible articles were developed at a meeting with all the authors of the article and can be found in the Appendix to Study I. The librarians at the HTA Centre searched for eligible articles in the Cochrane Library databases, EMBASE (OvidSP), MEDLINE (OvidSP), PsycINFO, PubMed, and in the Health Technology Assessment (HTA) databases of the NHS Centre for Reviews and Dissemination, the Danish Health and Medicines Authority, the Swedish Agency for Health Technology Assessment and Assessment of Social Services (SBU), and the Norwegian Knowledge Centre for the Health Services. They also searched the reference lists of relevant articles and for ongoing trials in the Clinical Trials database (clinicaltrials.gov).

The articles found were first checked for eligibility with PICO and inclusion criteria by title and abstract by the librarians, then by full text by the other authors. The main reasons for exclusion were lack of oral disease and/or wrong population. There was consensus regarding the articles to be included in the final review. The results gathered from the studies were synthesized into different tables, and meta-analyses were conducted when suitable.

QUALITY OF INDIVIDUAL STUDIES

To assess the scientific quality of the included studies systematically, the SBU checklist (SBU [Swedish Agency for Health Technology Assessment and Assesment of Social Services], 2012) was used, in line with the CONSORT checklist for RCTs (Moher et al., 2012). The checklist includes 32 questions, addressing the risk of different biases with regard to study precision and internal and external validity. By using the checklist, an overall quality rating per study—high, moderate, low—was generated.

QUALITY OF EVIDENCE ACROSS STUDIES

The quality of evidence across studies was systematically assessed through the use of the Grading of Recommendations Assessment, Development and Evaluation (GRADE; Balshem et al. (2011)) guidelines. Through GRADE study limitations, the directness, precision of data and publication bias, among other factors, are assessed. At the end of the assessment, an overall confidence level in the effect estimate is generated, ranging from high (⊕⊕⊕⊕) to very low (⊕◯◯◯) defined further in Figure 5.

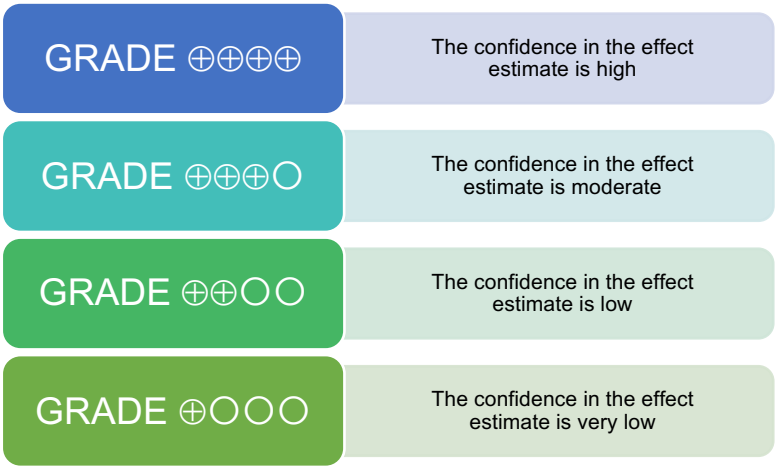

Figure 5. Quality levels of evidence according to GRADE (Balshem et al., 2011)

STUDY II

In Study II we (HW, UW, MH) developed a brief version of ACT for young adults with caries disease together with an expert in ACT (Celia Young). The intervention was based on a brief format of ACT developed for primary health care (Strosahl et al., 2012), and this was done for several reasons:

a) ACT is not a disease-specific intervention (S. C. Hayes et al., 1999), but originally developed for both behavioural and mental health issues, making ACT suitable for oral health-related issues where behaviours play a crucial role.
b) Public dental care and primary health care have similar organizational structures and share the mission to treat and prevent disease where behaviours are part of the aetiology. Thus, behavioural interventions are relevant and can be used in both settings.
c) Brief formats of ACT have shown some promising results (Powers et al., 2009), and we reasoned that young adults may prefer brief treatment over longer interventions. A brief format of ACT also offers the possibility of finding a cost-effective treatment.
d) We (HW, UW, MH) were also able to take a course in brief ACT lead by two of the founders (Strosahl and Gustavsson) and one led by our own ACT expert (CY), who has attended multiple training sessions with the founders and has practiced the method in primary care.

The brief format of ACT for primary health care (Strosahl et al., 2012) needed to be adapted to dental care, our intended patient group and planned RCT. Background information about the researchers and ACT expert who made these adjustments of ACT to dental care is given in Figure 6.

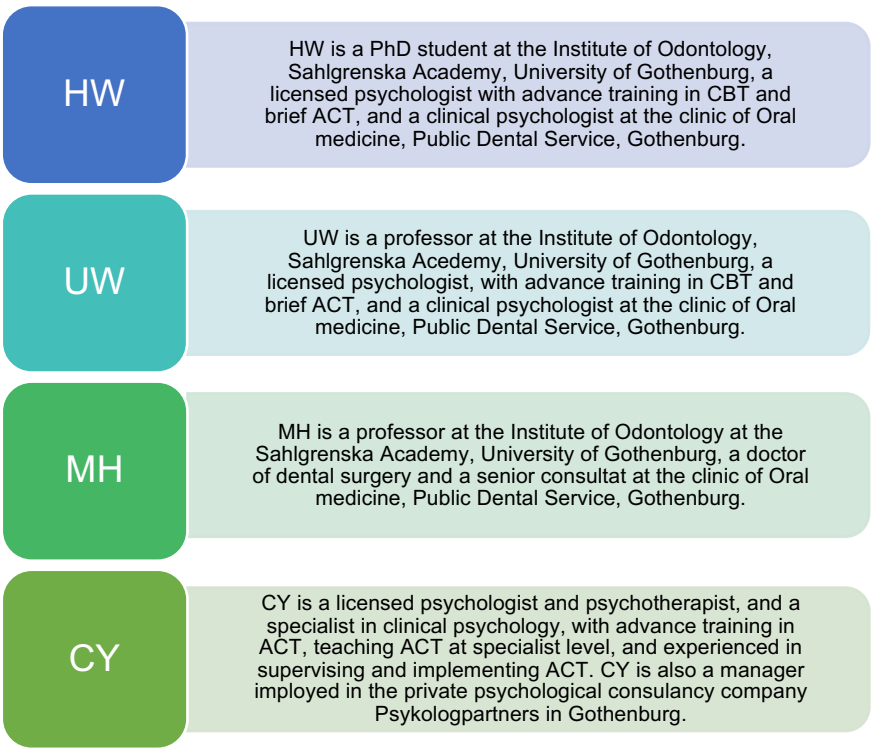

Figure 6. The developers behind the brief ACT for young adults with dental caries

Firstly, we (HW, UW, MH, CY) outlined a treatment manual based on the structure found in Strosahl et al. (2012). Within this structure, we wanted to address all the main ACT processes and include well-known exercises. However, there are several techniques and exercises to choose from (e.g., in Louma et al. (2007) and Strosahl et al. (2012)), so we carefully considered which ones to use, and tested them on a few young adults in dental care before deciding upon which ones to include. During this process we found the need for a mindfulness exercise, aimed specifically at increasing the awareness of the young adults' oral health. To our knowledge there were no such exercises, so we developed one, called "Mindful oral health".

After the treatment had been developed, tested and refined, we agreed unanimously on the treatment content. For example, it was decided to include the defusion exercise found in R. Harris (2009), and the Bull's Eye Value Survey (addressing values) found in Lundgren, Luoma, Dahl, Strosahl, and Melin (2012). We also agreed upon the structure for each session and developed work sheets, to guide the psychologist through the sessions and increase treatment fidelity, and for the participants when working with values at each session. The final intervention was described in a treatment manual (Study II) and tested and evaluated in an RCT (Study III and IV).

STUDY III AND IV

DESIGN AND PARTICIPANTS

Studies III and IV are based on an RCT conducted between 2013 and 2015 at two public dental service clinics in region Västra Götaland, Sweden. Study participants were recruited consecutively in connection with their ordinary visits to their clinics. Eligible patients were young adults, 18-25 years of age, with a minimum of two manifest proximal dental caries lesions. Exclusion criteria were a psychiatric and/or neuropsychiatric diagnosis and not being able to communicate in Swedish. Both the intervention and the control group received standardized oral health information at baseline, from a brochure used at the time for this purpose at the clinics. The information was provided verbally and in writing by the study coordinators.

The participants were then randomized to either intervention (ACT + information) or control (information alone) through block randomization, as described in Pocock (1983). The blocks were stratified (using randomly permuted blocks) by gender and smoking. The study coordinators who allocated the participants to their respective study groups were blinded to the allocation sequence.

The intervention group received two 45-minute sessions of ACT, two weeks apart. The rationale for ACT for young caries-active patients and the treatment manual are described further in Study II. To enhance treatment fidelity the psychologist who provided the intervention (HW) was regularly supervised by the ACT expert (CY) and followed the work sheets provided for each session.

In Study III, the primary outcomes included toothbrushing, use of additional fluorides, flossing and use of toothpicks.

In Study IV, the primary outcomes included toothbrushing, consumption of sweets, consumption of sugary sodas and self-rated oral health; and the secondary outcomes included use of additional fluorides, flossing, use of toothpicks, smoking, psychological flexibility and acceptance, Sense of Coherence (SOC), dental anxiety, and Locus of Control (LoC). The primary outcomes were chosen based on their relevance for oral health. Psychological flexibility was measured as a theoretically relevant construct of ACT (Ong et al., 2019). SOC, LoC and dental anxiety were measured since they are psychological factors of interest for oral health (Daly et al., 2013), and since it is unknown whether they change after a behavioural intervention or not.

The time for follow-up in Study III was two weeks, and in Study IV 18 weeks after baseline. The assessed outcomes over time are shown in Table 3.

Table 3. Assessed primary and secondary outcome variables over time

	Baseline	+ 2 weeks	+ 9 weeks	+ 18 weeks
Dental caries	X			
Self-rated oral health	X		X	X
Oral hygiene behaviours	X	X	X	X
Sugar consumption	X		X	X
Smoking	X		X	X
Psychological flexibility	X		X	X
Health attitudes	X		X	X

MEASUREMENTS

The background variables included questions about age, sex, housing, country of birth, dental care attendance, mother's education, and mother's country of birth. In Study III, the five response alternatives for dental care attendance were dichotomized into "often" (twice a year; once a year) vs. "seldom" (every other year; less than every other year; only when acute problem).

Dental caries was registered based on the participant's last ordinary radiological and clinical examination at the clinic. The number and type of lesions on each tooth (and its five surfaces) were registered following well-

known standards (including secondary and D1-D3 caries). A total caries score was calculated based on the number of surfaces with manifest (secondary or D3) caries.

Self-rated oral health, oral health-related behaviours, psychological flexibility and health attitudes were assessed through a questionnaire. In Study III, oral health-related behaviours were not dichotomized, but in Study IV they were. In addition to the oral hygiene behaviours measured in Study III, consumption of sweets and sugary sodas was measured in Study IV. In Study IV smoking was measured with the question "Do you smoke on a daily basis?", with the response alternatives "yes", "no" and "no but I used to", dichotomized into "yes" or "no".

The Acceptance and Action Questionnaire (AAQ; S. C. Hayes, Bissett, et al. (2004)) was used to measure psychological flexibility and acceptance. The AAQ-II is based on seven of the ten AAQ questions. The questions are scored 1-7 and summarized into a total score between 7 and 49. High scores indicate psychological inflexibility and/or experiential avoidance (low acceptance). Study IV report on the AAQ-II scores since it has shown to have better psychometric properties than the original AAQ (Bond et al., 2011). Recent studies have questioned the validity of the AAQ-II as well, although AAQ-II is nowadays the most commonly used measurement for psychological flexibility (Ong et al., 2019).

The sense of coherence (SOC; Antonovsky (1987)) measurement assesses how individuals succeed in finding meaning, comprehending and managing stressful events. The SOC 13-item version in Swedish (Langius, Björvell, & Antonovsky, 1992), with satisfactory psychometric properties (Eriksson & Lindström, 2005), was used in studies III and IV. The questions in SOC-13 have categorical endpoints scored 1-7 and are summarized into a total score between 13 and 91. A high score indicates a high SOC.

The Multidimensional Health Locus of Control scales (MHLoC; Wallston, Wallston, and Devellis (1978)) are commonly used in health research to measure beliefs concerning control over different life events. There are 18 questions, six each assessing internal locus of control, chance locus of control and external locus of control, with categorical response alternatives, scored 1-6. A total score between 6 and 36 is calculated per subscale. High scores indicate the importance of that LoC subscale. There is support for the validity of the MHLoC (Wallston, 2005). Study IV used a Swedish version that has been adapted to dental care; with the term "dentist" and "dental personnel" added to the questions including the term "doctor" and "medical personnel".

Dental anxiety was measured using the Dental Anxiety Scale (DAS; Corah, Gale, and Illig (1978)), including four questions with categorical response alternatives scored 1-5 and summarized into a total score between 4 and 20. The cut-off for severe dental anxiety is at 13 points, and the DAS has shown satisfactory psychometrics properties across studies (Newton & Buck, 2000).

STATISTICS

Study I included descriptive statistics and meta-analyses. The meta-analyses were conducted on aggregated data, using the random effects model comparing 95% confidence intervals and pooled mean differences. The software used for the statistical analyses was RevMan 5:3 (Review Manager, 2014) that also generates an estimate of the between-study variance. The studies were weighted based on the number of events and participants.

Prior to studies III and IV, a power-analysis was carried out and recommended at least 53 participants for a 20% reduction in gingivitis, with a power of 80% and a significance level of 5%. Taking dropouts into account the RCT required at least 130 participants. Power calculations based on oral health behaviours did not change the number of participants needed.

Studies III and IV include descriptive statistics and inferential statistics. In line with the CONSORT principles for RCTs (Moher et al., 2012), intention-to-treat (ITT) and per protocol (PP) analyses were carried out. The statistical tests in Study III included the Mann-Whitney U test for independent groups, the Chi^2 and Wilcoxon Signed Rank test for dependent groups, and calculations were made for effect sizes according to Cohen's d. The statistical tests in Study IV included the Chi^2, the Cochrane Q, the generalized linear model and the Mann-Whitney U test for independent groups.

In studies III-IV, the last-observation-carried-forward technique was used for imputing missing values due to dropouts in the ITT analyses. Missing values on item level in Study IV were imputed with the mean value of that subscale for that respondent, according to the recommendation in Sloan et al. (2007). The software used for the statistical analyses was the SPSS (Statistical Package for the Social Sciences) version 23.0. The level to determine statistical significance was set at $p < 0.05$. Study III used Bonferroni corrections for multiple comparisons, giving a p-value for statistical significance in baseline variables of $p < 0.005$ and $p < 0.003$ for primary outcomes.

RESULTS

STUDY I

In December 2013, the librarians found 846 unique articles, ten of which were included in the review. In July 2014, an additional search was conducted by the librarians, who found 378 new articles, one of which was eligible and included in the review. The search for ongoing trials in February 2014 and July 2015 identified no studies to include. The systematic review included eleven articles, based on nine different RCTs, shown in Table 4.

The included studies had been conducted in Sweden, the United States, Belgium, France, and Japan, and were all on adult patients (the majority > 50 years of age) with periodontitis. Studies on patients with dental caries and peri-implantitis were missing in the literature.

The interventions and their theoretical framework varied. Motivational interviewing (MI) reoccurred as the intervention mode; some used MI as their only intervention, others components of MI or MI in combination with self-regulation theory. Other theoretical frameworks included the behavioural cognitive method, a combination of the client empowerment model, the explanatory model and the human needs conceptual model, social learning theory, and a combination of self-efficacy theory and theory of reasoned action. The interventions were provided by different professions: dentists, dental hygienists, psychologists, a trained counsellor. One study did not specify the profession of the treatment provider. The interventions were of different duration (one to nine sessions) and session length (10-90 minutes).

PRIMARY OUTCOMES

Four RCTs reported on the outcome ‘pocket depth’ (including probing of pocket depth) as a measurement of periodontitis. Two of the RCTs found statistically significant differences in favour of psychological interventions, whereas two found no statistically significant differences between psychological interventions and treatment as usual.

Six RCTs reported on the outcome ‘gingivitis’ in terms of gingival index and bleeding on probing. The meta-analyses on gingival index and bleeding on probing found no statistically significant differences between treatment conditions. A sub-analysis, including a meta-analysis of gingivitis, in terms of bleeding on probing, for interventions using MI in comparison with treatment as usual found no statistically significant differences.

Table 4. The included articles with their intervention and control condition

Author, year	Intervention	Control
Brand et al., 2013	Brief motivation interviewing	Traditional oral health education
Godard et al., 2011	Motivational interviewing	Standard consultation
Jönsson et al., 2006	Client self-care commitment model	Treatment as usual
Jönsson et al., 2009	Individually tailored oral health educational programme including aspects of motivational interviewing	Standard treatment programme
Jönsson et al., 2010	Individually tailored oral health educational programme, including aspects of motivational interviewing (same as in Jönsson et al., 2009)	Standard treatment programme
Jönsson et al., 2014	Individually tailored oral health educational programme, including aspects of motivational interviewing (same as in Jönsson et al., 2009)	Standard treatment programme
Kakudate et al., 2009	Farquhar's six-step method	Traditional oral hygiene instructions
Little et al., 1997	Freedom from plaque	Usual dental care
Philippot et al., 2005	Behavioural educational intervention including motivational interviewing and diary	Standard treatment
Stenman et al., 2012	Motivational interviewing	Conventional educational intervention
Tedesco et al., 1992	Social cognitive intervention	Standard regular treatment

SECONDARY OUTCOMES

The meta-analysis on 'plaque presence' found no statistically significant difference between the intervention and the control condition in the secondary outcome. The meta-analysis on plaque index (-0.24;95% CI: -0.41-0-06) found a small, statistically significant difference in favour of the psychological interventions. Four RCTs was not possible to include in the meta-analyses on plaque, due to lack of data or different outcome measure for plaque. However, they reported similar results.

Three RCTs reported on oral health-related behaviours and found small, statistically significant improvements in interdental cleaning (n = 2) and in toothbrushing (n = 1) in favour of psychological interventions.

Three RCTs reported on oral health-related attitudes and self-efficacy; two found no significant differences between psychological interventions and treatment as usual, and one found a small but positive effect on toothbrushing self-efficacy in favour of psychological interventions.

Only one RCT reported on OHRQoL, and found no differences between the studied conditions. No studies reported on self-rated oral health and/or complications.

QUALITY RATINGS

The quality of evidence for primary and secondary outcomes across studies was rated as low (⊕⊕◯◯), except for OHRQoL, which was rated as very low (⊕◯◯◯). The GRADE ratings can be found in Table 14, and the quality ratings of individual studies in Tables 7-13, in the Appendix to Study I.

STUDY II

The scientific paper presents the rationale for ACT (i.e., the relevance of different ACT processes) for young adults with poor oral health in terms of dental caries. The treatment manual presents the intervention, including two (45-minute) individual sessions of ACT, to be delivered by a licensed psychologist in public dental care. One of our suggestions was that clarifying values could guide and generate oral health-related behaviour change, even though the intervention includes all the main ACT processes (acceptance, mindfulness, values, defusion, self as context and committed action). The template for each session is presented below, but since ACT is a person-centred intervention, the psychologist also needs to take the young adults (inner and outer) context into account. The scientific paper also demonstrates how the treatment can be provided through an illustrative case.

SESSION ONE TEMPLATE

The first session starts with an introduction, including presentation of the treatment rationale. A brief interview is conducted (Strosahl et al., 2012), followed by the oral health mindfulness exercise developed for this study and focused questions based on the "Focused interview" found in Strosahl et al. (2012). This anamnestic part leads up to a case conceptualization, following CBT and ACT theory, including a behaviour analysis (Cooper, Heron, & Heward, 2020) and the "Four Square Tool" (Strosahl et al., 2012), which the psychologist uses for a systematic and psychological evaluation of the patient's current life situation, psychological skills vs. pathological processes. Through the case conceptualization, the psychologist can adapt the intervention to the specific patient, making it more patient-oriented. If the patient is willing to try to change a behaviour of importance for his/her oral health, the session shifts to clarifying oral health-related values, through the Bull's Eye Value Survey (Lundgren et al., 2012). The therapy also includes working with fused thoughts, stories about themselves and acceptance (Louma et al., 2007). Finally, the patient is helped to develop a plan for behaviour change to which he/she can commit (Strosahl et al., 2012).

SESSION TWO TEMPLATE

The second session starts by following up on the experience from the previous session and in between sessions with the focus on the behaviour change plan. The oral health mindfulness exercise is conducted again. The psychologist then assesses how the individual relates to the values stated in the last session (Strosahl et al., 2012), for example, by being accepting or avoidant, mindful or tangled up in fused material and/or self-stories, committed or ambivalent, etc. The values of importance for oral health are then worked with again through the Bull's Eye Values Survey (Lundgren et al., 2012), and the fused material through an exercise in defusion described in R. Harris (2009), together with other ACT processes (to increase acceptance, mindfulness and self-as context) (Louma et al., 2007). The behaviour change plan is then modified with regard to the session content (Strosahl et al., 2012) and possibilities to live in accordance with inner oral health-related values from now on, are discussed and specified.

STUDY III AND IV

The study coordinators contacted 186 eligible patients, 51 of whom declined to participate and 135 who were included in the RCT reported in Studies III-IV. The participants ranged from 18 to 25 years of age and the mean age was 21 years. Almost as many females (64) as men (71) were included in the

study. The majority of the participants were Nordic-born (76%), but 46% had mothers born in non-Nordic countries. At baseline there were no significant differences between study groups with regard to sociodemographic variables, dental caries, oral health-related behaviours, health attitudes or psychological flexibility (Study III-IV).

The mean number of caries lesions at baseline was 6.3 in the intervention group and 4.9 in the control group (Study IV). The distribution was skewed and the median number (5 vs. 4) may therefore be more representative. The vast majority of the participants, 84%, rated their oral health as poor, 16% as good and no one as very good (Study IV).

At baseline, around 60% of the participants reported toothbrushing twice a day, and around 40% reported toothbrushing once a day or less (Study IV). Around 40% of the participants used additional fluorides once a week or less and consumed sweets several times a week or more (Study IV). In addition, the majority reported flossing and using toothpicks once a week or less and consumption of sugary sodas several times a week or more. In the whole sample, 35% were smokers at baseline (Study III).

The total number of drop-outs in Study III was n = 8, and in Study IV n = 20. In addition, technical data retrieval issues caused missing data on all outcomes from two participants (one individual per study group).

PRIMARY OUTCOMES

In Study III, the intervention group (n = 67) improved significantly in all four oral hygiene behaviours (toothbrushing, flossing, use of additional fluorides and toothpicks) immediately after the intervention (effect sizes, 0.26 - 0.32). The control group (n = 68) only improved in two oral hygiene behaviours (flossing and the use of additional fluorides) immediately after the intervention (effect sizes, 0.22 - 0.23) and these results were non-significant after Bonferroni corrections.

In Study IV, the intervention group, unlike the control group, improved significantly in the consumption of sweets and sugary sodas, between baseline and the 18-week follow-up. The consumption of sweets over time in the intervention group are shown in Figure 7, and in the control group in Figure 8. Both the intervention group and the control group improved significantly in self-rated oral health, but not in toothbrushing between baseline and 18-week follow-up. There were no significant differences between study groups in primary outcomes at the 18-week follow-up.

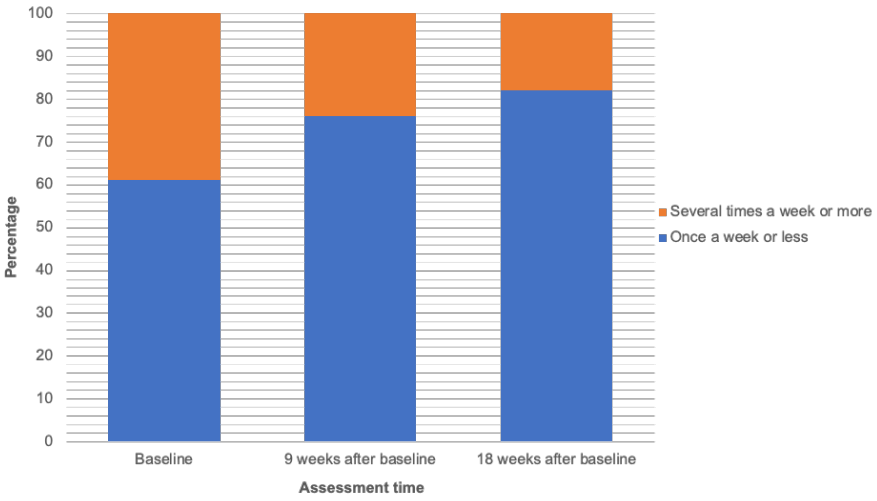

Figure 7. Consumption of sweets in the intervention group, shown as the prevalence of participants having a particular consumption pattern at different assessment times (Study IV)

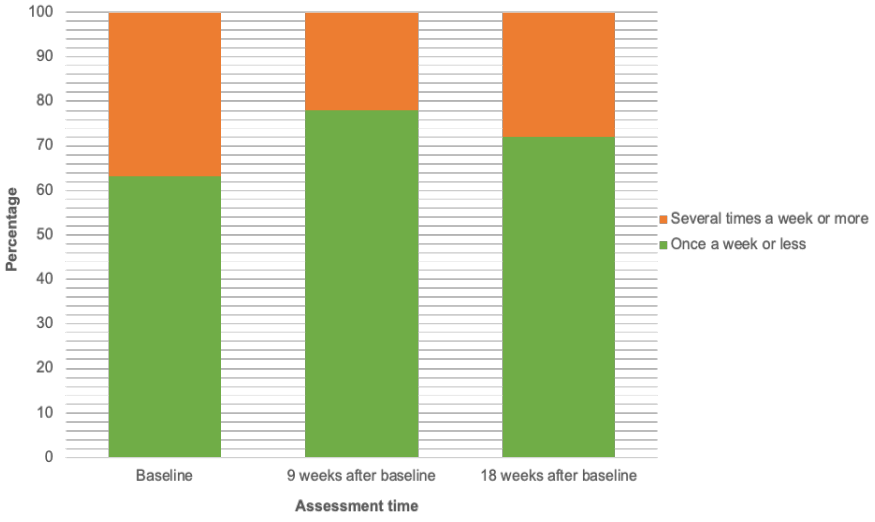

Figure 8. Consumption of sweets in the control group, shown as the prevalence of participants having a particular consumption pattern at different assessment times (Study IV)

SECONDARY OUTCOMES

In Study IV, the intervention group, unlike the control group, improved significantly in flossing, between baseline and the 18-week follow-up. Both the intervention group and the control group improved in use of additional fluorides, but not in use of toothpicks or smoking, between baseline and the 18-week follow-up. There were no significant differences between study groups in secondary outcomes at the 18-week follow-up. Sub-group analyses found that non-smokers in the intervention group improved in more oral health-related behaviours than smokers ($p < 0.05$), between baseline and the 18-week follow up. No adverse events were reported during the study period.

DISCUSSION

STUDY I

MAIN RESULTS

Study I, studying the efficacy of behavioural interventions, found eleven articles reporting on nine RCTs that fulfilled the PICO and inclusion criteria. Furthermore, meta-analyses could be conducted. There was little to no effect on clinical outcomes, oral health-related behaviours and attitudes from the behavioural interventions included and the confidence in the effect estimates was low (⊕⊕◯◯). However, the statistically significant findings (in plaque index, oral health behaviours and self-efficacy) were in favour of psychological interventions. There was a lack of studies on adolescents, patients with dental caries and/or peri-implantitis, and from general dental care settings. Only one study reported the effect on OHRQoL. No study reported on adverse events.

IN RELATION TO CURRENT RESEARCH

Since Study I was carried out, others have performed systematic literature reviews on behavioural interventions in the dental setting. The systematic review by Al Rawahi et al. (2017) found no studies (systematic reviews, randomized controlled trials, before and after studies or controlled trials) on behavioural interventions to reduce the intake of sugar in patients with or without dental caries in dental care. A review by Carra et al. (2020) found three additional RCTs, compared with Study I, evaluating behavioural interventions (as their only intervention) on adult periodontal patients. These studies evaluated brief formats of MI and personalized oral hygiene information based on implementation intervention theory and social cognitive theory. Two of the studies found no significant differences between study groups in clinical outcomes (Ramsay et al., 2018; Stenman, Wennström, & Abrahamsson, 2018). One study found positive effects from the behavioural intervention on interdental cleaning and interdental cleaning self-efficacy (Woelber et al., 2016). One study found no significant differences in oral hygiene behaviours between study groups (Stenman et al., 2018), and one found no significant differences in oral hygiene self-efficacy (Ramsay et al., 2018). Thus, the additional RCTs found mixed evidence from behavioural interventions on oral health-related behaviours and self-efficacy, and no effect on clinical outcomes. However, the risk of bias was high across the included studies, limiting the possibilities to draw reliable conclusions. Both

the review by Al Rawahi et al. (2017) and the review by Carra et al. (2020) stress the need, once more, for additional research on behavioural interventions for adults with poor oral health.

It was noteworthy at the time of our review that there were no RCTs on behavioural interventions for adolescents with poor oral health. Recently, Xiang, Wong, Perfecto, and McGrath (2020) conducted a systematic review and meta-analysis on behavioural interventions for adolescents (10-19 years of age), and found ten RCTs. The interventions were based on different approaches, such as the health belief model, self-efficacy theory, sense of coherence, social cognitive theory, and theory of health behaviour. Treatment providers were dentists, teachers, parents, peers, and a health education specialist. Time for follow-up varied from two weeks to 24 months. Five RCTs reported on oral health-related behaviours; three of them found improvements in frequency of toothbrushing and flossing; two found the effect indecisive. There was no significant difference between behavioural interventions and control conditions at three months, but after a year a significant reduction was found in favour of behavioural interventions in plaque presence. The strength of the evidence was low. The participants of the included studies did not need to have an oral disease, as they needed in Study I. Furthermore, several of the studies were conducted in class-room settings instead of dental care, as in Study I. Thus, the review by Xiang et al. (2020) found some promising but limited evidence for behavioural interventions in adolescents. More high-quality studies are needed, including studies on adolescents with poor oral health treated within dental care.

STRENGTHS AND LIMITATIONS

Study I found nine RCTs on adult periodontal patients and allowed meta-analyses to be performed, whereas the systematic review by Renz et al. (2007) found four RCTs on behavioural interventions for adults with periodontal disease and did not include any meta-analyses.

Another strength of Study I, was the use of an established methodology, for systematic reviews and quality ratings of individual studies and outcomes (Balshem et al., 2011; Moher et al., 2012; Moher et al., 2009; SBU [Swedish Agency for Health Technology Assessment and Assesment of Social Services], 2012). Moreover, it was possible to perform meta-analyses to generate estimates of “true” effects, instead of only descriptions of the evidence found in previous reviews.

The quality of the included studies was low, which may lead to a risk of bias and erroneous conclusions in the articles. The quality of evidence across the included studies was also low (⊕⊕◯◯) for the majority of outcomes, and the results of the meta-analyses therefore need to be interpreted with caution. Future research may change the confidence in the effect estimates.

The possibility to evaluate the effect of different behavioural interventions was limited. The interventions and their theoretical framework were poorly described, despite the relevance of this from a theoretical, clinical and research perspective (Conner & Norman, 2017; Michie & Prestwich, 2010). In addition, the interventions varied in how they were delivered, and sometimes they were used in combination with other interventions.

The time for follow-up was short, especially if a pause between the final treatment session and follow-up was required, since several of the studies provided treatment until the final time for follow-up. In addition, there was great variation in the way that the clinical variables (e.g., periodontal pockets, gingivitis and plaque) were measured. Only two RCTs (Jönsson, Lindberg, Oscarson, & Ohrn, 2006; Jönsson, Öhrn, Oscarson, & Lindberg, 2009) measured the same oral health-related behaviour. In addition, only one RCT reported on OHRQoL. Furthermore, the results of the review cannot be generalized to adolescents, patients with other diseases and/or patients treated in public dental care, since these were not represented in any of the included studies.

CLINICAL RELEVANCE

Study I contributed with valuable knowledge regarding the efficacy of behavioural interventions in dental care, and highlighted knowledge gaps at the time of carrying out the review. The review found very limited evidence on behavioural interventions in dental care. Especially noteworthy was the lack of high-quality studies on patients with dental caries, despite being such a common condition among patients in dental care. Importantly, the statistically significant findings were small but in favour of psychological interventions to improve oral health/oral health behaviours. These findings are also supported by evidence from behavioural interventions for other health issues, such as smoking and eating disorders for which there are effective psychological treatments (APA Presidential Task Force on Evidence-Based Practice, 2006; Jönsson & Öhrn, 2014; Prochaska & DiClemente, 1983; Robinson & Vail, 2012; Webb et al., 2010). Study I also showed the need to continue to develop and test behavioural interventions for patients with poor oral health, in particular patients with dental caries.

STUDY II

MAIN RESULTS

Study II introduces the modern, theory-based psychological intervention ACT to dental care, and describes how the brief format of ACT (Strosahl et al., 2012) already used in primary health care settings, was further developed for young adults with dental caries. A rationale is provided for using a brief ACT to treat young adults with poor oral health, as well as a treatment manual and a case illustration. This intervention was then tested in an RCT (Study III-IV).

IN RELATION TO CURRENT RESEARCH

We suggested that using ACT with the focus on clarifying values would be relevant to bring about change in patients with poor oral health. This seems to be in line with suggestions by current researchers in the field of ACT to effect health behaviour change (Yıldız, 2020; Zhang et al., 2018). We also argued that the specific ACT intervention should be delivered by a psychologist, since the intervention demands knowledge and clinical experience of CBT in addition to ACT. A CBT psychologist would have advanced training in, and extensive experience of, behaviour analysis and should be able to provide this, also in a brief therapy intervention. There are also studies reporting that the involvement of more experienced psychologists limits the number of dropouts from ACT interventions (Ong et al., 2018), and studies from the field of MI show that a brief course in MI and believing that one practices MI is insufficient to acquire the skills needed to deliver MI (Miller & Mount, 2001). It is therefore reasonable to assume that taking a brief course in ACT is not enough, and that additional education and training are required.

When coding our intervention according to the "Behaviour change technique taxonomy" (version 1) by (Michie et al., 2013), the result includes health consequences and emotional consequences, self-monitoring of behaviour, problem solving and coping planning, a version of a behavioural contract, goal setting (behaviour), commitment, discrepancy between current behaviour and goals, review of outcome goals (but with an emphasis on the valued directions). The intervention also includes focus on past success (not always but sometimes), pros and cons, reframing, behavioural experiments and regulation of negative emotions. Thus, our intervention included more BCTs than the average 2.6 found in the review by Pears and Sutton (2020) of ACT to promote physical activities. In agreement with their review, additional ACT techniques (e.g., acceptance and mindfulness) were not

coded since these are not included in the current version of the taxonomy, which is undergoing further development and evaluation.

STRENGTHS AND LIMITATIONS

There is a growing recognition of the importance of describing the theory behind behaviour change interventions and the techniques used to deliver the intervention (Bartholomew & Mullen, 2011; Michie & Prestwich, 2010). As Michie and Prestwich (2010) have called for, the theory behind the intervention in Study II was named and described, intervention specific constructs targeted, and only one single theory was used. Additionally, the intervention techniques were linked to the main ACT processes. Several techniques were also used for the same construct such as mindfulness and/or defusion. ACT techniques, for example, the Four Square Tool in Strosahl et al. (2012), were used to adapt the intervention to each participant. In addition, a theory-relevant construct (AAQ-II; (S. C. Hayes, Strosahl, et al., 2004)) was measured before and after the intervention, reported in Study IV.

A limitation in Study II is related to the fact that there is limited evidence on the effect of brief interventions (e.g., Powers et al. (2009)). Thus, there is a risk that the dose of the intervention was too low. Even though the intervention was developed through careful consideration, including well-defined therapeutic processes and exercises found in the ACT literature and/or developed together with an ACT expert. The exercises were also tested on young adults in dental care, before inclusion in the final treatment manual. However, there are additional ACT techniques and exercises that others may find relevant to test and evaluate. The acceptability of the treatment among the study participants is presented in Study III and IV. The treatment effect, on oral health behaviours is presented in Study III and IV, and on health attitudes, psychological flexibility and acceptance in Study IV.

CLINICAL RELEVANCE

To our knowledge, Study II is the first to consider ACT for patients in dental care and to present an ACT treatment manual for young adults with dental caries. There are some books including ACT treatment manuals; for example, Eifert and Forsyth (2005) for anxiety disorder, Sandoz, Wilson, and Dufrene (2010) for eating disorders, and Walser and Westrup (2007) for post-traumatic stress disorder (PTSD). L. L. Hayes (2015) have also described how ACT can be used in adolescents. The treatment manual of Study II was published in a scientific journal, thereby scientifically reviewed, and retrievable in databases. This could be particularly useful when adapting interventions to new settings and/or patient categories. Other researchers and clinicians around the world can now test and develop the intervention further.

STUDY III AND IV

MAIN RESULTS

The direct effect of the ACT intervention in Study III on oral health-related behaviours in terms of oral hygiene was promising. The effect over time of the intervention on flossing, consumption of sweets and sugary sodas in Study IV was also promising, since even small changes, for example, in sugar consumption for patients with dental caries may be of clinical relevance in the long-term (WHO, 2017). However, there were no significant differences between groups in oral health-related behaviours or health attitudes or psychological flexibility and acceptance 18 weeks after the intervention, and the direct effects found on toothbrushing (Study III) were not sustained (Study IV).

IN RELATION TO CURRENT GUIDELINES AND RESEARCH

From a dental perspective, toothbrushing twice a day with fluoridated tooth-paste is a desired behaviour for patients with dental caries (Socialstyrelsen [National Swedish Board of Health and Welfare], 2011). In our RCT 40% of the young adult participants reported a lower toothbrushing frequency than recommended. Some study participants chose to change that behaviour between session one and two, as the results in Study III shows. However, the majority of the participants stated that they already brushed their teeth twice a day, and there were those who were not willing to change their toothbrushing frequency. From an ACT perspective, these patients might have other relevant behaviours that they are more willing and able to change. Success in such changes might lead to additional changes in more desired behaviours later on. A deidentified example from the study may illustrate this:

> A participant comes to session one with an energy drink and says: “Well I guess I am here because I drink a lot of these! I know they are no good for your teeth, but I just don’t want to change it! I must have my energy drinks on a daily basis, so don’t you dare try to make me quit!” In line with the treatment manual, I clarified the rationale for the session and asked if it was possible to talk about behaviours of relevance for oral health, but at the same time made it very clear that it would be the patient’s choice what behaviour potentially to modify in the end. For this reason, energy drink consumption, among other behaviours, was included in the behavioural analysis. In the end (not surprisingly), the patient chose to modify another oral health-related behaviour (additional usage of fluorides) and not his/her consumption of energy drinks. However, at session two the patient started off by saying “Can you imagine, I have actually cut down on my energy drinks as well! Can we talk about how I can do that some more?”

This example shows why the ACT approach may enable change in someone who might otherwise have dropped out of treatment, or not changed any behaviour, if confronted about the energy drinks or poor toothbrushing. However, leaving the choice of behaviour to change to the patient, may have reduced our chances of finding significant results in Study III and IV.

Many of the study participants had high levels of caries, and the majority rated their oral health as poor, whereas people in Sweden generally rate their oral health as good (Socialstyrelsen [National Swedish Board of Health and Welfare], 2011).

The mean value of the AAQ-II in both groups was below the values of 24-28 points, which Bond et al. (2011) found to be associated with cut-offs in measurements of mental distress (e.g., depression or anxiety). There is no established cut-off for SOC, but the mean SOC-13 value in both groups was almost equal to the mean value of 60 found in the Swedish population by Langius and Björvell (1993), although a bit lower than the mean value of 70 (SD 11.4) found in the sample from a Swedish city (Jönköping) by Lindmark, Hakeberg, and Hugoson (2011). In general, the participants scored somewhat higher on the I-LoC and E-LoC than on the C-LoC; however, the scores on each subscale were quite close to each other. The mean DAS score was below the cut-off for severe dental anxiety (Newton & Buck, 2000).

The fact that there were no changes in health attitudes over time in Study IV is in line with some studies that have tested behavioural interventions in patients with periodontal disease (Brand et al., 2013; Tedesco et al., 1992), and contradictive to the results from some other studies that have found positive effects on SOC and LoC from behavioural interventions in patients with periodontal disease (Kakudate et al., 2009) and study participants in non-dental settings (Heggdal & Lovaas, 2018; Nammontri et al., 2013).

The intervention had no effect on the AAQ-II score, which may be due to measurement issues. Bond et al. (2011) found the psychometrics of the AAQ-II to be satisfactory, whereas evaluations after the planning of the present RCT have found that the AAQ-II measures psychological distress, depression, stress, anxiety and neuroticism to a significant extent (Ong et al., 2019; Rochefort, Baldwin, & Chmielewski, 2018; Tyndall et al., 2019; Wolgast, 2014). The intervention tested in Study III and IV did not aim to change such conditions.

STRENGTHS AND LIMITATIONS

Studies III and IV are based on an RCT, and the RCT included an acceptable number of participants (n = 135). The dropout rate in Study III was < 10% and in Study IV < 15%, which is acceptable—even promising—in the light of young adults often dropping out of treatment (Swift & Greenberg, 2012), and compared with dropout rates in other ACT studies (Karekla et al., 2019; Ong et al., 2018). The RCT included almost as many males as females, which is rare in studies on ACT for health behaviour change, but important for the generalizability of results (Yıldız, 2020). There was very little missing data, limiting the need for imputation and making the data largely reliable. Study III and IV report on the effect of a behavioural intervention on different behaviours of relevance for oral health, self-rated oral health and adverse events, previously unreported in similar studies (Werner et al., 2016). The time for follow-up, included a pause between final treatment and follow-up, and was reasonably long in comparison with some of the previous studies on behavioural interventions.

To enhance treatment fidelity, a licenced psychologist (HW) with advanced training in brief ACT delivered the intervention, while being very familiar with the treatment content as she was one of the developers of the treatment manual. In addition, session worksheets were used and supervision provided to enhance treatment fidelity. It could be considered a limitation that the intervention was not filmed or audiotaped for additional treatment fidelity examination (Borrelli, 2011). However, the intervention was not filmed or audiotaped, since it is difficult to control for the possible influence of recording on the study participants.

Other limitations in Studies III-IV include that blinding was not possible due to the study design, and the effect on clinical variables and oral health-related quality of life (OHRQoL) was not evaluated. All outcomes were self-reported and may be biased. However, self-reported methods are the most common way to measure behaviour change (Davis et al., 2014).

The fact that the participants were free to choose a behaviour to change may have lowered the power of the study. There are also other health behaviours of relevance for young adult's oral health, such as consumption of energy drinks and alcohol, that were not evaluated. In my experience from the study, overconsumption of energy drinks was highly prevalent among the participants and many of them also wanted to change this behaviour.

The attitudinal scales were all well-known and their psychometrics have been evaluated. However, they were generic, whereby specific oral health-related attitudinal changes may have been missed. The AAQ-II, for example, was not specified for the patient group or setting of Study III and IV. The AAQ-II also aims to measure experiential avoidance in addition to psychological flexibility (S. C. Hayes, Strosahl, et al., 2004), whereas the intervention developed in Study II focuses more on values in combination with psychological flexibility. There are also other psychological factors that could be of relevance to measure, such as self-efficacy and optimism.

CLINICAL RELEVANCE

Studies III and IV target a patient group with a commonly seen diagnosis in clinical practice, and a disease that risks progressing if not treated (WHO, 2017); thus, a group that is highly relevant to treat. In Sweden, young adults are not called for regular health check-ups after they have graduated from secondary school. Dental care is the only arena where young adults are seen regularly, since they are called for regular oral health check-ups (Tandvårdslag [the Swedish Dental Services Act] (1985:125)). It may also be natural to talk about habits of relevance for oral and general health at such appointments, and offer help within dental and/or health care when needed.

The findings regarding the immediate positive effects on oral hygiene behaviours, and the 18-week effect on consumption of sweets are promising, indicating that a brief ACT-intervention after modification may be useful for oral health behaviour change in young adults. This needs to be tested in similar clinical trials where different types and different numbers of sessions should be evaluated, in order to refine the impact of an ACT intervention.

GENERAL DISCUSSION

BEHAVIOURAL INTERVENTIONS IN DENTAL CARE

At the time of Study III-IV, more studies on behavioural interventions had been called for by the Socialstyrelsen [National Swedish Board of Health and Welfare] (2011), among others (Renz et al., 2007). More research in this field are still called for (Al Rawahi et al., 2017; Carra et al., 2020; Newton & Asimakopoulou, 2015; Xiang et al., 2020), including studies on patients with dental caries (Albino & Tiwari, 2020) and studies on patients in public dental care (Watt et al., 2020).

The national guidelines for dental care in Sweden already recommend behavioural interventions for patients with an oral disease combined with poor oral hygiene, smoking and/or having a diet too high in sugars (Socialstyrelsen [National Swedish Board of Health and Welfare], 2011). However, there are knowledge gaps when it comes to effective behavioural interventions for patients in dental care (Carra et al., 2020; Renz et al., 2007; Werner et al., 2016). Through additional high-quality research on behavioural interventions, the national guidelines for dental care could be improved to guide practitioners to more specific knowledge about which kind of theory and behavioural intervention to use, for what patient, in what dosage and delivered by whom.

The overview in Table 1 shows that there are over 20 different theories that are possible to use for behaviour change in dental care, and many of the theories have not yet been tested in dental care. The effectiveness of behavioural interventions is not only based on the theory applied. The therapist, the client, and the therapeutic relationship among other factors, contributes to the results (APA, 2010). There are gaps, for instance, in the knowledge regarding the amount of training needed to deliver behavioural interventions effectively. The MI-studies that found some treatment providers believing they are providing MI, when they are not in fact doing so (Miller & Mount, 2001), raises the question whether it is more cost-effective to educate and train dental teams in psychological theories and methods, or to use licensed psychologists who already have advanced education and training in such theories and methods? Perhaps other gains could be found as well, if multi professional teams including psychologists were to be used more in primary dental care?

Study II is an example of how psychologists could aid and treat patients within dental care. The recent Lancet series on oral health have called for increased inter-professional collaborations among the health professions for improved and effective treatments of patients with poor oral health, including preventative and promotive approaches (Watt et al., 2020). Psychologists could be a useful resource, but there are only a few psychologists working within dental care in Sweden today. The psychologists in the region of Västra Götaland, within public dental care, are only a handful, and found in specialized dental care, treating patients with severe dental anxiety. However, a patient does not need to have a mental issue to be treated by a psychologist. Patients often have health issues in health care settings, so why not oral health issues in the dental setting?

ETHICAL CONSIDERATIONS

The Regional Ethical Review Board in Gothenburg, Sweden (now replaced with the Swedish Ethical Review Authority) approved of Studies II-IV (reg. no. 840-12). In Sweden, research need to have an ethical approval. In addition, there are research codices, guidelines and principles to guide research. The well-known and established principles of biomedical ethics (Beauchamp & Childress, 2001), include:

1. Beneficence
2. Non-maleficence
3. Autonomy
4. Justice

Through improved understanding of behavioural interventions for patients with poor oral health, their treatment may be more effective and their suffering reduced. There is always the risk though, that psychological treatment, like the intervention developed in Study II and tested in Studies III-IV, may give rise to stress and negative emotions. Action was therefore taken to detect any adverse events; however, none was reported. The study participants also answered questionnaires, which may be stressful. The questionnaires took about 15 minutes in total to complete, and the study coordinators were close at hand to be able to assist the respondents, if needed. However, according to the study coordinators, their help was rarely needed.

Another ethical concern is autonomy. All participants gave their informed consent prior to study participation, and were free to end their participation at any time. ACT also takes autonomy into account. A collaborative relationship between the patient and therapist is central and the intervention is adapted to the patient, who is encouraged and helped to make more conscious choices, which may strengthen his/her autonomy.

All participants in Study III and IV had dental treatment as usual (except for no prophylaxis between session one and two in the intervention group). Not providing dental treatment in parallel with the study could perhaps have improved the possibility to evaluate the ACT intervention. However, that would have been unethical. Thus, some of the participants had their caries lesions treated during the study period, which may have contributed to the improvements found in self-rated oral health in both groups in Study IV.

When it comes to the justice principle, the ambition was that all young adults fulfilling the study inclusion criteria should have an equal chance of being recruited. The exclusion criteria disqualify some patients from treatment within the study context. Such criteria are common in clinical trials, but the pros and cons of the eligibility criteria could always be discussed. Some of the main reasons for the exclusion criteria were the limited evidence for ACT for several psychiatric diagnoses at the time of the planning of the studies, and the risk of other medical and psychotherapeutic treatment for such conditions interfering with the possibility to evaluate the effect of ACT.

CONCLUSION

This thesis has addressed the scientific knowledge about behavioural interventions with a psychological framework in dental care.

Study I showed a lack of high-quality studies on behavioural interventions for patients with an oral disease, especially dental caries and peri-implantitis. Psychological interventions need to be developed and tested, not only on adults in specialist dental care but also on adolescents and young adults in the public dental service.

Study II showed how the modern brief behavioural intervention of ACT was adapted to dental care, the reasons for using it and how it can be done. In addition, Study II gives an example of how a licensed psychologist can cooperate with dental teams in the public dental service to treat patients with an oral disease such as dental caries.

Study III and IV found young caries-active patients willing to meet a psychologist providing ACT within the public dental service, and the majority of the intervention group accepted and followed through the intervention.

Study III and IV found that the intervention group improved on more oral hygiene behaviours than the control group, directly and 18 weeks after baseline. In addition, Study IV found the intervention group, but not the control group, to be significantly improved in terms of the consumption of sweets and sodas over time. However, the differences in oral health behaviours in Study IV were not statistically significant between groups, and there were no differences in attitudes or psychological flexibility or acceptance over time or between the study groups.

Since Study III and IV are based on what appears to be the first RCT of ACT in dental care, ACT should yet not be implemented, but there is some promising evidence and reasons to test if some adjustments (e.g., a booster session) could improve the long-term effect of the ACT intervention for young adults with poor oral health.

FUTURE PERSPECTIVES

The behavioural interventions tested for patients with poor oral health only represent a small selection of all existing behavioural interventions. The scientific basis for behavioural interventions is growing, but more high-quality research is needed to evaluate current (e.g., MI) and new (e.g., ACT) interventions with a psychological framework in dental care.

Future studies need to include patients with dental caries and peri-implantitis and not only patients with periodontal disease. In addition, as Socialstyrelsen [National Swedish Board of Health and Welfare] (2011) also acknowledges, psychological interventions can also be tested on patients with functional limitations of their mouth and jaws. It may also be possible to target patients with erosion due to risk behaviours. As called for in Study I and by others, additional research is needed on younger patients and patients in public dental care. Future studies also need to include longer follow-up periods.

The measurements available today to evaluate behavioural interventions need to be improved. More consistent and standardized measurements of clinical outcomes could increase the possibilities to compare results across studies. There is also a need to develop valid and reliable measurements for each intervention (e.g., MI and ACT). Future studies should also include measurements of oral health behaviours, health attitudes, self-rated oral health, oral health-related quality of life, complications and risks.

The brief version of ACT introduced in this thesis can be refined and developed further. Future studies may benefit from including a booster session. A three-session therapy intervention would still be brief in comparison with many other forms of psychotherapy. Furthermore, ACT could be tested on different patient groups in dental care. In theory, patients with temporomandibular pain, for example, could benefit from the mindfulness and acceptance exercises found in ACT.

Finally, recent articles have called for more interprofessional collaborations between dental teams and health care providers. I hope this thesis has shed some light on how psychologists could contribute to the continuous efforts to improve behavioural interventions for patients with different oral health issues.

ACKNOWLEDGEMENT

To the study participants: Thank you for being so open-minded and willing to meet with a psychologist in dental care, and for contributing with your time and energy. Without you, this thesis would not have been possible.

To Ulla and Magnus: Thank you for having me on this project and as one of your PhD students. It has truly been a journey and I have learnt a great deal on the way. I admire your broad knowledge of dentistry and psychology, and your dedication to improve the care of patients in dentistry.

To my colleagues at the clinic of Oral medicine: Thank you for accepting me as one of your psychologists, and for everything that you have taught me about dental care and dentistry.

To Sven Carlsson: Little did we know when you were my supervisor during my studies to become a psychologist that I would be following in your footsteps, both clinically and in research. Thank you for leading the way, for setting such good examples, and for all the important work that you have done.

To Celia: Thank you for all your valuable knowledge of and guidance in ACT. I take all the interesting discussions we have had during my time as a PhD student with me and hope our roads will cross again in the future.

To Erika and Camilla and the staff at Angered and Vänersborg dental clinics: Thank you for all your efforts in the "ACT project" and for welcoming me with such open arms. It was so much fun working together!

To Birgitta and Anki and all the staff on "the fifth floor": Thank you for always being so helpful and including us PhD students. It means a lot!

To Lisa: I don't even know where to begin. You lit up my world from the day we became colleagues, and I am just so happy and thankful that we got to make a lot of this journey together and that I found such a genuine friend in you!

To Jennie: I am fortunate to have had you as my colleague and friend! We have not only shared a PhD project and many courses, but we have also both raised small children at the same time. I hope we will continue to be "just a knock on the door a way"!

To Nettan, Lotta, Karin, Negin, Astera: Thank you all for valuable scientific discussions and tips on the way, and for the many laughs we have had!

To Theresa, my first colleague as a psychologist. Your compassion, and the difference you make to young people's lives through psychology and being who you are is remarkable and will always inspire me.

To Helena, my partner in crime! I am honoured to be your friend, and happy that you are a psychologist: you are incredible in so many ways and always find the most relevant aspect of everything. I hope you will always be in my life.

To Karin K, my oldest friend and first study companion at the age of ten! It is so much fun that we both ended up doing research, and I am so happy that we have been able to keep in touch, even when the Atlantic was between us.

To Märta, my multi-talented friend: you are one of a kind, and have a heart of gold. You always give me energy and new perspectives, and I am so happy that you are in my life.

To Mum and Dad, thank you for always being there and for your endless support and encouragement. Thank you for teaching me so many valuable things when I was growing up. I hope I will be able to pass them on to my children. I love you endlessly.

To my siblings, you mean the world to me, and I will always be inspired by your courage and competence. You are my role models in so many ways and I am so grateful for your support. I love you and your families!

To Marcus: I am so glad that I get to share my life with you. Thank you for being my rock, for being such a great dad for our children and for everything that you have done to enable this journey. I just love you heaps and beyond!

To my children: You are the most amazing individuals there are and a constant reminder of what truly matters in life. I am so happy, thankful and proud to be your mum. I love you today, tomorrow, always!

FUNDING

The Institute of Odontology, Sahlgrenska Academy, University of Gothenburg.

The Public Dental Service, Region Västra Götaland.

The Health Care Sub-committee, Region Västra Götaland.

REFERENCES

A-Tjak, J. G., Davis, M. L., Morina, N., Powers, M. B., Smits, J. A., & Emmelkamp, P. M. G. (2015). A meta-analysis of the efficacy of acceptance and commitment therapy for clinically relevant mental and physical health problems. *Psychotherapy and Psychosomatics, 84*(1), 30-36. doi:10.1159/000365764

Al Rawahi, S. H., Asimakopoulou, K., & Newton, J. T. (2017). Theory based interventions for caries related sugar intake in adults: systematic review. *BMC Psychology, 5*(1), 1-6. doi:10.1186/s40359-017-0194-z

Albino, J., & Tiwari, T. (2020). Behavior change for caries prevention: understanding inconsistent results. *JDR Clinical and Translational Research, 5*(1), 6-9. doi:10.1177/2380084419878180

Anagnostopoulos, F., Buchanan, H., Frousiounioti, S., Niakas, D., & Potamianos, G. (2011). Self-efficacy and oral hygiene beliefs about toothbrushing in dental patients: a model-guided study. *Behavioral Medicine, 37*(4), 132-139. doi:10.1080/08964289.2011.636770

Antonovsky, A. (1987). *Unraveling the mystery of health: how people manage stress and stay well*. San Francisco: Jossey-Bass.

APA. (2010). *The heart & soul of change: delivering what works in therapy* (2nd ed.). Washington D.C.: American Psychological Association.

APA. (2020). APA Dictionary of Psychology. Retrieved from https://dictionary.apa.org/

APA Presidential Task Force on Evidence-Based Practice. (2006). Evidence-based practice in psychology. *American Psychologist, 61*, 271-285.

Baker, S. R., Mat, A., & Robinson, P. G. (2010). What psychosocial factors influence adolescents' oral health? *Journal of Dental Research, 89*(11), 1230-1235. doi:10.1177/0022034510376650

Balshem, H., Helfand, M., Schünemann, H. J., Oxman, A. D., Kunz, R., Brozek, J., . . . Guyatt, G. H. (2011). GRADE guidelines: 3. Rating the quality of evidence. *Journal of Clinical Epidemiology, 64*(4), 401-406. doi:10.1016/j.jclinepi.2010.07.015

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215. doi:10.1037//0033-295x.84.2.191

Barnes-Holmes, Y., Hayes, S. C., Barnes-Holmes, D., & Roche, B. (2001). *Relational frame theory: a post-Skinnerian account of human language and cognition*. New York: Academic.

Bartholomew, L. K., & Mullen, P. D. (2011). Five roles for using theory and evidence in the design and testing of behavior change interventions. *Journal of Public Health Dentistry, 71 Suppl 1*, S20-33. doi:10.1111/j.1752-7325.2011.00223.x

Batink, T., Jansen, G., & Peeters, F. (2015). Nieuwe generatie gedragstherapie, nieuwe generatie meetinstrumenten; een overzicht

van beschikbare ACT-meetinstrumenten [New generation behaviour therapy; new generation assessment measrues; a review of currently available assessment measures]. *Tijdschrift voor Psychiatrie, 57*(10), 739-748.

Beauchamp, T. L., & Childress, J. K. (2001). *Principles of biomedical ethics*. New York: Oxford University Press.

Berggren, U. (1984). *Dental fear and avoidance: a study of etiology, consequences and treatment.* (Doctoral thesis). University of Gothenburg, Gothenburg.

Bernabe, E., Marcenes, W., Hernandez, C. R., Bailey, J., Abreu, L. G., Alipour, V., . . . Kassebaum, N. J. (2020). Global, Regional, and National Levels and Trends in Burden of Oral Conditions from 1990 to 2017: A Systematic Analysis for the Global Burden of Disease 2017 Study. *Journal of Dental Research, 99*(4), 362-373. doi:10.1177/0022034520908533

Bernabé, E., Vehkalahti, M. M., Sheiham, A., Lundqvist, A., & Suominen, A. L. (2016). The Shape of the Dose-Response Relationship between Sugars and Caries in Adults. *Journal of Dental Research, 95*(2), 167-172. doi:10.1177/0022034515616572

Bernabé, E., Watt, R. G., Sheiham, A., Suominen-Taipale, A. L., Uutela, A., Vehkalahti, M. M., . . . Tsakos, G. (2010). Sense of coherence and oral health in dentate adults: findings from the Finnish Health 2000 survey. *Journal of Clinical Periodontology, 37*(11), 981-987. doi:10.1111/j.1600-051X.2010.01604.x

Bond, F. W., Hayes, S. C., Baer, R. A., Carpenter, K. M., Guenole, N., Orcutt, H. K., . . . Zettle, R. D. (2011). Preliminary psychometric properties of the Acceptance and Action Questionnaire–II: A revised measure of psychological inflexibility and experiential avoidance. *Behavior Therapy, 42*(4), 676-688. doi:10.1016/j.beth.2011.03.007

Borrelli, B. (2011). The assessment, monitoring, and enhancement of treatment fidelity in public health clinical trials. *Journal of Public Health Dentistry, 71 Suppl 1*, S52-63.

Brand, V. S., Bray, K. K., MacNeill, S., Catley, D., & Williams, K. (2013). Impact of single-session motivational interviewing on clinical outcomes following periodontal maintenance therapy. *International Journal of Dental Hygiene, 11*(2), 134-141. doi:10.1111/idh.12012

Brennan, D. S., & Spencer, A. J. (2012). Social support and optimism in relation to the oral health of young adults. *International Journal of Behavioral Medicine, 19*(1), 56-64. doi:10.1007/s12529-010-9136-3

Broadbent, J. M., Thomson, W. M., & Poulton, R. (2006). Oral health beliefs in adolescence and oral health in young adulthood. *Journal of Dental Research, 85*(4), 339-343. doi:10.1177/154405910608500411

Cademartori, M. G., Gastal, M. T., Nascimento, G. G., Demarco, F. F., & Corrêa, M. B. (2018). Is depression associated with oral health outcomes in adults and elders? A systematic review and meta-

analysis. *Clinical Oral Investigations, 22*(8), 2685-2702. doi:10.1007/s00784-018-2611-y

Cane, J., O'Connor, D., & Michie, S. (2012). Validation of the theoretical domains framework for use in behaviour change and implementation research. *Implementation Science, 7*(1), 1-7. doi:10.1186/1748-5908-7-37

Carr, A. B., & Ebbert, J. (2012). Interventions for tobacco cessation in the dental setting. *Cochrane Database of Systematic Reviews, 2012*(6). doi:10.1002/14651858.CD005084.pub3

Carra, M. C., Detzen, L., Kitzmann, J., Woelber, J. P., Ramseier, C. A., & Bouchard, P. (2020). Promoting behavioural changes to improve oral hygiene in patients with periodontal diseases: A systematic review. *Journal of Clinical Periodontology, 47*, 72-89. doi:10.1111/jcpe.13234

Chapple, I. L., Bouchard, P., Cagetti, M. G., Campus, G., Carra, M. C., Cocco, F., . . . Schulte, A. G. (2017). Interaction of lifestyle, behaviour or systemic diseases with dental caries and periodontal diseases: consensus report of group 2 of the joint EFP/ORCA workshop on the boundaries between caries and periodontal diseases. *Journal of Clinical Periodontology, 44*, S39-S51. doi:10.1111/jcpe.12685

Chase, J. A., Houmanfar, R., Hayes, S. C., Ward, T. A., Vilardaga, J. P., & Follette, V. (2013). Values are not just goals: Online ACT-based values training adds to goal setting in improving undergraduate college student performance. *Journal of Contextual Behavioral Science, 2*(3-4), 79-84. doi:10.1016/j.jcbs.2013.08.002

Conner, M., & Norman, P. (2005). *Predicting health behaviour research and practice with social cognition models* (2nd ed.). Maidenhead: Open University Press.

Conner, M., & Norman, P. (2017). Health behaviour: Current issues and challenges. *Psychology & Health, 32*(8), 895-906. doi:10.1080/08870446.2017.1336240

Cooper, J. O., Heron, T. E., & Heward, W. L. (2020). *Applied behavior analysis* (3d ed.). Hoboken: Pearson Education, Inc.

Corah, N. L., Gale, E. N., & Illig, S. J. (1978). Assessment of a dental anxiety scale. *Journal of the American Dental Association, 97*(5), 816-819. doi:10.14219/jada.archive.1978.0394

Dahlgren, G., & Whitehead, M. (1991). *Policies and strategies to promote social equity in health*. Stockholm: Institute for Futures Studies.

Daly, B., Batchelor, P., Treasure, E., & Watt, R. (2013). *Essential dental public health.* (2nd ed.). Oxford (UK): Oxford University Press.

Davis, R., Campbell, R., Hildon, Z., Hobbs, L., & Michie, S. (2014). Theories of behaviour and behaviour change across the social and behavioural sciences: a scoping review. *Health Psychology Review*, 1-36. doi:10.1080/17437199.2014.941722

de Ridder, D., Kroese, F., Evers, C., Adriaanse, M., & Gillebaart, M. (2017). Healthy diet: Health impact, prevalence, correlates, and interventions. *Psychology & Health, 32*(8), 907-941. doi:10.1080/08870446.2017.1316849

Dindo, L., Marchman, J., Gindes, H., & Fiedorowicz, J. G. (2015). A brief behavioral intervention targeting mental health risk factors for vascular disease: a pilot study. *Psychotherapy and Psychosomatics, 84*(3), 183-185. doi:10.1159/000371495

Dochat, C., Wooldridge, J. S., Herbert, M. S., Lee, M. W., & Afari, N. (2021). Single-Session Acceptance and Commitment Therapy (ACT) Interventions for Patients with Chronic Health Conditions: A Systematic Review and Meta-Analysis. *J Contextual Behav Sci, 20*, 52-69. doi:10.1016/j.jcbs.2021.03.003

Duarte, P. M., Nogueira, C. F. P., Silva, S. M., Pannuti, C. M., Schey, K. C., & Miranda, T. S. (2021). Impact of Smoking Cessation on Periodontal Tissues. *International Dental Journal*. doi:10.1016/j.identj.2021.01.016

Eifert, G. H., & Forsyth, J. P. (2005). *Acceptance and commitment therapy for anxiety disorders: A practitioner's treatment guide to using mindfulness, acceptance, and values-based behavior change strategies*. Oakland: New Harbinger Publications.

Elyasi, M., Abreu, L. G., Badri, P., Saltaji, H., Flores-Mir, C., & Amin, M. (2015). Impact of Sense of Coherence on Oral Health Behaviors: A Systematic Review. *PloS One, 10*(8), e0133918. doi:10.1371/journal.pone.0133918

Ericsson, J. S., Östberg, A. L., Wennström, J. L., & Abrahamsson, K. H. (2012). Oral health-related perceptions, attitudes, and behavior in relation to oral hygiene conditions in an adolescent population. *European Journal of Oral Sciences, 120*(4), 335-341. doi:10.1111/j.1600-0722.2012.00970.x

Eriksson, M., & Lindström, B. (2005). Validity of Antonovsky's sense of coherence scale: a systematic review. *Journal of Epidemiology and Community Health, 59*(6), 460-466. doi:10.1136/jech.2003.018085

FDI. (2021). FDI's definition of oral health. Retrieved from https://www.fdiworlddental.org/fdis-definition-oral-health

Fernández, D., Vigo, D., Sampson, N. A., Hwang, I., Aguilar-Gaxiola, S., Al-Hamzawi, A. O., . . . Haro, J. M. (2020). Patterns of care and dropout rates from outpatient mental healthcare in low-, middle- and high-income countries from the World Health Organization's World Mental Health Survey Initiative. *Psychological Medicine*, 1-13. doi:10.1017/S0033291720000884

Finlayson, T. L., Williams, D. R., Siefert, K., Jackson, J. S., & Nowjack-Raymer, R. (2010). Oral health disparities and psychosocial correlates of self-rated oral health in the National Survey of

American Life. *American Journal of Public Health, 100*, S246-S255. doi:10.2105/AJPH.2009.167783

Foxcroft, D. R., Coombes, L., Wood, S., Allen, D., Almeida Santimano, N. M., & Moreira, M. T. (2016). Motivational interviewing for the prevention of alcohol misuse in young adults. *Cochrane Database of Systematic Reviews*(7). doi:10.1002/14651858.CD007025.pub4

Frost, H., Campbell, P., Maxwell, M., O'Carroll, R. E., Dombrowski, S. U., Williams, B., . . . Pollock, A. (2018). Effectiveness of Motivational Interviewing on adult behaviour change in health and social care settings: A systematic review of reviews. *PloS One, 13*(10), e0204890. doi:10.1371/journal.pone.0204890

Gloster, A. T., Walder, N., Levin, M. E., Twohig, M. P., & Karekla, M. (2020). The empirical status of acceptance and commitment therapy: A review of meta-analyses. *Journal of Contextual Behavioral Science, 18*, 181-192. doi:10.1016/j.jcbs.2020.09.009

Grey, N. E., Lobel, M., & Cannella, D. T. (2013). Something to chew on: psychosocial factors associated with oral health practices. *Journal of Applied Social Psychology, 43*, E13-E22. doi:10.1111/jasp.12016

Hakeberg, M., & Wide Boman, U. (2017). Dental care attendance and refrainment from dental care among adults. *Acta Odontologica Scandinavica, 75*(5), 366-371. doi:10.1080/00016357.2017.1317105

Halliburton, A. E., & Cooper, L. D. (2015). Applications and adaptations of Acceptance and Commitment Therapy (ACT) for adolescents. *Journal of Contextual Behavioral Science, 4*(1), 1-11. doi:10.1016/j.jcbs.2015.01.002

Harris, E., & Samuel, V. (2020). Acceptance and Commitment Therapy: A Systematic Literature Review of Prevention and Intervention Programs for Mental Health Difficulties in Children and Young People. *Journal of Cognitive Psychotherapy, 34*(4), 280-305. doi:10.1891/jcpsy-d-20-00001

Harris, R. (2009). *ACT Made Simple. An easy-to-read primer on acceptance and commitment therapy*. Oakland: New Harbinger.

Harris, R., Gamboa, A., Dailey, Y., & Ashcroft, A. (2012). One-to-one dietary interventions undertaken in a dental setting to change dietary behaviour. *Cochrane Database of Systematic Reviews, 2012*(3). doi:10.1002/14651858.CD006540.pub2

Hayes, L. L. (2015). *The thriving adolescent: using acceptance and commitment therapy and positive psychology to help teens manage emotions, achieve goals, and build connection*. Oakland: Context Press, an imprint of New Harbinger Publications, Inc.

Hayes, S. C., Bissett, R., Roget, N., Padilla, M., Kohlenberg, B. S., Fisher, G., . . . Niccolls, R. (2004). The impact of acceptance and commitment training and multicultural training on the stigmatizing attitudes and professional burnout of substance abuse counselors.

Behavior Therapy, 35(4), 821-835. doi:10.1016/S0005-7894(04)80022-4

Hayes, S. C., Levin, M. E., Plumb-Vilardaga, J., Villatte, J. L., & Pistorello, J. (2013). Acceptance and commitment therapy and contextual behavioral science: Examining the progress of a distinctive model of behavioral and cognitive therapy. *Behavior Therapy, 44*(2), 180-198. doi:10.1016/j.beth.2009.08.002

Hayes, S. C., Luoma, J. B., Bond, F. W., Masuda, A., & Lillis, J. (2006). Acceptance and commitment therapy: Model, processes and outcomes. *Behaviour Research and Therapy, 44*(1), 1-25. doi:10.1016/j.brat.2005.06.006

Hayes, S. C., Pistorello, J., & Levin, M. E. (2012). Acceptance and commitment therapy as a unified model of behavior change. *The Counseling Psychologist, 40*(7), 976-1002. doi:10.1177/0011000012460836

Hayes, S. C., Strosahl, K., & Wilson, K. G. (1999). *Acceptance and Commitment Therapy: An experiential approach to behavior change.* New York: Guilford Press.

Hayes, S. C., Strosahl, K., Wilson, K. G., Bissett, R., Pistorello, J., Toarmino, D., . . . McCurry, S. M. (2004). Measuring experiential avoidance: A preliminary test of a working model. *The Psychological Record, 54*(4), 553-578. doi:10.1007/BF03395492

Hayes, S. C., Wilson, K. G., Gifford, E. V., Follette, V. M., & Strosahl, K. (1996). Experimental avoidance and behavioral disorders: A functional dimensional approach to diagnosis and treatment. *Journal of Consulting and Clinical Psychology, 64*(6), 1152-1168. doi:10.1037//0022-006X.64.6.1152

Heggdal, K., & Lovaas, B. (2018). Health promotion in specialist and community care: How a broadly applicable health promotion intervention influences patient's sense of coherence. *Scandinavian Journal of Caring Sciences, 32*(2), 690-697. doi:10.1111/scs.12498

Higgins, P., & Green, S. (2011). Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0 [updated March 2011]. Retrieved from https://handbook-5-1.cochrane.org/

Holmes, E. A., Ghaderi, A., Harmer, C. J., Ramchandani, P. G., Cuijpers, P., Morrison, A. P., . . . Craske, M. G. (2018). The Lancet Psychiatry Commission on psychological treatments research in tomorrow's science. *The Lancet Psychiatry, 5*(3), 237-286. doi:10.1016/S2215-0366(17)30513-8

Inglehart, M. R., & Bagramian, R. (2002). Oral health-related quality of life. In M. R. Inglehart & R. Bagramian (Eds.). Chicago: Quintessence Publishing

Jackson, M. L., Williams, W. L., Hayes, S. C., Humphreys, T., Gauthier, B., & Westwood, R. (2016). Whatever gets your heart pumping: the impact of implicitly selected reinforcer-focused statements on

exercise intensity. *Journal of Contextual Behavioral Science, 5*(1), 48-57. doi:10.1016/j.jcbs.2015.11.002

Jensen, M. P., Vowles, K. E., Johnson, L. E., & Gertz, K. J. (2015). Living well with pain: Development and preliminary evaluation of the Valued Living Scale. *Pain Medicine, 16*(11), 2109-2120. doi:10.1111/pme.12802

Jepsen, S., Blanco, J., Buchalla, W., Carvalho, J. C., Dietrich, T., Dörfer, C., . . . Machiulskiene, V. (2017). Prevention and control of dental caries and periodontal diseases at individual and population level: consensus report of group 3 of joint EFP/ORCA workshop on the boundaries between caries and periodontal diseases. *Journal of Clinical Periodontology, 44 Suppl 18*, S85-s93. doi:10.1111/jcpe.12687

Jönsson, B., Holde, G. E., & Baker, S. R. (2020). The role of psychosocial factors and treatment need in dental service use and oral health among adults in Norway. *Community Dentistry and Oral Epidemiology, 48*(3), 215-224. doi:10.1111/cdoe.12518

Jönsson, B., Lindberg, P., Oscarson, N., & Ohrn, K. (2006). Improved compliance and self-care in patients with periodontitis—a randomized control trial. *International Journal of Dental Hygiene, 4*(2), 77-83. doi:10.1111/j.1601-5037.2006.00175.x

Jönsson, B., & Öhrn, K. (2014). Evaluation of the effect of non-surgical periodontal treatment on oral health-related quality of life: estimation of minimal important differences 1 year after treatment. *Journal of Clinical Periodontology, 41*(3), 275-282. doi:10.1111/jcpe.12202

Jönsson, B., Öhrn, K., Oscarson, N., & Lindberg, P. (2009). The effectiveness of an individually tailored oral health educational programme on oral hygiene behaviour in patients with periodontal disease: a blinded randomized-controlled clinical trial (one-year follow-up). *Journal of Clinical Periodontology, 36*(12), 1025-1034. doi:10.1111/j.1600-051X.2009.01453.x

Kakudate, N., Morita, M., Sugai, M., & Kawanami, M. (2009). Systematic cognitive behavioral approach for oral hygiene instruction: a short-term study. *Patient Education and Counseling, 74*(2), 191-196. doi:10.1016/j.pec.2008.08.014

Karekla, M., Konstantinou, P., Ioannou, M., Kareklas, I., & Gloster, A. T. (2019). The phenomenon of treatment dropout, reasons and moderators in acceptance and commitment therapy and other active treatments. *Clinical Psychology in Europe, 1*(3), 1-36. doi:10.32872/cpe.v1i3.33058

Kisely, S., Sawyer, E., Siskind, D., & Lalloo, R. (2016). The oral health of people with anxiety and depressive disorders – a systematic review and meta-analysis. *Journal of Affective Disorders, 200*, 119-132. doi:10.1016/j.jad.2016.04.040

Kopp, S. L., Ramseier, C. A., Ratka-Krüger, P., & Woelber, J. P. (2017). Motivational interviewing as an adjunct to periodontal therapy-a systematic review. *Frontiers in Psychology, 8*, 279. doi:10.3389/fpsyg.2017.00279

Kyllönen, H. M., Muotka, J., Puolakanaho, A., Astikainen, P., Keinonen, K., & Lappalainen, R. (2018). A brief acceptance and commitment therapy intervention for depression: a randomized controlled trial with 3-year follow-up for the intervention group. *Journal of Contextual Behavioral Science, 10*, 55-63. doi:10.1016/j.jcbs.2018.08.009

Langius, A., & Björvell, H. (1993). Coping ability and functional status in a Swedish population sample. *Scandinavian Journal of Caring Sciences, 7*(1), 3-10.

Langius, A., Björvell, H., & Antonovsky, A. (1992). The sense of coherence concept and its relation to personality traits in Swedish samples. *Scandinavian Journal of Caring Sciences, 6*(3), 165-171. doi:10.1111/j.1471-6712.1992.tb00146.x

Lappalainen, P., Granlund, A., Siltanen, S., Ahonen, S., Vitikainen, M., Tolvanen, A., & Lappalainen, R. (2014). ACT Internet-based vs face-to-face? A randomized controlled trial of two ways to deliver Acceptance and Commitment Therapy for depressive symptoms: An 18-month follow-up. *Behaviour Research and Therapy, 61*, 43-54. doi:10.1016/j.brat.2014.07.006

Lawlor, E. R., Islam, N., Bates, S., Griffin, S. J., Hill, A. J., Hughes, C. A., . . . Ahern, A. L. (2020). Third-wave cognitive behaviour therapies for weight management: A systematic review and network meta-analysis. *Obesity Reviews, 21*(7), e13013. doi:10.1111/obr.13013

Levin, M. E., Hildebrandt, M. J., Lillis, J., & Hayes, S. C. (2012). The impact of treatment components suggested by the psychological flexibility model: A meta-analysis of laboratory-based component studies. *Behavior Therapy, 43*(4), 741-756. doi:10.1016/j.beth.2012.05.003

Lindmark, U., Hakeberg, M., & Hugoson, A. (2011). Sense of coherence and its relationship with oral health-related behaviour and knowledge of and attitudes towards oral health. *Community Dentistry and Oral Epidemiology, 39*(6), 542-553. doi:10.1111/j.1600-0528.2011.00627.x

Lindson, N., Thompson, T. P., Ferrey, A., Lambert, J. D., & Aveyard, P. (2019). Motivational interviewing for smoking cessation. *Cochrane Database of Systematic Reviews*(7). doi:10.1002/14651858.CD006936.pub4

Livheim, F., Tengström, A., Andersson, G., Dahl, J., Björck, C., & Rosendahl, I. (2020). A quasi-experimental, multicenter study of acceptance and commitment therapy for antisocial youth in residential care. *Journal of Contextual Behavioral Science, 16*, 119-127. doi:10.1016/j.jcbs.2020.03.008

Locker, D., & Allen, F. (2007). What do measures of 'oral health-related quality of life' measure? *Community Dentistry and Oral Epidemiology, 35*(6), 401-411. doi:10.1111/j.1600-0528.2007.00418.x

Louma, J. B., Hayes, S. C., & Walser, R. D. (2007). *Learning ACT: An acceptance & commitment therapy skills-training manual for therapists*. Oakland: New Harbinger Publications, Inc.

Lundgren, T., Luoma, J. B., Dahl, J., Strosahl, K., & Melin, L. (2012). The bull's-eye values survey: a psychometric evaluation. *Cognitive and Behavioral Practice, 19*(4), 518-526. doi:10.1016/j.cbpra.2012.01.004

Masood, M., Younis, L. T., Masood, Y., Bakri, N. N., & Christian, B. (2019). Relationship of periodontal disease and domains of oral health-related quality of life. *Journal of Clinical Periodontology, 46*(2), 170-180. doi:10.1111/jcpe.13072.

McAndrews, Z., Richardson, J., & Stopa, L. (2019). Psychometric properties of acceptance measures: A systematic review. *Journal of Contextual Behavioral Science, 12*, 261-277. doi:10.1016/j.jcbs.2018.08.006

Michie, S., & Johnston, M. (2013). Behavior Change Techniques. In M. D. Gellman & J. R. Turner (Eds.), *Encyclopedia of Behavioral Medicine*. New York: Springer New York.

Michie, S., Johnston, M., Abraham, C., Lawton, R., Parker, D., Walker, A., & "Psychological Theory" Group. (2005). Making psychological theory useful for implementing evidence based practice: a consensus approach. *Quality & Saftey in Health Care, 14*(1), 26-33. doi:10.1136/qshc.2004.011155

Michie, S., & Prestwich, A. (2010). Are interventions theory-based? Development of a theory coding scheme. *Health Psychology, 29*(1), 1. doi:10.1037/a0016939

Michie, S., Richardson, M., Johnston, M., Abraham, C., Francis, J., Hardeman, W., . . . Wood, C. E. (2013). The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. *Annals of Behavioral Medicine, 46*(1), 81-95. doi:10.1007/s12160-013-9486-6

Miller, W. R., & Mount, K. A. (2001). A small study of training in motivational interviewing: Does one workshop change clinician and client behavior? *Behavioural and Cognitive Psychotherapy, 29*(4), 457-471. doi:10.1017/S1352465801004064

Miller, W. R., & Rollnick, S. (2013). *Motivational interviewing: helping people change* (3d ed.). New York, NY: Guilford Press.

Moher, D., Hopewell, S., Schulz, K. F., Montori, V., Gøtzsche, P. C., Devereaux, P. J., . . . Altman, D. G. (2012). CONSORT 2010 explanation and elaboration: updated guidelines for reporting parallel

group randomised trials. *International Journal of Surgery (London, England), 10*(1), 28-55. doi:10.1016/j.ijsu.2011.10.001

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & Prisma Group. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Medicine, 6*(7), e1000097.

Morrison, V., & Bennet, P. (2011). *An introduction to health psychology.* (2nd ed.). Harlow: Pearson Education.

Nammontri, O., Robinson, P. G., & Baker, S. R. (2013). Enhancing oral health via sense of coherence: a cluster-randomized trial. *Journal of Dental Research, 92*(1), 26-31. doi:10.1177/0022034512459757

Newton, J. T., & Asimakopoulou, K. (2015). Managing oral hygiene as a risk factor for periodontal disease: a systematic review of psychological approaches to behaviour change for improved plaque control in periodontal management. *Journal of Clinical Periodontology, 42 Suppl 16*, S36-S46. doi:10.1111/jcpe.12356

Newton, J. T., & Buck, D. J. (2000). Anxiety and pain measures in dentistry: a guide to their quality and application. *Journal of the American Dental Association, 131*(10), 1449-1457. doi:10.14219/jada.archive.2000.0056

Ng, S. K., & Leung, W. K. (2006). Oral health-related quality of life and periodontal status. *Community Dentistry and Oral Epidemiology, 34*(2), 114-122. doi:10.1111/j.1600-0528.2006.00267.x

NICE. (2015). Oral health promotion: general dental practice. NICE guideline [NG30]. Retrieved from https://www.nice.org.uk/guidance/ng30

Norderyd, O., Koch, G., Papias, A., Köhler, A. A., Helkimo, A. N., Brahm, C. O., . . . Frisk, F. (2015). Oral health of individuals aged 3-80 years in Jönköping, Sweden, during 40 years (1973-2013). *Swedish Dental Journal, 39*(2), 57-68.

O'Neill, L., Latchford, G., McCracken, L. M., & Graham, C. D. (2019). The development of the Acceptance and Commitment Therapy Fidelity Measure (ACT-FM): A delphi study and field test. *Journal of Contextual Behavioral Science, 14*, 111-118. doi:10.1016/j.jcbs.2019.08.008

Ong, C. W., Lee, E. B., Levin, M. E., & Twohig, M. P. (2019). A review of AAQ variants and other context-specific measures of psychological flexibility. *Journal of Contextual Behavioral Science, 12*, 329-346. doi:10.1016/j.jcbs.2019.02.007

Ong, C. W., Lee, E. B., & Twohig, M. P. (2018). A meta-analysis of dropout rates in acceptance and commitment therapy. *Behaviour Research and Therapy, 104*, 14-33. doi:10.1016/j.brat.2018.02.004

Pears, S., & Sutton, S. (2020). Effectiveness of Acceptance and Commitment Therapy (ACT) interventions for promoting physical activity: a systematic review and meta-analysis. *Health Psychology Review*, 1-26. doi:10.1080/17437199.2020.1727759

Peres, M. A., Macpherson, L. M. D., Weyant, R. J., Daly, B., Venturelli, R., Mathur, M. R., . . . Watt, R. G. (2019). Oral diseases: a global public health challenge. *Lancet, 394*(10194), 249-260. doi:10.1016/s0140-6736(19)31146-8

Peruzzo, D. C., Benatti, B. B., Ambrosano, G. M., Nogueira-Filho, G. R., Sallum, E. A., Casati, M. Z., & Nociti, F. H., Jr. (2007). A systematic review of stress and psychological factors as possible risk factors for periodontal disease. *Journal of Periodontology, 78*(8), 1491-1504. doi:10.1902/jop.2007.060371

Pocock, S. (1983). *Clinical trials: a practical approach*. Chichester: John Wiley & Sons.

Powers, M. B., Zum Vörde Sive Vörding, M. B., & Emmelkamp, P. M. (2009). Acceptance and Commitment Therapy: A Meta-Analytic Review. *Psychotherapy and Psychosomatics, 78*(2), 73-80. doi:10.1159/000190790

Prochaska, J. O., & DiClemente, C. C. (1983). Stages and processes of self-change of smoking: toward an integrative model of change. *Journal of Consulting and Clinical Psychology, 51*(3), 390-395. doi:10.1037//0022-006x.51.3.390

Ramsay, C. R., Clarkson, J. E., Duncan, A., Lamont, T. J., Heasman, P. A., Boyers, D., . . . Young, L. (2018). Improving the Quality of Dentistry (IQuaD): a cluster factorial randomised controlled trial comparing the effectiveness and cost-benefit of oral hygiene advice and/or periodontal instrumentation with routine care for the prevention and management of periodontal disease in dentate adults attending dental primary care. *Health Technology Assessment, 22*(38), 1-144. doi:10.3310/hta22380

Ramseier, C. A., & Suvan, J. E. (2015). Behaviour change counselling for tobacco use cessation and promotion of healthy lifestyles: a systematic review. *Journal of Clinical Periodontology, 42 Suppl 16*, S47-S58. doi:10.1111/jcpe.12351

Reilly, E. D., Ritzert, T. R., Scoglio, A. A., Mote, J., Fukuda, S. D., Ahern, M. E., & Kelly, M. M. (2019). A systematic review of values measures in acceptance and commitment therapy research. *Journal of Contextual Behavioral Science, 12*, 290-304. doi:10.1016/j.jcbs.2018.10.004

Renz, A., Ide, M., Newton, T., Robinson, P. G., & Smith, D. (2007). Psychological interventions to improve adherence to oral hygiene instructions in adults with periodontal diseases. *Cochrane Database of Systematic Reviews*(2). doi:10.1002/14651858.CD005097.pub2

Review Manager. (2014) (Version 5.3). Copenhagen, Denmark: Nordic Cochrane Centre, Cochrane Collaboration.

Richardson, W. S., Wilson, M. C., Nishikawa, J., & Hayward, R. S. (1995). The well-built clinical question: a key to evidence-based decisions.

ACP Journal Club, 123(3), A12-A13. doi:10.7326/ACPJC-1995-123-3-A12

Robinson, L. M., & Vail, S. R. (2012). An integrative review of adolescent smoking cessation using the Transtheoretical Model of Change. *Journal of Pediatric Health Care, 26*(5), 336-345. doi:10.1016/j.pedhc.2010.12.001

Rochefort, C., Baldwin, A. S., & Chmielewski, M. (2018). Experiential avoidance: An examination of the construct validity of the AAQ-II and MEAQ. *Behavior Therapy, 49*(3), 435-449. doi:10.1016/j.beth.2017.08.008

Roth, A., & Fonagy, P. (2005). *What Works for Whom?: A Critical Review of Psychotherapy Research* (2nd ed.). New York: Guilford Publications.

Rothman, K. J. (1976). Causes. *American Journal of Epidemiology, 104*(6), 587-592. doi:10.1093/oxfordjournals.aje.a112335

Rotter, J. B. (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychological Monographs, 80*(1), 1-28.

Ruiz, F. J. (2012). Acceptance and commitment therapy versus traditional cognitive behavioral therapy: A systematic review and meta-analysis of current empirical evidence. *International Journal of Psychology and Psychological Therapy, 12*(3), 333-357.

Sandoz, E. K., Wilson, K. G., & Dufrene, T. (2010). *Acceptance and commitment therapy for eating disorders: a process-focused guide to treating anorexia and bulimia*. Oakland: New Harbinger Publications.

SBU [Swedish Agency for Health Technology Assessment and Assesment of Social Services]. (2012). Checklists from SBU regarding randomized controlled trials Retrieved from https://www2.sahlgrenska.se/sv/SU/Forskning/HTA-centrum/Hogerkolumnundersidor/Hjalpmedel-under-projektet/.

Scheerman, J. F., van Loveren, C., van Meijel, B., Dusseldorp, E., Wartewig, E., Verrips, G. H., . . . van Empelen, P. (2016). Psychosocial correlates of oral hygiene behaviour in people aged 9 to 19 - a systematic review with meta-analysis. *Community Dentistry and Oral Epidemiology, 44*(4), 331-341. doi:10.1111/cdoe.12224

Scheier, M. F., & Carver, C. S. (1985). Optimism, coping, and health: assessment and implications of generalized outcome expectancies. *Health Psychology, 4*(3), 219-247. doi:10.1037//0278-6133.4.3.219

Sheeran, P., Maki, A., Montanaro, E., Avishai-Yitshak, A., Bryan, A., Klein, W. M. P., . . . Rothman, A. J. (2016). The impact of changing attitudes, norms, and self-efficacy on health-related intentions and behavior: A meta-analysis. *Health Psychology, 35*(11), 1178-1188. doi:10.1037/hea0000387

Sheiham, A., & Watt, R. G. (2000). The common risk factor approach: a rational basis for promoting oral health. *Community Dentistry and*

Oral Epidemiology: Commentary, 28(6), 399-406. doi:10.1034/j.1600-0528.2000.028006399.x

Silva, A. N. D., Alvares de lima, S. T., & Vettore, M. V. (2018). Protective psychosocial factors and dental caries in children and adolescents: a systematic review and meta-analysis. *International Journal of Paediatric Dentistry, 28*(5), 443-458. doi:10.1111/ipd.12375

Sischo, L., & Broder, H. L. (2011). Oral health-related quality of life: what, why, how, and future implications. *Journal of Dental Research, 90*(11), 1264-1270. doi:10.1177/0022034511399918

Sloan, J. A., Dueck, A. C., Erickson, P. A., Guess, H., Revicki, D. A., Santanello, N. C., & Mayo/FDA Patient-Reported Outcomes Consensus Meeting Group. (2007). Analysis and interpretation of results based on patient-reported outcomes. *Value in Health, 10*(2), S106-S115. doi:10.1111/j.1524-4733.2007.00273.x

Socialstyrelsen [National Swedish Board of Health and Welfare]. (2011). Nationella riktlinjer för vuxentandvård 2011 - stöd för styrning och ledning. Retrieved from https://www.socialstyrelsen.se/globalassets/sharepoint-dokument/artikelkatalog/nationella-riktlinjer/2011-5-1.pdf

Socialstyrelsen [National Swedish Board of Health and Welfare]. (2017). Utvecklingen av psykisk ohälsa hos barn och unga vuxna - till och med 2016. Retrieved from https://www.socialstyrelsen.se/globalassets/sharepoint-dokument/artikelkatalog/statistik/2017-12-29.pdf

Socialstyrelsen [National Swedish Board of Health and Welfare]. (2018). Nationella riktlinjer för prevention och behandling vid ohälsosamma levnadsvanor - stöd för styrning och ledning. Retrieved from https://www.socialstyrelsen.se/globalassets/sharepoint-dokument/artikelkatalog/nationella-riktlinjer/2018-6-24.pdf

Socialstyrelsen [National Swedish Board of Health and Welfare]. (2020). Tillståndet och utvecklingen inom hälso- och sjukvård samt tandvård. Lägesrapport 2020. Retrieved from https://www.socialstyrelsen.se/globalassets/sharepoint-dokument/artikelkatalog/ovrigt/2020-3-6667.pdf

Soldani, F. A., Lamont, T., Jones, K., Young, L., Walsh, T., Lala, R., & Clarkson, J. E. (2018). One-to-one oral hygiene advice provided in a dental setting for oral health. *Cochrane Database of Systematic Reviews, 10*(10). doi:10.1002/14651858.CD007447.pub2

Stenman, J., Wennström, J. L., & Abrahamsson, K. H. (2018). A brief motivational interviewing as an adjunct to periodontal therapy-A potential tool to reduce relapse in oral hygiene behaviours. A three-year study. *International Journal of Dental Hygiene, 16*(2), 298-304. doi:10.1111/idh.12308

Stockton, D., Kellett, S., Berrios, R., Sirois, F., Wilkinson, N., & Miles, G. (2019). Identifying the underlying mechanisms of change during

Acceptance and Commitment Therapy (ACT): A systematic review of contemporary mediation studies. *Behavioural and Cognitive Psychotherapy, 47*(3), 332-362. doi:10.1017/S1352465818000553

Strecher, V. J., DeVellis, B. M., Becker, M. H., & Rosenstock, I. M. (1986). The role of self-efficacy in achieving health behavior change. *Health Education Quarterly, 13*(1), 73-92. doi:10.1177/109019818601300108

Strosahl, K., Robinson, P., & Gustavsson, T. (2012). *Brief interventions for radical change: Principles and practice of focused acceptance and commitment therapy*. Oakland: New Harbinger Publications.

Swift, J. K., & Greenberg, R. P. (2012). Premature Discontinuation in Adult Psychotherapy: A Meta-Analysis. *Journal of Consulting and Clinical Psychology, 80*(4), 547-559. doi:10.1037/a0028226

Tandvårdslag [the Swedish Dental Services Act] (1985:125). Tandvårdslag (1985:125). *Svensk författningssamling 1985:125 tom SFS 22017:34.* Retrieved from https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/tandvardslag-1985125_sfs-1985-125

Tedesco, L. A., Keffer, M. A., Davis, E. L., & Christersson, L. A. (1992). Effect of a social cognitive intervention on oral health status, behavior reports, and cognitions. *Journal of Periodontology, 63*(7), 567-575. doi:10.1902/jop.1992.63.7.567

Tyndall, I., Waldeck, D., Pancani, L., Whelan, R., Roche, B., & Dawson, D. L. (2019). The Acceptance and Action Questionnaire-II (AAQ-II) as a measure of experiential avoidance: Concerns over discriminant validity. *Journal of Contextual Behavioral Science, 12*, 278-284. doi:10.1016/j.jcbs.2018.09.005

Wallston, K. A. (2005). The Validity of the Multidimensional Health Locus of Control Scales. *Journal of Health Psychology, 10*(5), 623-631. doi:10.1177/1359105305055304

Wallston, K. A., Wallston, B. S., & Devellis, R. (1978). Development of the Multidimensional Health Locus of Control (MHLC) Scales. *Health Education Monographs, 6*(2), 160-170. doi:10.1177/109019817800600107

Walser, R. D., & Westrup, D. (2007). *Acceptance & commitment therapy for the treatment of post-traumatic stress disorder & trauma-related problems: a practitioner's guide to using mindfulness & acceptance strategies*. Oakland, CA: New Harbinger Publications.

Watt, R. G. (2005). Strategies and approaches in oral disease prevention and health promotion. *Bulletin of the World Health Organization, 83*(9), 711-718. doi:/S0042-96862005000900018

Watt, R. G., Daly, B., Allison, P., Macpherson, L. M. D., Venturelli, R., Listl, S., . . . Benzian, H. (2019). Ending the neglect of global oral health: time for radical action. *Lancet, 394*(10194), 261-272. doi:10.1016/s0140-6736(19)31133-x

Watt, R. G., Daly, B., Allison, P., Macpherson, L. M. D., Venturelli, R., Listl, S., . . . Benzian, H. (2020). *The Lancet* Oral Health Series: Implications for oral and dental research. *Journal of Dental Research, 99*(1), 8-10. doi:10.1177/0022034519889050

Watt, R. G., & Sheiham, A. (2012). Integrating the common risk factor approach into a social determinants framework. *Community Dentistry and Oral Epidemiology, 40*(4), 289-296. doi:10.1111/j.1600-0528.2012.00680.x

Webb, T. L., Joseph, J., Yardley, L., & Michie, S. (2010). Using the internet to promote health behavior change: a systematic review and meta-analysis of the impact of theoretical basis, use of behavior change techniques, and mode of delivery on efficacy. *Journal of Medical Internet Research, 12*(1), e4. doi:10.2196/jmir.1376

Werner, H., Hakeberg, M., Dahlström, L., Eriksson, M., Sjögren, P., Strandell, A., . . . Wide Boman, U. (2016). Psychological interventions for poor oral health: A systematic review. *Journal of Dental Research, 95*(5), 506-514. doi:10.1177/0022034516628506

WHO. (1946). Preamble to the Constitution of WHO as adopted by the International Health Conference, New York, 19 June - 22 July 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of WHO, no. 2, p. 100) and entered into force on 7 April 1948. Retrieved from https://www.who.int/about/who-we-are/frequently-asked-questions

WHO. (2017). Sugars and dental caries. Retrieved from www.who.int/entity/nutrition/publications/nutrientrequirements/sugars-dental-caries-keyfacts/en/

WHO. (2020). Oral Health. Retrieved from https://www.who.int/news-room/fact-sheets/detail/oral-health

WHO. (2021). Adolescent and young adult health. Retrieved from https://www.who.int/news-room/fact-sheets/detail/adolescents-health-risks-and-solutions

Woelber, J. P., Spann-Aloge, N., Hanna, G., Fabry, G., Frick, K., Brueck, R., . . . Ratka-Krüger, P. (2016). Training of dental professionals in motivational interviewing can heighten interdental cleaning self-efficacy in periodontal patients. *Frontiers in Psychology, 7*, 254-254. doi:10.3389/fpsyg.2016.00254

Wolgast, M. (2014). What does the Acceptance and Action Questionnaire (AAQ-II) really measure? *Behavior Therapy, 45*(6), 831-839. doi:10.1016/j.beth.2014.07.002

Worthington, H. V., MacDonald, L., Pericic, P. T., Sambunjak, D., Johnson, T. M., Imai, P., & Clarkson, J. E. (2019). Home use of interdental cleaning devices, in addition to toothbrushing, for preventing and controlling periodontal diseases and dental caries. *Cochrane Database of Systematic Reviews*(4). doi:10.1002/14651858.CD012018.pub2

Xiang, B., Wong, H. M., Perfecto, A. P., & McGrath, C. P. J. (2020). The effectiveness of behavioral interventions to improve oral health in adolescents at different periods of follow-up: A systematic review and meta-analysis. *Patient Education and Counseling, 103*(4), 725-733. doi:10.1016/j.pec.2019.11.030

Yıldız, E. (2020). The effects of acceptance and commitment therapy on lifestyle and behavioral changes: A systematic review of randomized controlled trials. *Perspectives in Psychiatric Care, 56*(3), 657-690. doi:10.1111/ppc.12482

Ylöstalo, P., Ek, E., & Knuuttila, M. (2003). Coping and optimism in relation to dental health behaviour—a study among Finnish young adults. *European Journal of Oral Sciences, 111*(6), 477-482. doi:10.1111/j.0909-8836.2003.00083.x

Zhang, C., Leeming, E., Smith, P., Chung, P. K., Hagger, M. S., & Hayes, S. C. (2018). Acceptance and commitment therapy for health behavior change: A contextually-driven approach. *Frontiers in Psychology, 8*. doi:10.3389/fpsyg.2017.02350

Östberg, A.-L., & Abrahamsson, K. H. (2013). Oral health locus of control in a Swedish adolescent population. *Acta Odontologica Scandinavica, 71*(1), 249-255. doi:10.3109/00016357.2012.671361