ORIGINAL ARTICLE

Motivation and anxiety for dental treatment and dental attendance: The roles of the locus of causality personality and treatment styles

Anne Elisabeth Münster Halvari[1] 🆔 | Hallgeir Halvari[2] | Edward L. Deci[2,3,4] | Geoffrey C. Williams[3]

[1]Faculty of Dentistry, Department of Dental Hygienist Education, University of Oslo, Oslo, Norway

[2]Department of Business, Marketing and Law, University of South-Eastern Norway, Hønefoss, Norway

[3]Department of Clinical and Social Sciences in Psychology, University of Rochester, Rochester, NY, USA

[4]Institute for Positive Psychology and Education, Australian Catholic University, Strathfield, NSW, Australia

Correspondence
Anne Elisabeth Münster Halvari, Faculty of Dentistry, Department of Dental Hygienist Education, University of Oslo, Geirmyrsveien 69/71, 0455 Oslo, Norway.
Email: ahalvari@odont.uio.no

Abstract

The purpose of the present study was to test a self-determination theory model with the following hypotheses: (1) Patients' autonomous causality personality orientation and oral health care professionals' autonomy-supportive treatment styles, as perceived by patients, would both be positively indirectly associated with dental attendance through patients' autonomous motivation for dental treatment. (2) Patients' controlled causality personality orientation and oral health care professionals' controlling treatment styles, as perceived by patients, would both be positively indirectly associated with avoidance of making a dental clinic appointment through patients' anxiety for dental treatment. A sample size of about 200 patients was estimated to be acceptable in detecting moderate effect sizes (independent variables: 5–6; power: .80; $p < .05$). Student patients ($N = 226$) responded to a survey with validated questionnaires. Using *LISREL*, both hypotheses were supported. In addition, patients' perception of a controlling treatment style moderated the controlled personality—dental anxiety relation, so that a lower controlling treatment style mitigated dental anxiety substantially among patients with a high control orientation. Effect sizes were moderate to large. Analyses (Z-scores) also revealed that the autonomous personality is more strongly linked to situational autonomous motivation than situational autonomy support, whereas a controlled personality and a perceived controlling treatment style are equally and significantly associated to dental anxiety. Both patient personalities and oral health care professionals' treatment styles are substantially linked to autonomous motivation and anxiety for dental treatment, which are relatively strongly associated with dental attendance and avoiding dental clinic appointments, respectively.

1 | INTRODUCTION

The current study used the hierarchical model of motivation (Vallerand, 2000) to test a model in which locus of causality personality dispositions for dental health was expected to be indirectly associated, through situational motivation and anxiety for dental treatment, with dental attendance and avoiding making dental clinic appointments. As described by Vallerand (2000), these associations are explained as a spill-over or top-down effect from the contextual motivation level of dental health (i.e., autonomy and control causality orientations) to the situational motivation and anxiety level of dental treatment, which would predict attendance and avoidance behaviors. In addition, social contextual dental treatment styles were added to the model.

Social contextual dental treatment styles are important to investigate as they are linked to increase in autonomous motivation and reductions in anxiety for dental treatment, which both are shown associated with higher dental attendance and better oral health and functioning (Hägglin, Berggren, Hakeberg, & Ahlqwist, 1996; Halvari, Halvari, & Deci, 2017; Halvari, Halvari, Williams, & Deci, 2017). For the first time, locus of causality personality dispositions and dental treatment styles was modeled to study dental attendance and avoidance of making dental clinic appointments, through motivation and anxiety for dental treatment, and thus, was expected to extend the value of Self-Determination Theory (SDT; Deci & Ryan, 1985a, 2000) and its practical use in the dental field.

1.1 | Locus of causality

deCharms (1971) described "origins" and "pawns" as individual's locus of causality dispositions predicting human behaviors. An origin is engaged in an activity because the person "wants to," feels doing it as a result of free choice, and believes in one's own effort to reach his goals. A pawn behaves because the person "has to", and feels that he is being coerced and forced to do an activity. Because external factors determine his fate, the person feels that there is not much he can do to change his behavior and outcome. Origin and pawn personal causation constructs are similar to the individual differences defined as autonomy and controlled causality orientations in SDT (Deci & Ryan, 1985a). Individual differences in autonomy and controlled causality orientations are defined in terms of whether one orients toward one's context seeing possibilities of self-determination and choice, or seeing external rewards and pressures (Ryan & Deci, 2017, p. 216). For instance, according to SDT (Deci & Ryan, 1987), an autonomy causality oriented person would orient toward the environment by creating options and possibilities for choice in accordance with their personality, to interpret the social context as more autonomy-supportive, tend to use identified and integrated self-regulations, and intrinsic motivation, and respond to the context surrounding them with interest. Conversely, a controlled causality oriented person would orient toward external contingencies and controls, by feeling pressured to satisfy important others by complying with their advice and suggestions, and organize their behaviors based on deadlines and rewards. They would tend to interpret events as controlling.

Research on other fields than the dental field has found that an autonomy causality orientation is associated with autonomous motivation for health behavior and attendance in the program (Pavey & Sparks, 2010; Williams, Grow, Freedman, Ryan, & Deci, 1996) and autonomous work motivation (Lam & Gurland, 2008), which respectively, in turn, influenced intentions to reduce health-risk behavior after health-risk information (Pavey & Sparks, 2010) and job satisfaction and job identification commitment (Lam & Gurland, 2008). Other research indicates that autonomy causality orientations are positively associated with need satisfaction and adaptive functioning such as job performance and psychological adjustment (Baard, Deci, & Ryan, 2004), and job interview success among business school students (Tay, Ang, & Van Dyne, 2006). In a series of studies, Liu and colleagues (2011a, 2011b, 2011c) found that autonomy orientation was related to various work outcomes such as passion, creativity, organizational citizenship behavior, job involvement, and turnover. Among students, autonomy causality orientations have been positively associated with intrinsic regulation, the prototype of autonomous motivation (Hagger & Chatzisarantis, 2011; Hagger, Koch, & Chatzisarantis, 2015), attitude-behavior consistency (Koestner, Bernieri, & Zuckerman, 1992), relationship-maintaining behaviors (Knee, Patrick, Vietor, Nanayakkara, & Neighbors, 2002), and intrinsic and identified regulations (Kwan, Hooper, Magnan, & Bryan, 2011; Williams & Deci, 1996). Conversely, a control causality orientation has been associated with less adaptive outcomes such as Type A personality (Deci & Ryan, 1985b), self-handicapping (Knee & Zuckerman, 1998), and external regulation among students (Kwan et al., 2011).

In the dental field, recent research supports that a person who is autonomy causality oriented toward dental health would be autonomously motivated for dental treatment (Halvari, Halvari, Bjørnebekk, & Deci, 2012b). A person who is control or impersonal causality oriented toward dental health, or having an external locus of control, would be more controlled motivated or anxious for dental treatment (Halvari, Halvari, Williams, & et al., 2017; Poulton, Waldie, Thomson, & Locker, 2001). Research indicates that relative autonomy causality orientation at the domain-specific level of dental health not only predicts situational autonomous motivation and anxiety for dental treatment, but also behaviors such as dental attendance and oral hygiene self-care (Halvari et al., 2012b, Halvari, Halvari, Deci, 2017). This evidence indicates that both autonomous motivation and anxiety for dental treatment play important roles in the indirect association between the relative autonomy causality oriented personality and oral health care behaviors.

1.2 | Perceived autonomy-supportive and controlling treatment styles

Autonomy-supportive contexts are defined as "ones in which significant others offer choice, provide a meaningful rationale,

minimize pressure, and acknowledge the target individual's feelings and perspectives" (Williams & Deci, 1996; Williams et al., 1996, p. 117). According to SDT (Ryan & Deci, 2017), autonomy support facilitates the satisfaction of the needs for autonomy, competence, and relatedness, which all three are essential to optimal development, integrity, and well-being. Failure to satisfy any of these needs will be manifested in diminished growth, integrity, and wellness. Experimental and cross-sectional research indicates that oral health care professionals' autonomy-supportive treatment styles positively influence autonomous motivation for dental treatment (Halvari & Halvari, 2006; Halvari et al., 2012b; Halvari, Halvari, & Deci, 2017; Halvari, Halvari, Bjørnebekk, & Deci, 2010), and positively affect dental attendance (Halvari et al., 2010). In addition, autonomous motivation for dental treatment has been positively associated with dental attendance (Halvari et al., 2010; Halvari, Halvari, Williams, et al., 2017). This pattern of results indicates that the indirect association between autonomy support and dental attendance goes through autonomous motivation for dental treatment.

Further, according to SDT, a thwarting or controlling health care professional would be associated with patients whose needs are frustrated, which is associated with greater ill-being and more impoverished functioning (Halvari, Halvari, Williams, et al., 2017; Ryan & Deci, 2017). Oral health care professionals are perceived as needs thwarting or controlling when they seduce, coerce, use tangible rewards, pressure, and punish their patients to make them feel, think, or behave in certain ways. Patients' perception of a controlling oral health care professional style is also associated with withdrawal of attention and affection when the patient does not enact the valued behaviors recommended, and thus, may thwart patients' needs for autonomy, competence, and relatedness (Halvari et al., 2010; Roth, Assor, Niemiec, Ryan, & Deci, 2009). Patient's data indicate that distressing dental experiences positively linked to dental anxiety has been oral health care professionals' treatment style perceived as non-understanding or controlling, a negative dentist who is perceived as angry or making condescending remarks, and perceived helplessness and embarrassment during dental treatment (Halvari et al., 2010; Halvari, Halvari, Williams, et al., 2017; Humphris & King, 2011; Moore, Birn, Kirkegaard, Brødsgaard, & Scheutz, 1993; Oosterink, Jongh, & Aartman, 2009). Patient's perception of oral health care professionals' controlling treatment style and dental anxiety have both been found positively linked with avoiding dental clinic appointments (Halvari et al., 2010; Halvari, Halvari, Williams, et al., 2017). This pattern of evidence indicates that the indirect link between patient's perception of a controlling treatment style and avoiding dental clinic appointments goes through dental anxiety.

1.3 | Hypotheses

Based on the theory and evidence described above, we tested a model with the following hypotheses: (1) Patients' autonomy causality orientation and oral health care professionals' autonomy-supportive treatment styles would both be positively indirectly associated with dental attendance through patients' autonomous motivation for dental treatment. (2) Patients' controlled causality orientation and oral health care professionals' controlling treatment styles, as perceived by patients, would both be positively indirectly associated with avoidance of making a dental clinic appointment through patients' anxiety for dental treatment. Finally, treatment styles were expected to moderate the links between personality and dental anxiety. The research on such moderator effects is scarce, but a study by Grolnick and Ryan (1987) indicates that experimentally induced learning conditions that are controlling (in relation to less controlling conditions) resulted in more pressure and anxiety and less learning, presumably because they were more conducive to controlled motivation or an external locus of causality. Other research indicates that personalities who feel controlled by the environment and accept external influence were less anxious if the controlling treatment styles perceived by patients were reduced at the dental clinic (Halvari, Halvari, & Deci, 2020). Thus, we hypothesized that (3) patient's perception of a controlling treatment style would moderate the positive link from a controlled causality orientation to dental anxiety, such that a reduction of patient's perception of oral health care professional's control (i.e., minimizing pressure) would reduce dental anxiety among those high in controlled orientation (in relation to those low in controlled orientation).

2 | METHOD

2.1 | Participants

Students from all study disciplines at the University of Oslo were invited to participate in the study. They were informed about the aims of the study and gave their informed consent to participate. No incentives were offered for participation. A total of 595 questionnaires were handed out and 226 were returned (38%). Participants' ages ranged from 18 to 46 years (M = 25.3, SD = 4.91). More females than males responded to the questionnaire (females = 71.2%).

The majority of participants evaluated their oral health as relatively good ("good," 16.4%; "fairly good," 38.1%; "very good," 32.7%; or "excellent," 8.4%), whereas 4.4% responded with "bad." About half of the participants visited a public clinic (55.1%) as they had access to free dental treatment due to age, whereas 44.9% had started treatment in the private "pay" system. Of the participants, 59.3% had a job besides the studies (hours/week: M = 8.63, SD = 10.10). Their financial situation at the moment was relatively good as 89.4 described it as good or very good, 9.7% as difficult, and 0.9% as very difficult.

2.2 | Translation of measures and their reliabilities

All questionnaire measures described below were translated to Norwegian, and back-translated to English, and adapted following the procedures suggested by Beaton, Bombardier, Guillemin, and Ferraz (2000). Reliabilities of these scales are shown in Table 1.

TABLE 1 Zero-order correlations[a] and descriptive statistics among variables

Variables	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Autonomy orientation	–												
2. Control orientation	.06	–											
3. Autonomy support	.34***	–.22***	–										
4. Controlling style	–.20***	.28***	–.68***	–									
5. Autonomous motivation	.46***	–.13*	.40***	–.31***	–								
6. Dental anxiety	–.16*	.29***	–.33***	.42***	–.32***	–							
7. Dental attendance	.14*	.01	.31***	–.27***	.56***	–.17**	–						
8. Avoiding appointments	–.07	.17**	–.20***	.33***	–.29***	.54***	–.26***	–					
9. Gender	–.06	–.12	–.02	–.01	–.14*	–.16**	–.12	–.07	–				
10. Age	.21***	.04	.03	.02	.16**	.06	–.10	.01	.06	–			
11. Work (hrs/week)	.03	.08	.07	–.07	.13	–.10	.07	–.04	–.12	.22	–		
12. Problems economy	–.01	–.04	–.08	.11	–.01	–.04	.12	.06	–.06	.23	–.12	–	
13. Education	.14*	.04	–.03	.07	.04	–.02	–.05	.11	–.02	.55***	.21***	.08	–
Mean	4.85	3.70	5.05	2.20	4.43	2.24	2.25	1.48	1.29	25.3	8.63	2.67	3.81
Standard deviation	1.28	1.34	1.24	1.13	1.50	0.98	0.82	0.97	0.45	4.91	10.1	0.77	1.45
Skewness	–0.51	–0.03	–0.59	1.09	–0.12	0.91	–0.49	2.26	0.95	1.72	1.34	–0.07	–0.04
Reliability (α)	.86	.84	.90	.86	.90	.90	–	–	–	–	–	–	–

Note: $N = 226$. Gender: 1 = females; 2 = males. Effect sizes for correlation coefficients: Small = .10; Medium = .30; Large = .50 (Cohen, 1992).

[a]Pearson correlations, except Spearman's point biserial correlations involving gender.

$*p < .05$; $**p < .01$; $***p < .001$, two-tailed tests.

2.3 | Design of questionnaire and analyses

Before the participants responded to the items in the questionnaire, they were introduced to their own clinic context by the following instructions and questions: "Think back to your last visit to a dental hygienist or dentist. It is important that you try to think about the treatment and your experiences with this oral health care professional." This introduction was followed by questions on who this oral health care professional was (a dental hygienist or a dentist, a female or a male), the number of visits to this oral health care professional, type of clinic (private or public), and time since last visit. "If you answered "dental hygienist" in question 1, please have this person in mind and answer the following questions with reference to your dental hygienist. However, if you answered "dentist" in question 1, please answer the following questions with reference to your dentist." Of the respondents, 84% recalled their dentist.

A sample size of about 200 patients was estimated to be acceptable in detecting moderate effect sizes for multiple correlation analysis (independent variables: 5–6; power: .80; $p < .05$) (Cohen, 1992).

Autonomy and Controlled Orientation was assessed with the Dental Care Causality Orientation Scale adapted from the Exercise Causality Orientations Scale (Rose, Markland, & Parfitt, 2001) and the General Causality Orientations Scale (Deci & Ryan, 1987). A sample of the six scenarios is: "Imagine: You are at your oral health care professional's office and have been told that there is some damage from brushing. Your first reaction will probably be": (a) "I will talk to my oral health care professional to find out what I can do to take care of my oral health in the best way in the future" (Autonomy); (b) "I will have a guilty conscience and feel that I have to improve how I brush my teeth" (Controlled). Responses were from 1 (very unlikely) to 7 (very likely). The items were averaged within each subscale. Reliability and validity indications of the scale were acceptable in the study by Halvari and colleagues (2017), with Cronbach's alpha coefficients of .76 (Autonomy) and .69 (Controlled). In the current study, the alpha reliability coefficients were .86 and .84, respectively.

Perceived Autonomy Support was measured with the 6-item version of the modified Health Care Climate Questionnaire (Williams et al., 1996), which was adapted to oral health care. A sample item is: "I feel that my oral health care professional has provided me choices and options." Responses could vary from 1 (strongly disagree) to 7 (strongly agree). In the current study, the alpha reliability coefficient was .90.

Perceived Controllingness at the Dental Clinic was measured with the Perceived Controlling Style at the Dental Clinic Questionnaire (PCSDCQ; Halvari, Halvari, Bjørnebekk, & Deci, 2012a). The six items are intended to measure clinic conditions that may (1) Threaten satisfaction of the need for autonomy, which means that people experience less choice and believe that their actions are other-initiated (de Charms, 1968). Sample item: "I feel that the oral health care professional will do what he/she wants and not listen to me when I sit in the chair." (2) Threaten fulfillment of the need for competence, which means that people experience that they are *not* capable of

acting effectively to attain desired results (White, 1959). Sample item: "When my teeth are being examined, I feel underestimated and humiliated." (3) Threaten fulfillment of the relatedness need which involves an experience of *not* being safely attached to and understood by others (Baumeister & Leary, 1995). Sample item: "My oral health care professional does not see me as a person, he/she sees only my teeth." Participants responded to the items on a 1 (*strongly disagree*) to 7 (*strongly agree*) scale. For additional reliability and validity indications of the PCSDCQ, see (Halvari et al., 2010, 2012a, 2013). In the current study, the α reliability coefficient was .86.

Autonomous Motivation for Treatment was measured with the Self-Regulation Questionnaire for Dental Treatment (SRQDT; Halvari et al., 2010). The scale comprises six items for autonomous motivation for treatment. Participants responded to the items following two stems: "I decided to enter treatment with my dental professional because: …" and "If I remain in treatment it will probably be because:", using a 7-point scale ranging from 1 (*not true at all*) to 7 (*very true*). Two sample items for autonomous motivation are: (1) "Going to treatment has become a natural habit for me," and (2) "I experience going to treatment as personally important." The items were averaged to reflect autonomous motivation. Reliability and validity indications for the SRQDT are presented elsewhere (Halvari et al., 2010). In the current study, the alpha reliability coefficient was .90.

Anxiety for Dental Treatment was measured by the 5-item Modified Dental Anxiety Scale (Humphris, Crawford, Hill, Gilbert, & Freeman, 2013). An example item is: "If you were sitting in the waiting room (waiting for treatment), how would you feel?" Participants responded on a 5-point scale ranging from 1 (*not anxious*) to 5 (*extremely anxious*). The items were averaged to reflect anxiety for dental treatment. In an UK study, the reliability (α) of this scale was .89; test-retest was .82 (Humphris et al., 2013). In the current study, Cronbach's α was .90.

Assessment of clinic attendance and avoidance of dental appointments. Clinic attendance was measured with this question: "In general, would you say you visit your dental professional: regularly (score 3), occasionally (score 2), or only when you are in pain/or trouble (score 1)". This scale is the same as used frequently in research on dental attendance (Humphris et al., 2013). The measure of avoiding making a dental appointment is from the Dental Fear Survey (Milgrom, Weinstein, & Getz, 1995). Its focus is on avoidance of dentistry and consists of the following two questions: "Has fear or worry ever caused you to put off making an appointment (1) with a dental hygienist?; (2) with a dentist?" Responses were 1 (*never*), 2 (*once or twice*), 3 (*a few times*), 4 (*often*), and 5 (*nearly everytime*). The items were averaged to reflect avoiding appointments.

2.4 | Background assessments

Gender (1 = *female* and 2 = *male*). Age was indicated in *years*. Educational level and socioeconomic status information were taken care of by the following three questions: (1) "What is your highest completed education?" Response alternatives were from 1 (*junior*

or senior high school) to 5 (university or university college education of more than 5 years). (2) "How many hours per week do you work for income?" (3) "How would you describe your financial situation at the moment?" Response alternatives were from 1 (very good) to 5 (very difficult).

3 | RESULTS

3.1 | Sample evaluation, descriptive statistics, and reliability

Sample information (N = 226) indicates that the majority of participants had visited an oral health care professional last year (70.2%), whereas 19.6% had visited a clinic 2–3 years ago, and 10.2% as long as 4–7 years ago. These results are almost the same as in other samples used in Norway in which 71.7% (N = 322; Halvari, Halvari, & Deci, 2017) and 78.9% (N = 156; Halvari et al., 2012b) had visited their oral health care professional last year. The present measure used to measure dental attendance was the same as Humphris et al. (2013) used in their validation study of the Modified Dental Anxiety Scale, that is "visiting the dentist" measured with the following response alternatives; "regular," "occasional," and "when in pain/or trouble." A cross-tabulation of these two measures yielded that 89.7% of "regular" attenders had visited their oral health care professional last year, as recommended by oral health care authorities in Norway, whereas only 48.5% and 49% of those responding "occasional" and "when in pain", respectively, did the same. The Effect Size (ES) was large: ES = .46; X^2 = 61.64, p < .001. The total distribution of scores was for "regularly" (48.7%, n = 110), "occasionally" (27.4%, n = 62), and for "when in pain" (23.9%, n = 54). This indicates that the measure of dental attendance is appropriate and valid.

The other dependent measure avoiding making a dental clinic appointment has a somewhat high skewness (2.26 in relation to a cut-off = 2.0), but are according to Kline (2005) acceptable for use in SEM analysis and in analysis of indirect links. A closer look at the distribution of scores for this variable yields that 73.5% never avoids their appointments, but as many as 60 participants have done it several times (26.5%). Thus, this measure is appropriate, in particular because it is an important indicator of the oral health of participants. In addition, with 26.5% of participants avoiding appointments, this indicates that the sample is appropriate, that is, has successfully recruited participants not possible to reach due to avoidance in dental treatment settings. The distribution of scores for this measure of avoiding making a dental clinic appointment corresponds well with another sample used Halvari, Halvari, and Deci (2017), in which 22.4% (n = 72) of the sample (N = 322) had avoided dental appointments (skew = 2.1).

The means, standard deviations, skewness values, and reliabilities for all variables are found in Table 1. All reliability coefficients are acceptable and above .84. Skewness values are acceptable. Dental anxiety (skew = .91) and a controlling treatment style (skew = 1.09) were among the variables with the highest skewness, but within an

acceptable normal distribution for use in parametric statistics (Kline, 2005). For example, dental anxiety had a mean score of 11.2 in the current sample (2.24 pr. item X 5 items, see Table 1). This mean value for dental anxiety is almost the same as the mean value presented by Humphris et al. (2013) in their validation study of the Modified Dental Anxiety Scale. Of the participants, 54.4% had low scores (5–10; "not anxious"), 26.1% had moderate scores (11–15; "quite anxious"), and 19.5% had high scores (16–25; "very and extremely anxious"). Those with extreme dental anxiety (DA ≥ 19) were somewhat lower in the present sample (10.6%) compared to the Humphris et al. (2013) study (11.6), and the reliability coefficients (α) were .90 and .92, respectively. Hence, the sample is in accordance with similar research done in the UK, evaluated in relation to the distribution of the main intervening dental anxiety variable in the present study. Regarding the perceived controlling treatment style, 55.8% responded with low scores (7–12; "disagree"), 33.6% with moderate scores (13–24; "somewhat agree"), and 10.6% responded with high scores (25–36; "agree"). Because all variables illustrated in the theoretical model (see Figure 1) had acceptable skewness values (see Table 1), we used SEM to test the model.

3.2 | Hypotheses testing

3.2.1 | Theoretical model

The zero order correlations in Table 1 are all in line with the hypotheses. In addition, compared to males, females had significantly higher scores on autonomous motivation and dental anxiety. The correlation between age and both autonomy orientation and autonomous motivation was significantly positive, and education correlated significantly positively with autonomy orientation. Thus, the SEM was tested controlling for gender, age, and education.

3.2.2 | Structural equation modeling

Structural equation modeling (LISREL, version 8.80) was used to test the model (Figure 1). The interaction term and the one-item dental attendance variable were treated as observed variables, and the error variance was set to 15% of the squared standard deviation as recommended in the literature (Anderson & Gerbing, 1988). All other variables in the model are latent, but due to the large number of variables and indicators (i.e., scale items) relative to the sample size, three parcels were created as indicators for each variable in order to simplify the model—as recommended by Little, Cunningham, Shahar, and Widaman (2002). In testing the model in Figure 1, factor loadings for items/ parcels are all significant, and they are (loadings in parentheses) for autonomy causality orientation (.76, .77, .86), for controlled causality orientation (.71, .79, .89), for perceived autonomy support (.84, .86, .87), for perceived controllingness (.75, .81, .85), for dental anxiety (.69, .72, .91), for autonomous motivation (.61, .77, .84), and for avoiding dental clinic appointments (.87, .95).
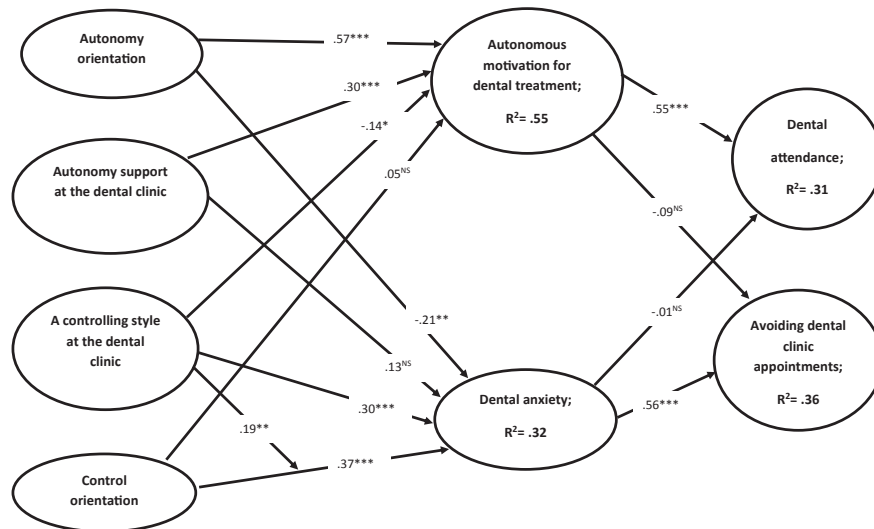
FIGURE 1 Standardized parameter estimates in the latent structural equation model of dental attendance and avoiding appointments. *p < .05; **p < .01; ***p < .001. NS = Not Significant. Due to presentation clarity, all factor loadings are presented in the Method Section. This *SEM* was simultaneously controlled for gender, age, and education. The results yielded no significant links for education, but age was positively correlated with both autonomy orientation (.22, t = 2.43, p < .05) and autonomous motivation (.14, t = 2.21, p < .05), and females (relative to males) scored higher on autonomous motivation (–.15, t = 2.17, p < .05). Fit indices for the complete model were [X^2 (df = 242, N = 226) = 478.08, p < .001; RMSEA (90% CI) = .066 (.057, .074); CFI = .95; IFI = .95; SRMR = .084]. Effect sizes for parameter estimates: Small = .10; Medium = .30; Large = .50, and for R^2: Small = .02; Medium = .15; Large = .35 (Cohen, 1992)

To evaluate the fit of the model tested, we used the chi-square likelihood ratio (X^2), the Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI), and the Incremental Fit Index (IFI) as recommended (Bollen, 1989; Hu & Bentler, 1999). A good fit should have a value close to or lower than .06 for the RMSEA, a value close to or lower than .08 for the SRMR, and a value close to or higher than .95 for the CFI and IFI.

3.2.3 | Empirical models

The measurement model for Figure 1 is tested with all variables and indicators and find to fit the data well [X^2 (df = 216, N = 226) = 415.70, p < .001; RMSEA (90% CI) = .064 (.055, .073); CFI = .96; IFI = .96; SRMR = .066]. In this measurement model, all factor loadings were significant. The structural model was tested with this measurement model included and also yielded a good fit [X^2 (df = 242, N = 226) = 478.08, p < .001; RMSEA (90% CI) = .066 (.057, .074); CFI = .95; IFI = .95; SRMR = .084]. The standardized parameter estimates are shown in Figure 1.

3.3 | Tests of indirect links

The indirect links in Figure 1 (hypotheses 1 and 2) are tested simultaneously with the *SEM* (see Table 2). It is interesting to note that autonomy causality orientation seems to be effective both in relation to high dental attendance and in relation to low avoidance through autonomous motivation and dental anxiety, respectively. Controlled causality orientation is indirectly linked with avoiding dental clinic

appointments through dental anxiety. Autonomy support seems to function well for high dental attendance through autonomous motivation, and a perceived controlling treatment style for high avoidance through dental anxiety. These results confirm hypotheses 1 and 2.

3.3.1 | Personality and social context linked with motivation and anxiety: Contrasted correlations

The personality at the domain-specific level represented by autonomy causality orientation predicted autonomous treatment motivation more strongly (.57, p < .001) than the social contextual autonomy-supportive treatment style (.30, p < .001) (Z = 3.60, N = 226, p < .001). The controlled causality orientation (.37, p < .001) and the perceived controlling treatment style (.30, p < .001) were equally positively significantly associated with dental anxiety (Z = 0.83, N = 226, p = .40).

3.3.2 | Moderator analyses

We used *SEM* to test the moderator hypothesis. It was hypothesized that a perceived controlling treatment style would moderate the positive link from a controlled causality orientation to dental anxiety, such that perception of a reduced professional's control (i.e., minimizing pressure) would reduce dental anxiety among those high in control orientation (in relation to those low in controlled orientation). The unstandardized regression coefficients indicated that both the centered controlled causality orientation (.28, p < .001) and the

TABLE 2 LISREL tests of indirect links emerging in Figure 1

Independent variable (IV)		Mediator (M)		Dependent variable (DV)	Effect[a]	SE	a*b path Z	95% CI Lower	Upper
1. Autonomy orientation	→	Autonomous motivation	→	Dental attendance	.22	.04	5.18***	.17	.37
2. Control orientation	→	Autonomous motivation	→	Dental attendance	.05	.03	1.73	−.03	−.15
3. CO × CS	→	Dental anxiety	→	Dental attendance	−.00	.01	−.09	−.02	.02
4. Autonomy orientation	→	Dental anxiety	→	Avoiding appointments	−.17	.06	−2.99**	−.11	−.35
5. Control orientation	→	Dental anxiety	→	Avoiding appointments	.18	.05	3.82***	.15	.35
6. CO × CS	→	Dental anxiety	→	Avoiding appointments	.12	.05	2.43*	.03	.23
7. Autonomy support	→	Autonomous motivation	→	Dental attendance	.12	.06	2.10*	.01	.17
8. Controlling style	→	Dental anxiety	→	Dental attendance	−.02	.05	−.38	−.04	.04
9. Autonomy support	→	Autonomous motivation	→	Avoiding appointments	.04	.09	.52	−.10	.18
10. Controlling style	→	Dental anxiety	→	Avoiding appointments	.20	.09	2.30*	.06	.34

Note: a-path = IV → M; b-path = M → DV. Indirect links # 2,3,48, and 9 were not a priori hypothesized.

Abbreviations: CO, Control Orientation; CS, Controlling Style.

[a]Effect size for indirect effect: Small = .01; Medium = .09; Large = .25 (Cohen, 1988; Shrout & Bolger, 2002).
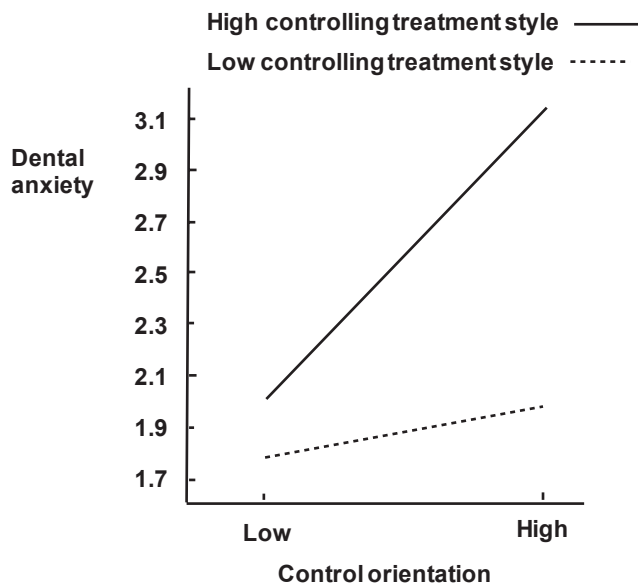
*p < .05; **p < .01; ***p < .001.

FIGURE 2 Simple regression lines depicting the relationship between control orientation and dental anxiety at specified values of a controlling treatment style

perceived controlling treatment style (.35, *p* < 001) predicted dental anxiety. In addition, perception of a controlling treatment style (CS) moderated the association between a controlled causality orientation (CO) and dental anxiety (.22, *p* < .01). This result confirmed hypothesis 3. The regression lines for the cross-product or interaction are shown in Figure 2. This was done by plotting centered values of one standard deviation (*SD*) below the mean and values of one standard deviation above the mean of the variables in the following formula proposed by West, Aikin, and Krull (1996, pp. 35–36): $Y = b_0 + (b_1 X) + (b_2 W) + (b_3 XW)$, where b_0 is the intercept, b_1 to b_3 are the unstandardized regression coefficients, X represents the perceived controlling treatment style, and W represents the controlled causality orientation.

4 | DISCUSSION

The SDT process model of dental attendance and avoiding dental clinic appointments fit the data well. Both autonomy causality orientation and autonomy support were positively associated with autonomous motivation for dental treatment, which was positively linked with dental attendance. In addition, the analysis indicated that the positive links between both autonomy causality orientation and autonomy support, respectively, and dental attendance were indirect through autonomous motivation. Conversely, both the controlled causality orientation and patient's perception of oral health care professionals' controlling treatment style predicted dental anxiety, which was linked with high avoidance of dental clinic appointments. The results indicated that the positive links between both the controlled causality orientation and a perceived controlling treatment style, respectively, and avoidance of dental clinic appointments, were indirect through dental anxiety.

This is the first study showing that both an autonomy causality orientation at the domain-specific level of personality and an

autonomy-supportive treatment style predict dental attendance indirectly through autonomous motivation for treatment, and that both a controlled causality orientation and a perceived controlling treatment style predict avoiding appointments indirectly through dental anxiety. Previous research has shown that this pattern of results is supported for parts of the relations tested in the current model (Halvari et al., 2010, 2012b; Halvari, Halvari, & Deci, 2017). That is, treatment styles have been studied in relation to autonomous motivation for dental treatment, dental anxiety, dental attendance, and avoiding dental appointments. However, autonomy and controlled personality orientations have not been separately linked with these outcomes through autonomous motivation and dental anxiety. These results are important because low dental attendance or high avoidance of making dental clinic appointments are both linked to poor oral health and functioning (Hägglin et al., 1996; Halvari, Halvari, & Deci, 2017).

Further, this is also the first study showing that patient's perception of a controlling treatment style moderated the positive link between a controlled causality orientation and dental anxiety, such that a lower oral health care professional's control (i.e., minimizing pressure), as perceived by patients, was associated with low dental anxiety among those high in controlled orientation (contrasted with those low in controlled orientation). These results have both theoretical and practical values, because they are in accordance with a central hypothesis in self-determination theory (Deci & Ryan, 2000), that either an increase in autonomy support or a reduction in controllingness will influence more self-determined integration of motivation, better performance, and higher well-being (viz., low anxiety). It is promising to confirm that a lower perceived controllingness is associated with very low dental anxiety in particular among patients those high in a controlled causality orientation.

The results of the current study indicate that an autonomy causality orientation and autonomy support are both associated with greater integration of autonomous motivation to engage in dental treatment, a behavior which is not fun. Moreover, an autonomy causality orientated patient seems not only to integrate treatment into their autonomous motivation system, resulting in attendance, but at the same time, they tend to experience lower dental anxiety, resulting in lower defense and avoidance. Conversely, a highly controlled causality oriented patient is only oriented toward high anxiety and subsequent avoidance. The pattern of these results is supported by recent research indicating that a highly autonomy causality oriented person is interpreting, integrating, and accepting both "positive" and "negative" experiences as meaningful and relevant, whereas a highly controlled causality oriented person is less open to negative experiences, more defensive, and tends to not accept them,—which might result in more anxiety and avoidance (Pavey & Sparks, 2010; Su & Reeve, 2011; Weinstein, Deci, & Ryan, 2011).

This discussion indicates that both personality orientations and treatment styles directly affect motivation and behavior. However, their influences are likely to be bidirectional, as autonomy and controlled causality orientations may influence autonomy-supportive and controlled treatment styles (Reeve, Jang, & Jang, 2018), respectively, which influence autonomous treatment motivation and anxiety for treatment, respectively. Conversely, treatment styles may affect autonomy and controlled causality orientations situationally, which increase and decrease autonomous motivation and anxiety, respectively (Ryan, Soenens, & Vansteenkiste, 2019). Future research using cross-lagged longitudinal designs should be conducted in order to answer questions regarding directionality among these constructs.

Because high autonomy support and low controllingness are so important for high autonomous motivation for dental treatment and dental attendance, low dental anxiety and low avoidance of dental clinic appointments, oral health care professionals are much more likely to be effective if they are trained to be more autonomy-supportive with their patients (Williams & Deci, 1996).

Contrast analyses indicated that patient's autonomy causality orientation at the domain-specific level of personality was more strongly associated than autonomy support with autonomous motivation for dental treatment. However, autonomy support was still significantly correlated with autonomous motivation for dental treatment, and the zero-order correlation (.34, $p < .001$) between autonomy support and autonomy causality orientation may indicate, in the long run, that these constructs may reciprocally influence each other—and thus, may be indirectly or directly linked with autonomous motivation for dental treatment, as seen in a longitudinal study of weight loss (Williams et al., 1996).

The model in the current study was tested when controlling for gender, age, and socioeconomic variables. Of the significant correlations, age was positively correlated with autonomy causality orientation and autonomous motivation, and gender was positively correlated with autonomous motivation in favor of females. However, these correlations were small, and did not affect the fit of the model. This is in line with results from similar samples with students from the University of Oslo, in which the links between motivation variables and oral health-related variables were the same after controlling for socioeconomic variables, including education level (Halvari et al., 2012a), and age and gender (Halvari, Halvari, & Deci, 2017).

4.1 | Practical implications

High autonomous and low controlling treatment styles carried out at dental clinics, as perceived by patients, seem to be important for supporting high autonomous motivation and low dental anxiety, high dental attendance and low avoidance of clinic appointments. To be more autonomy-supportive and less controlling, oral health care professionals can provide options and a rationale for change, elicit and reflect on patient perspectives, support patient's initiatives, minimize pressure and a controlling language, and remain non-judgmental as provided in self-determination theory (Halvari et al., 2012a).

4.2 | Strengths and limitations

Common method variance (CMV) might distort the self-report results in studies using data from the same source. To illustrate, positive affectivity may affect systematic variance in the relations between variables that are more positive and less negative than the actual or true variance that exists between the variables (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). However, tests of CMV using positive affect as the marker variable, in a sample similar to the sample used in present study and including some of the same variables, indicate that CMV did not significantly distort the correlations or the model fit in the *SEM* (Halvari, Halvari, & Deci, 2019).

Measurements were appropriate for causality orientations and treatment styles, and autonomous motivation and anxiety for dental treatment. Observed measures of dental attendance and avoidance of dental clinic appointments would have strengthened the design of the study. However, if construct validity of self-report measures is demonstrated, other methods are not necessarily better (Conway & Lance, 2010). In the present study, only well-validated measures were used. In addition, construct validity of the self-report measures was demonstrated in *SEM*. Caution must be taken when it comes to generalizing the results, because the results are based on a convenience sample from a specific population of students. The purpose of the current study was to test a theoretical model derived from a universal theory of human motivation, assuming that constructs such as personal causation, motivation, and anxiety for dental treatment are more or less present in all individuals (Deci & Ryan, 2000). Thus, the study tried to maximize the internal validity of the study, assuming that the relations between variables would be the same independent of sample variations. The study has the limitations associated with being cross-sectional and the absence of a design allowing randomized control and longitudinal data implies that conclusions regarding causality cannot be inferred (Bollen, 1989). The analysis of the hypothesized model was performed in *SEM* with mostly latent variables, which is a strength, but the arrows between variables do not imply causality. Regarding this, it is important to note that randomized controlled trials have been conducted in the dental field supporting the role of autonomy support positively influencing oral health care behaviors and oral health (Halvari & Halvari, 2006; Halvari et al., 2012b).

5 | CONCLUSION

Causality orientations conceived as health care domain-specific personality constructs and perceived autonomy-supportive and controlling treatment styles used by oral health care professionals may have major roles in explaining autonomous motivation and anxiety for dental treatment, which may be relatively strongly associated with dental attendance and avoiding making dental clinic appointments.

ORCID

Anne Elisabeth Münster Halvari https://orcid.org/0000-0001-5506-4704

REFERENCES

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin*, *103*, 411–423. https://doi.org/10.1037/0033-2909.103.3.411

Baard, P. P., Deci, E. L., & Ryan, R. M. (2004). The relation of intrinsic need satisfaction to performance and well-being in two work settings. *Journal of Applied Social Psychology*, *34*, 2045–2068.

Baumeister, R., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, *117*, 497–529. https://doi.org/10.1037/0033-2909.117.3.497

Beaton, D. E., Bombardier, C., Guillemin, F., & Ferraz, M. B. (2000). Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine (phila Pa 1976)*, *25*, 3186–3191.

Bollen, K. (1989). *Structural equations with latent variables*. New York, NY: Wiley.

Cohen, J. (1988). *Statistical power analysis for the behavioural sciences*. Hillsdale, NJ: Erlbaum.

Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*, 155–159. https://doi.org/10.1037/0033-2909.112.1.155

Conway, J., & Lance, C. (2010). What reviewers should expect from authors regarding common method bias in organizational research. *Journal of Business and Psychology*, *25*, 325–334. https://doi.org/10.1007/s10869-010-9181-6

de Charms, R. (1968). *Personal causation: The internal affective determinants of behavior*. New York, NY: Academic Press.

deCharms, R. (1971). From pawns to origins: Toward self-motivation. In G. S. Lesser (Ed.), *Psychology and educational practice* (pp. 380–470). Glenview, IL: Scott, Foresman and Company.

Deci, E. L., & Ryan, R. M. (1985a). *Intrinsic motivation and self-determination in human behavior*. New York, NY: Plenum.

Deci, E. L., & Ryan, R. M. (1985b). The general causality orientations scale: Self-determination in personality. *Journal of Research in Personality*, *19*, 109–134. https://doi.org/10.1016/0092-6566(85)90023-6

Deci, E. L., & Ryan, R. M. (1987). The support of autonomy and the control of behavior. *Journal of Personality and Social Psychology*, *53*, 1024–1037. https://doi.org/10.1037/0022-3514.53.6.1024

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, *11*, 227–268. https://doi.org/10.1207/S15327965PLI1104_01

Grolnick, W. S., & Ryan, R. M. (1987). Autonomy in children's learning: An experimental and individual difference investigation. *Journal of Personality and Social Psychology*, *52*, 890–898. https://doi.org/10.1037/0022-3514.52.5.890

Hagger, M. S., & Chatzisarantis, N. L. D. (2011). Causality orientations moderate the undermining effect of rewards on intrinsic motivation. *Journal of Experimental Social Psychology*, *47*, 485–489. https://doi.org/10.1016/j.jesp.2010.10.010

Hagger, M. S., Koch, S., & Chatzisarantis, N. L. D. (2015). The effect of causality orientations and positive competence-enhancing feedback on intrinsic motivation: A test of additive and interactive effects. *Personality and Individual Differences*, *72*, 107–111. https://doi.org/10.1016/j.paid.2014.08.012

Hägglin, C., Berggren, U., Hakeberg, M., & Ahlqwist, M. (1996). Dental anxiety among middle-aged and elderly women in Sweden: A study of oral state, utilization of dental services and concomitant factors. *Gerodontology*, *13*, 25–42.

Halvari, A., & Halvari, H. (2006). Motivational predictors of change in oral health: An experimental test of self-determination theory. *Motivation and Emotion*, *30*, 295–306. https://doi.org/10.1007/s11031-006-9035-8

Halvari, A. E. M., Halvari, H., Bjørnebekk, G., & Deci, E. L. (2010). Motivation and anxiety for dental treatment: Testing a self-determination

theory model of oral self-care behavior and dental clinic attendance. *Motivation and Emotion*, *34*, 15–33.

Halvari, A. E. M., Halvari, H., Bjørnebekk, G., & Deci, E. L. (2012a). Motivation for dental home care: Testing a self-determination theory model. *Journal of Applied Social Psychology*, *42*, 1–39.

Halvari, A. E. M., Halvari, H., Bjørnebekk, G., & Deci, E. L. (2012b). Self-determined motivational predictors of increases in dental behaviors, decreases in dental plaque, and improvement in oral health: A randomized clinical trial. *Health Psychology*, *31*, 777–788. https://doi.org/10.1037/a0027062

Halvari, A., Halvari, H., Bjørnebekk, G., & Deci, E. L. (2013). Oral health and dental well-being: Testing a self-determination theory model. *Journal of Applied Social Psychology*, *43*, 275–292. https://doi.org/10.1111/j.1559-1816.2012.00996.x

Halvari, A. E. M., Halvari, H., & Deci, E. L. (2017). Attending and avoiding dental appointments: Do "bright" and "dark" motivational paths have a role? *International Journal of Dental Hygiene*, *16*, 286–297. https://doi.org/10.1111/idh.12274

Halvari, A. E. M., Halvari, H., & Deci, E. L. (2019). Dental anxiety, oral health-related quality of life, and general well-being: A self-determination theory perspective. *Journal of Applied Social Psychology*, *49*, 295–306. https://doi.org/10.1111/jasp.12583

Halvari, A. E. M., Halvari, H., & Deci, E. L. (2020). The roles of patients' authentic personality and clinicians' treatment styles in predicting patients' dental anxiety and avoidance of dental appointments. *Europe's Journal of Psychology*, *16*, 45–61.

Halvari, A. E. M., Halvari, H., Williams, G. C., & Deci, E. L. (2017). Predicting dental attendance from dental hygienists' autonomy support and patients' autonomous motivation: A randomised clinical trial. *Psychology & Health*, *32*, 127–144. https://doi.org/10.1080/08870446.2016.1244536

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, *6*, 1–55. https://doi.org/10.1080/10705519909540118

Humphris, G., Crawford, J. R., Hill, K., Gilbert, A., & Freeman, R. (2013). UK population norms for the modified dental anxiety scale with percentile calculator: Adult dental health survey 2009 results. *BMC Oral Health*, *13*, 1–11. https://doi.org/10.1186/1472-6831-13-29

Humphris, G., & King, K. (2011). The prevalence of dental anxiety across previous distressing experiences. *Journal of Anxiety Disorders*, *25*, 232–236. https://doi.org/10.1016/j.janxdis.2010.09.007

Kline, R. B. (2005). *Principles and practice of structural equation modelling*. New York, NY: The Guilford Press.

Knee, C. R., Patrick, H., Vietor, N. A., Nanayakkara, A., & Neighbors, C. (2002). Self-determination as growth motivation in romantic relationships. *Personality and Social Psychology Bulletin*, *28*, 609–619. https://doi.org/10.1177/0146167202288005

Knee, C. R., & Zuckerman, M. (1998). A nondefensive personality: Autonomy and control as moderators of defensive coping and self-handicapping. *Journal of Research in Personality*, *32*, 115–130. https://doi.org/10.1006/jrpe.1997.2207

Koestner, R., Bernieri, F., & Zuckerman, M. (1992). Self-regulation and consistency between attitudes, traits, and behaviors. *Personality and Social Psychology Bulletin*, *18*, 52–59. https://doi.org/10.1177/0146167292181008

Kwan, B. M., Hooper, A. E. C., Magnan, R. E., & Bryan, A. D. (2011). A longitudinal diary study of the effects of causality orientations on exercise-related affect. *Self and Identity*, *10*, 363–374. https://doi.org/10.1080/15298868.2010.534238

Lam, C. F., & Gurland, S. T. (2008). Self-determined work motivation predicts job outcomes, but what predicts self-determined work motivation? *Journal of Research in Personality*, *42*, 1109–1115. https://doi.org/10.1016/j.jrp.2008.02.002

Little, T. D., Cunningham, W. A., Shahar, G., & Widaman, K. F. (2002). To parcel or not to parcel: Exploring the question, weighing the merits. *Structural Equation Modeling*, *9*, 51–173. https://doi.org/10.1207/S15328007SEM0902_1

Liu, D., Chen, X.-P., & Yao, X. (2011a). From autonomy to creativity: A multilevel investigation of the mediating role of harmonious passion. *Journal of Applied Psychology*, *96*, 294–309. https://doi.org/10.1037/a0021294

Liu, D., & Fu, P.-P. (2011b). Motivating protégés' personal learning in teams: A multilevel investigation of autonomy support and autonomy orientation. *Journal of Applied Psychology*, *96*, 1195–1208. https://doi.org/10.1037/a0024716

Liu, D., Zhang, S., Wang, L., & Lee, T. W. (2011c). The effects of autonomy and empowerment on employee turnover: Test of a multilevel model in teams. *Journal of Applied Psychology*, *96*, 1305–1316. https://doi.org/10.1037/a0024518

Milgrom, P., Weinstein, P., & Getz, T. (1995). *Treating fearful dental patients*. Seattle, WA: Continuing Dental Education University of Washington.

Moore, R., Birn, H., Kirkegaard, E., Brødsgaard, I., & Scheutz, F. (1993). Prevalence and characteristics of dental anxiety in Danish adults. *Community Dentistry and Oral Epidemiology*, *21*, 292–296. https://doi.org/10.1111/j.1600-0528.1993.tb00777.x

Oosterink, F. M. D., de Jongh, A., & Aartman, I. H. A. (2009). Negative events and their potential risk of precipitating pathological forms of dental anxiety. *Journal of Anxiety Disorders*, *23*, 451–457. https://doi.org/10.1016/j.janxdis.2008.09.002

Pavey, L. J., & Sparks, P. (2010). Autonomy and reactions to health-risk information. *Psychology and Health*, *25*, 855–872. https://doi.org/10.1080/08870440902929528

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioural research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, *88*, 879–903.

Poulton, R., Waldie, K. E., Thomson, M. W., & Locker, D. (2001). Determinants of early- vs late-onset dental fear in a longitudinal-epidemiological study. *Behaviour Research and Therapy*, *39*, 777–785. https://doi.org/10.1016/S0005-7967(00)00060-7

Reeve, J., Jang, H.-R., & Jang, H. (2018). Personality-based antecedents of teachers' autonomy-supportive and controlling motivating styles. *Learning and Individual Differences*, *62*, 12–22. https://doi.org/10.1016/j.lindif.2018.01.001

Rose, E. A., Markland, D., & Parfitt, G. (2001). The development and initial validation of the exercise causality orientations scale. *Journal of Sports Science*, *19*, 445–462. https://doi.org/10.1080/026404101300149393

Roth, G., Assor, A., Niemiec, C. P., Ryan, R. M., & Deci, E. L. (2009). The emotional and academic consequences of parental conditional regard: Comparing conditional positive regard, conditional negative regard, and autonomy support as parenting practices. *Developmental Psychology*, *45*, 1119–1142. https://doi.org/10.1037/a0015272

Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. New York, NY: The Guilford Press.

Ryan, R. M., Soenens, B., & Vansteenkiste, M. (2019). Reflections on self-determination theory as an organizing framework for personality psychology: Interfaces, integrations, issues, and unfinished business. *Journal of Personality*, *87*, 115–145.

Shrout, P. E., & Bolger, N. (2002). Mediation in experimental and nonexperimental studies: New procedures and recommendations. *Psychological Methods*, *7*, 422–445. https://doi.org/10.1037/1082-989X.7.4.422

Su, Y.-L., & Reeve, J. (2011). A meta-analysis of the effectiveness of intervention programs designed to support autonomy. *Educational Psychology Review*, *23*, 159–188. https://doi.org/10.1007/s10648-010-9142-7

Tay, C., Ang, S., & Van Dyne, L. (2006). Personality, biographical characteristics, and job interview success: A longitudinal study of the mediating effects of interviewing self-efficacy and the moderating effects of internal locus of causality. *Journal of Applied Psychology, 91*, 446–454. https://doi.org/10.1037/0021-9010.91.2.446

Vallerand, R. J. (2000). Deci and Ryan's self-determination theory: A view from the hierarchical model of intrinsic and extrinsic motivation. *Psychological Inquiry, 11*, 312–318.

Weinstein, N., Deci, E. L., & Ryan, R. M. (2011). Motivational determinants of integrative positive and negative past identities. *Journal of Personality and Social Psychology, 100*, 527–544.

West, S. G., Aikin, L. S., & Krull, J. L. (1996). Experimental personality designs: Analyzing categorical by continuous variable interactions. *Journal of Personality, 64*, 1–48. https://doi.org/10.1111/j.1467-6494.1996.tb00813.x

White, R. W. (1959). Motivation reconsidered: The concept of competence. *Psychological Review, 66*, 297–333. https://doi.org/10.1037/h0040934

Williams, G. C., & Deci, E. D. (1996). Internalization of biopsychosocial values by medical students: A test of self-determination theory. *Journal of Personality and Social Psychology, 70*, 767–779. https://doi.org/10.1037/0022-3514.70.4.767

Williams, G. C., Grow, V. M., Freedman, Z., Ryan, R. M., & Deci, E. L. (1996). Motivational predictors of weight loss and weight-loss maintenance. *Journal of Personality and Social Psychology, 70*, 115–126. https://doi.org/10.1037/0022-3514.70.1.115