


# Dental hygienists' biopsychosocial beliefs and giving autonomy support in treatment of patients: A self-determination theory perspective

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## Abstract

**Objectives:** Self-determination theory posits that managers' autonomy-supportive behaviour and employees' autonomy causality orientation are motivation constructs to explain internalization of values, functioning and wellness at work. Hypothesis 1 tested whether profiles comprising perceived dental clinic managers' autonomy-supportive, as opposed to their controlling interpersonal style, and dental hygienists' autonomy, as opposed to their control and impersonal, causality orientations at baseline, would be positively related to dental hygienists' biopsychosocial (BPS) beliefs and giving autonomy support in treatment of patients after 18 months. Hypothesis 2 tested whether dental hygienists' BPS beliefs in treatment of patients will be positively associated with their autonomy-supportive behaviour given to patients after 18 months.

**Material and methods:** A prospective cohort design with 299 ( $M_{\text{age}} = 42.71$ ;  $SD_{\text{age}} = 12.62$ ) dental hygienists completed an online survey at baseline and after 18 months.

**Results:** Latent profile and correlational analyses supported the hypotheses. Effect sizes were moderate to large.

**Conclusions:** Both perceived managerial styles and dental hygienists' causality orientations are important for dental hygienists' BPS beliefs and autonomy-supportive behaviours when working with dental patients.

## KEYWORDS

autonomy, control, and impersonal causality orientations, biopsychosocial beliefs, giving autonomy support, perceived autonomy-supportive and controlling management, person-centred approach

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## 1 | INTRODUCTION

Engel's biopsychosocial model (BPSM) included social, psychological and behavioural dimensions of health and illness. The model is reckoned as a breakthrough to understand medicine as a science<sup>1,2</sup> and is the basis for The World Health Organization International Classification of Functioning, Disability, and Health (for details, see)<sup>3</sup>. It is generally accepted that health and illness are the result of an interaction between biological, psychological and social factors.<sup>4-6</sup> In addition, the BPSM is closely tied to the relationship-centred approach involving healthcare professionals taking the patients' perspective, being emphatic and building trust, and being sensitive to patients' and families' psychological needs in order to provide high-quality patient care.<sup>7-9</sup> Hence, an important consequence of the BPSM is that the relationship between healthcare professionals and patients influences the patients' health through the support for and satisfaction of the patients' psychological needs. When healthcare professionals are more relationship-centred, relative to being physician-centred, several positive outcomes emerge, such as higher satisfaction, treatment motivation and health competence, better adherence to prescriptions, maintained health-behaviour change and improved physical health and psychological well-being.<sup>9-13</sup>

Accordingly, we used self-determination theory (SDT)<sup>14-16</sup>, and its concepts of autonomy-supportive and controlling managerial styles at the workplace and causality orientations among dental hygienists to examine hygienists BPS beliefs and giving autonomy support in treatment of dental patients. This approach has been found as efficient as standard care and improves patient health.<sup>10,17-19</sup>

### 1.1 | SDT and autonomy-supportive vs. controlling management

According to SDT, the social-contextual variable of autonomy support facilitates, whereas a controlling manager style impedes, a fuller internalization of autonomous work motivation and values like those embedded in the BPSM. Such internalization means that the reasons for behaviour become more self-determined and fully aligned with abiding values and beliefs held by the individual.<sup>20</sup> From a SDT perspective, giving autonomy support or being controlling towards others is likely to support or frustrate, respectively, the basic human psychological needs for competence (an experience of capability and effectiveness), autonomy (an experience of volition and choice) and relatedness (an experience of mutual care and concern vis-à-vis others). Examples of need support are managers who offer information and choice (support of autonomy), give positive performance feedback (support of competence) and relate to employees in a warm and caring way (support of relatedness). In contrast, frustration of the psychological needs is related to managers' use of intimidating language and demands without meaningful rationales (frustration of autonomy), emphasis of faults, incompetence and low likelihood to improve (frustration of competence), and exclusion and refusal to be available for employees who are in need (frustration

of relatedness).<sup>21</sup> Indeed, autonomy support involves encouraging others to be self-initiating rather than pressuring them to behave in a specific manner; hence, it allows others to become more autonomous in work-related tasks.<sup>15</sup>

Research has demonstrated that autonomy-supportive interpersonal contexts facilitate internalization and integration of values,<sup>22</sup> are associated with higher BPS beliefs and more actively giving autonomy support in treatment of patients<sup>23</sup> and improvements in patients' oral healthcare behaviours and oral health.<sup>10,11,24,25</sup> Conversely, dental hygienists' controlling management style, as perceived by their patients, has been positively associated with maladaptive outcomes, such as their dental anxiety and avoidance of treatment.<sup>26,27</sup> SDT also suggests that motivational factors within the employee affect internalization of work-related values and beliefs, which are considered in the next paragraph.

### 1.2 | Causality orientations

Individual differences in autonomy, controlled and impersonal causality orientations are defined in terms of whether one orient towards one's context observing possibilities of self-determination and choice, or looking for external rewards and pressures, or feel unable to influence the environment (16, p. 216).

Research in work contexts has shown that an autonomy causality orientation is positively associated with autonomy-supportive managerial styles, psychological need satisfaction, autonomous work motivation and a range of adaptive work behaviours, such as learning and job performance.<sup>28-33</sup> Conversely, controlled and impersonal orientations have been correlated with less adaptive outcomes, such as more controlling managerial styles,<sup>34</sup> more extrinsic work motivation,<sup>28</sup> less autonomous work motivation and less BPS beliefs and autonomy-supportive behaviours towards patients.<sup>23</sup>

### 1.3 | Purpose, research questions and hypotheses

The purpose of this study is twofold: (1) to determine whether it is possible to identify unique latent profiles based on dental hygienists' perceive autonomy-supportive and controlling managerial styles at the workplace, and their locus of causality orientations and (2) determine whether latent profiles at baseline are associated with dental hygienists' biopsychosocial beliefs and giving of autonomy support in treatment of dental patients 18 months later?

Based on the literature reviewed, we hypothesized that profiles comprised by higher levels of perceived managerial autonomy support and lower levels of controllingness, as well as by higher levels of autonomy causality orientation and lower levels of control and impersonal causality orientations, will be related to higher levels of BPS belief and the giving of autonomy-supportive behaviour. In addition, we hypothesized that dental hygienists' BPS beliefs in treatment of patients will be positively associated with their autonomy-supportive behaviour given to patients.

## 2 | METHODS

### 2.1 | Participants and design

An online questionnaire with an invitation to participate was sent out to all 999 dental hygienist members registered in the Norwegian Dental Hygienist Federation. Informed consent to participate was given by 299 dental hygienists who responded in March 2017, and 180 of them answered the questionnaire 18 months later in September 2018. For missing participant data, please see the missing data analysis paragraph in the result section, and the description of the full informational maximal likelihood procedure used to retain 299 participants in all data. Approval from the Norwegian Center for Research Data was obtained prior to data collection (project number 53264).

The study was designed to be a prospective cohort study based on an assumption that the personal profiles may be relatively stable over time, among dental hygienists with high tenure and full-time positions, and also expected to predict the persons BPS beliefs and autonomy support given to patients after 18 months.

### 2.2 | Measures and their reliabilities

All measures described below were translated to Norwegian, and back-translated to English, and adapted following the procedures suggested by Beaton, Bombardier,<sup>36</sup> except the measure of causality orientations developed in Norway.

In line with the purposes of this study described above, we used the Work Causality Orientation Scale<sup>37</sup> to measure autonomy, controlled and impersonal orientations. For managerial styles, we used the Work Climate Questionnaire<sup>29</sup> to measure the autonomy-supportive style and items from the Psychologically Controlling Teaching Scale,<sup>38</sup> and the Teacher As Social Context Questionnaire<sup>39</sup> to measure the controlling managerial style. Regarding the two outcomes, we used the 14-item Physician Belief Scale<sup>41</sup> to measure BioPsychoSocial Beliefs, and the Health Care Climate Questionnaire<sup>42</sup> adapted to measure the giving of autonomy support.

*Autonomy, Controlled and Impersonal Orientation* was assessed with the Work Causality Orientation Scale.<sup>37</sup> A sample of the 6 scenarios is: 'Imagine: Your manager has the desire that you become more self-driven and independent in your job. The first thing you think will probably be: (A) 'This will be important for me to try, to see if it gives results' (*Autonomy*); (B) 'Feel the pressure to do as my manager says' (*Controlled*); (C) 'It is hard to do something about things like independence, I am who I am' (*Impersonal*). Responses ranged from 1 (*very unlikely*) to 7 (*very likely*).

*Perceived Autonomy Support* from managers was reported on the 6-item version of the Work Climate Questionnaire.<sup>29</sup> A sample item is 'I feel that my manager provides me choices and options'. The items were reported on a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

*Perceived Controllingness* from managers (12 items) was measured with a combination of the seven items in the Psychologically Controlling Teaching Scale<sup>38</sup> and two negatively worded items in the Teacher As Social Context Questionnaire<sup>39</sup> similar to the procedure and measure in the study by Haerens, Aelterman.<sup>40</sup> These items were adapted to fit the work context. In addition, three additional self-developed items were included to secure that all aspects of controlling leadership were included. A sample item is 'My manager often criticizes me for how I am doing my job'. Participants responded to the items on scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

*BioPsychoSocial Beliefs* were measured with the 14-item Physician Belief Scale.<sup>41</sup> Sample items are as follows: 'I cannot help a patient with a psychosocial problem I have not resolved myself', and 'Investigating issues of psychosocial problems decreases my efficiency'. The items were reported on a scale ranging from 1 (*completely agree*) to 7 (*completely disagree*).

*Giving Autonomy Support* to patients was reported on the 6-item version of the Health Care Climate Questionnaire<sup>42</sup> adapted to giving autonomy support. A sample item is as follows: 'I feel that I am providing my patients choices and options'. The items were reported on a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

### 2.3 | Background assessments

Gender and age (yrs.) were recorded. Educational information was assessed with the following question: 'What is your highest level of completed education?' with response alternatives from 1 (*junior or senior high school*) to 5 (*university or university college education of more than 5 years*). Full- or part-time positions were indicated in % of time worked, tenure in years, daytime versus evening work indicated and if they worked at public or private dental clinics.

### 2.4 | Data analysis

Based on the causality orientations and perceived manager styles at baseline, we aimed to identify potential subgroups of individuals within the study population by performing a latent profile analysis (LPA). In the LPA, the participants are, based on posterior class probabilities (i.e. new information combining causality orientations and manager styles), assigned towards the profile where they have the highest probability to belong.<sup>43</sup> The analysis was performed in Mplus 8.3<sup>44</sup> using the maximum likelihood estimator. For the LPA, we used 100 random start values for each model, with the 20 best retained for the final solution. To avoid local maxima, the final solution was, in line with the suggestions from Geiser,<sup>45</sup> replicated with 1500 random start values.

In the analysis procedure, we tested a sequence of nested models, starting with one profile, with the aim to examine whether more complex models (i.e. a model containing one more profile) fit the data better in comparison with more parsimonious models. We

tested solutions with one to four profiles. To determine the optimal solution, we assessed several statistical criteria described in the next paragraph as well as the substantive theoretical meaning of the solutions.<sup>43</sup>

Based on previous recommendations, the following statistical criteria were assessed.<sup>43</sup> First, we inspected the Akaike information criterion (AIC)<sup>46</sup>, the Bayesian information criterion (BIC)<sup>47</sup> and the sample size-adjusted BIC (SSA-BIC)<sup>48</sup>. On all these criteria, lower values indicating better model fit. Second, we inspected the Lo-Mendell-Rubin adjusted likelihood ratio test (LMR-LRT)<sup>49</sup> and the bootstrap likelihood ratio test (BLRT)<sup>43</sup>. Statistically significant tests ( $p < 0.05$ ) indicate that the current model solution fits the data better than a less complex solution. Third, we assessed the entropy criterion. The entropy indicates how accurate the classification of participants is into the different profiles. Entropy values closer to 1 are indicating high accuracy.<sup>50</sup> Fourth, we evaluated the different solutions to determine what solution that was most meaningful from a theoretical perspective. Also, in line with recommendations, solutions containing a profile with less than 25 participants were rejected due to lack of statistical power for a stable solution.<sup>50</sup>

Missing data were handled with full information maximum likelihood (FIML), retaining 299 participants in all results, as recommended by Enders.<sup>51</sup> Given the large drop-out we, however, conducted a sensitivity analysis where only participants who had data on both measurement occasions were included. This analysis favoured a similar solution with the same interpretation as the results obtained when using the full sample. We, therefore, decided to use the results from the full sample.

To investigate whether the participants in the identified latent profiles differed with respect to the two outcome variables measured at the follow up after 18 months, we used the three-step approach (BCH)<sup>52</sup>. In this analysis, the outcome variables were specified as auxiliary variables and continuous distal outcomes. In the three-step approach, an overall test of association using Wald's test is calculated together with pairwise profile comparisons. For all analyses, we used  $p < 0.05$  as an indicator of statistically significant results. Also, for all pairwise comparisons, Cohen's  $d$  effect sizes were calculated.

## 3 | RESULTS

### 3.1 | Missing data analysis

In the present study, 299 of the participants responded at baseline and 180 (60.4%) of them responded after 18 months; hence, 119 participants (39.6%) dropped out of the study. We therefore assumed that a missing not at random (MNAR) mechanism could be evident in the data (for details, see 51). Hence, we performed some recommended missing data analyses. We performed Little's missing completely at random (MCAR; 51) test, using SPSS 24, on the dependent variables BPS beliefs and giving autonomy support by comparing those participants who completed the two time points

with those participants who dropped out of the study: (A) completers (chi-square = 63.19;  $df = 77$ ;  $p = 0.871$ ; chi-square = 14.52;  $df = 10$ ;  $p = 0.150$ ) and (B) dropouts (chi-square = 51.64;  $df = 53$ ;  $p = 0.527$ ; chi-square = 9.68;  $df = 5$ ;  $p = 0.085$ ). Additionally, we performed independent samples  $t$ -tests to determine whether there were statistical differences between completers and dropouts. The bootstrap results, which were based on 10,000 resamples, showed that dropouts did not report lower levels of BPS beliefs at baseline ( $t = .904$ ;  $df = 247$ ;  $p = 0.367$ ; BC 95% CI [-0.132-0.355];  $d = 0.01$ ) nor lower levels of giving autonomy support at baseline ( $t = -0.350$ ;  $df = 251$ ;  $p = 0.727$ ; BC 95% CI [-0.198-0.139];  $d = 0.04$ ). Hence, the preliminary analyses indicated that the missing data in the present study were missing at random (MAR)<sup>51</sup>.

### 3.2 | Descriptive statistics, confirmative factor analysis, correlation and reliability

Nearly all participants were females (98%), their age ranged from 22 to 66 years ( $M = 42.71$ ,  $SD = 12.62$ ), and they had a dental hygienist education corresponding to a bachelor's degree (91.9%). Most of them had a full-time position (93.87%,  $SD = 18.16$ ), had a tenure of or had worked as a dental hygienist for 23 years ( $SD = 9.62$ ) and worked daytime (95.3%). They worked at public (65.7%) or private (34.3%) dental clinics.

The confirmatory factor analyses (CFA) specified for each of the 7 study variables yielded good fit to the data: RMSEA varied from 0.026 to 0.066, CFI from 0.916 to 0.997, SRMR from 0.013 to 0.050 and  $\chi^2/df$  from 1.20 to 2.80. Means, standard deviations, skewness values, reliability coefficients and Pearson correlation coefficients are presented in Table 1. Skewness values were acceptable, and reliability estimates did all exceed the 70 cut-off point defined by Nunnally.<sup>53</sup>

### 3.3 | Latent profile analysis

The LPA indicated that the 3-profile solution provided the best fit to the data (see Table 2). Profiles 1 – 3 contained 52, 50 and 197 dental hygienists respectively. Profile 1 contained dental hygienists having 'the most impersonal causality orientation'. Profile 2 included hygienists having 'the most controlled causality orientation and the most controlling manager'. Finally, profile 3 represented hygienists with 'the most autonomous causality orientation and the most autonomy-supportive manager' (see the subscale scores in Table 3). The reason for the profile 1 name 'most impersonal' dental hygienists is because they were clearly higher on impersonal orientation compared with profile 2 (Cohen's  $d$ , Effect Size,  $ES = 1.73$ ; Cohen 1992) and profile 3 ( $ES = 2.04$ ). In addition, they were clearly lowest on autonomy causality orientation compared to profile 2 ( $ES = 1.28$ ) and profile 3 ( $ES = 2.09$ ; see Table 3 for Means and SD's). Profile 2 was named 'hygienists with the most controlled causality orientation and the most controlling manager' because they were highest on control causality orientation compared with profile 1 ( $ES = 0.28$ ) and

**TABLE 1** Means, Standard Deviations, Skewness Values, Alpha Reliability Coefficients and Pearson Correlations<sup>1</sup> Between Predictor Variables (1–5) at Baseline (BL) and Biopsychosocial Beliefs and Giving Autonomy Support in Treatment of Patients after 18 Months (Variables 6–7) and Background Variables (8–9)

Variables	M	SD	Skew	$\alpha$	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Autonomy support from manager (BL)	5.49	1.38	-1.08	0.94	-	-0.74***	0.26***	-0.25***	-0.15**	0.21***	0.24***	-0.02	0.00
2. Controlling managerial style (BL)	2.21	1.35	1.26	0.96	-	-	-0.24***	0.28***	0.12*	-0.14*	-0.12	-0.05	0.04
3. Autonomy orientation, DH (BL)	6.19	0.82	-1.26	0.80	-	-	-	-0.18***	-0.58***	0.33***	0.34***	-0.14*	0.05
4. Control orientation, DH (BL)	3.58	1.54	0.12	0.87	-	-	-	-	0.36***	-0.26***	-0.02	-0.05	-0.03
5. Impersonal orientation, DH (BL)	1.95	0.92	1.48	0.76	-	-	-	-	-	-0.40***	-0.25***	0.08	0.02
6. BioPsychSocial Beliefs, DH (after 18 months)	5.26	1.07	0.04	0.91	-	-	-	-	-	-	0.26***	0.10	0.03
7. Giving autonomy support, DH (after 18 months)	5.99	0.66	-1.23	0.86	-	-	-	-	-	-	-	0.09	-0.05
8. Age	42.71	12.62	0.20	-	-	-	-	-	-	-	-	-	-0.08
9. Education <sup>2</sup>	3.95	0.32	-2.38	-	-	-	-	-	-	-	-	-	-

<sup>1</sup> N=299 (M+ FIML analysis). Two-tailed tests of significance. The range for variables 1–7 vary from 1 to 7.

<sup>2</sup> Education mean is close to bachelor level. Working in a public or private organization correlated only significantly with age ( $-0.30, p < 0.001$ ), that is the youngest dental hygienists was found in private businesses.

Abbreviation: BL, Baseline; DH, Dental hygienist.

profile 3 ( $ES = 0.75$ ), and clearly higher on a controlling managerial style compared with profile 1 ( $ES = 1.69$ ) and profile 3 ( $ES = 2.95$ ). In addition, they were clearly lowest on autonomy support compared with profile 1 ( $ES = 1.74$ ) and profile 3 ( $ES = 3.14$ ). Finally, profile 3 was labelled hygienists with 'the most autonomous causality orientation and the most autonomy-supportive manager', because they were clearly highest on autonomy causality orientation compared with profile 1 ( $ES = 2.09$ ) and profile 2 ( $ES = 0.58$ ), and highest on autonomy support compared with profile 1 ( $ES = 1.34$ ) and profile 2 ( $ES = 3.14$ ). In addition, this profile scored lowest on experiencing a controlling managerial style compared with both profile 1 ( $ES = 1.13$ ) and profile 2 ( $ES = 2.95$ ), lowest on control causality orientation compared with both profile 1 ( $ES = 0.58$ ) and profile 2 ( $ES = 0.75$ ), and lowest on impersonal causality orientation compared with both profile 1 ( $ES = 2.04$ ) and profile 2 ( $ES = 0.30$ ). Hence, profile 3 consists of the most self-determined or autonomous dental hygienists. The effect sizes were, according to Cohen (1992), in most cases large.

The three latent profiles were also used to analyse the associations to the two distal outcomes (i.e. BPS beliefs and giving autonomy support in treatment of patients after 18 months). The results showed that the most autonomous dental hygienists (profile 3) scored higher on both BPS beliefs and giving of autonomy support compared with the most controlled dental hygienists (profile 2), which scored higher on both outcomes relative to the most impersonal dental hygienists (profile 1). The effect sizes, based on comparison of mean values, were large between profiles 1 and 3. See chi-square statistics,  $p$ -values and effect sizes in Table 4.

## 4 | DISCUSSION

The LPA, which is a person-centred approach to analysing data, distinguished between three latent profiles of dental hygienists at baseline, based on their self-rating scores on perceived autonomy-supportive and controlling managerial clinic styles, and additionally, their autonomy, control and impersonal causality orientations. This 3-profile solution fit the data very well. Based on theory and research,<sup>16,22,23,34</sup> we hypothesized that the most autonomous profile 3 would be positively related to dental hygienists BPS beliefs and giving of autonomy support in treatment of patients after 18 months, relative to the most controlled and most impersonal profiles. The results confirmed our hypothesis. In addition, the association between BPS beliefs and giving autonomy support to patients was positive and significant, thus confirming the hypothesis that dental hygienists' BPS beliefs relate to their work-related behaviour being patient-centred.

This is the second study in the literature, besides the study by Williams and Deci,<sup>23</sup> indicating that autonomy-supportive, as opposed to controlling management, and autonomy causality orientation, as opposed to control and impersonal causality orientations, matter for health professionals' BPS beliefs and their giving of autonomy support in treatment of dental patients. However, the



Model	AIC	BIC	SSA-BIC	Entr	LMR	BLRT
2-profile solution	4406.99	4466.14	4415.40	0.89	<0.001	<0.001
3-profile solution	4264.83	4346.17	4276.40	0.88	0.05	<0.001
4-profile solution	4216.48	4320.00	4231.20	0.90	0.09	<0.001

TABLE 2 Fit Indices, Entropy and Model Comparisons for Estimated Latent Profile Analyses Models

Note: One profile in the 4-profile solution contains 10 cases.

Abbreviations: AIC, Akaike information criterion; BIC, Bayesian information criterion; BLRT, *p*-value for bootstrap likelihood ratio test; LMR, *p*-value for adjusted Lo-Mendell–Rubin likelihood ratio test; SSA-BIC, sample size-adjusted Bayesian information criterion.

TABLE 3 Mean Values and Standard Deviations for Study Variables in the Three Profiles and Outcomes

Profile	1 (N = 52)	2 (N = 50)	3 (N = 197)
	Highest impersonal orientation	Highest controlling manager and control orientation	Highest autonomy support and autonomy orientation
Variables (Baseline)	M (SD)	M (SD)	M (SD)
Autonomy support from managers	5.06 (0.93)	3.34 (1.04)	6.20 (0.76)
Controlling managerial style	2.51 (1.00)	4.33 (1.15)	1.54 (0.68)
Autonomy orientation, dental hygienist	5.11 (0.82)	6.14 (0.79)	6.52 (0.49)
Control orientation, dental hygienist	4.03 (1.14)	4.41 (1.55)	3.25 (1.53)
Impersonal orientation, dental hygienist	3.25 (0.94)	1.82 (0.69)	1.62 (0.63)
Outcomes (After 18 months)			
Biopsychosocial beliefs, dental hygienist	4.29 (0.83) <sup>a,b</sup>	4.90 (0.93) <sup>a,c</sup>	5.28 (1.02) <sup>b,c</sup>
Giving autonomy support, dental hygienist	5.47 (0.66) <sup>a,b</sup>	5.95 (0.51) <sup>a,c</sup>	6.21 (0.56) <sup>b,c</sup>

Note: For each outcome, cells sharing a common superscript differ significantly from each other at least at  $p < 0.05$  (one-tailed tests). For exact *p*-values, see Table 4.

TABLE 4 Chi-square Statistics, *p*-values<sup>1</sup> and Cohen's *d* Effect Size for the Pairwise Comparison Between Profiles

	Profile 1 vs 2			Profile 1 vs 3			Profile 2 vs 3		
	$\chi^2$	<i>p</i>	<i>d</i>	$\chi^2$	<i>p</i>	<i>d</i>	$\chi^2$	<i>p</i>	<i>d</i>
Biopsychosocial Beliefs	5.89	0.01	0.58	24.54	<0.001	0.88	3.57	0.03	0.36
Giving autonomy support	8.09	0.002	0.68	24.61	<0.001	1.10	5.44	0.01	0.43

Note: One-tailed tests of significance.

present study is the first study using a person-centred prospective cohort design.

The most impersonal dental hygienists in profile 1 seem to suffer due to their lowest BPSM beliefs and lowest autonomy support given to patients, probably also because they have the lowest autonomy causality orientation (see Table 3). The most controlled dental hygienists, in profile 2, having both the most controlled causality orientation and the most perceived controlling manager seem to suffer less, probably because their relatively high autonomy causality orientation serves as a buffer. Anyway, the most autonomous dental hygienists in profile 3, scoring highest on both autonomy causality orientation and perception of an autonomy-supportive manager, performed highest on both BPS beliefs and giving of autonomy

support in treatment of patients after 18 months. The effect sizes were large between the most autonomous profile 3 and the most impersonal profile 1. These results are of importance because both BPS beliefs and giving of autonomy support have been shown to be of significance for providing need satisfying care and improving the health of patients.<sup>9,10,13</sup> Hence, the results are interesting from a theoretical point of view and should be further tested in future studies.

Theoretically, the results might be interpreted separately by causality orientations and autonomous versus controlling contexts. First, SDT postulates that individual differences in autonomy, controlled and impersonal causality orientations affect internalization of values and beliefs.<sup>16</sup> An autonomy-oriented employee orients

towards possibilities of self-determination and choice, as opposed to control-oriented employees looking for external rewards and pressures, or as opposed to impersonal employees feeling unable to influence the environment (16, p. 216). Hence, autonomy-oriented employees are more likely to experience a sense of psychological freedom in carrying out work-related activities. In addition, they are more likely to perceive their behaviour to be self-initiated and consistent with their personal values and interests. Hence, they feel the behaviour emanates from themselves.<sup>54</sup>

Second, when managers encourage employees to be self-initiating rather than pressuring them to behave, employees engage and become more autonomous in the tasks at the workplace and in work-related learning. According to SDT, perception of autonomy support facilitates a fuller adoption and internalization of the beliefs and values acknowledged in their profession and espoused by their managers.<sup>16,20</sup> Research indicates that autonomy-supportive interpersonal contexts facilitate internalization and integration,<sup>22</sup> and are associated with higher BPS beliefs and giving autonomy support in treatment of patients.<sup>23</sup>

The psychological mechanisms explaining these results in SDT are also supposed related to the fit and/or conflict between perceived management and dental hygienists' causality orientations.<sup>55</sup> The results indicated that the fit between the highest autonomous context through management and the highest autonomous causality orientation (in the most autonomous profile 3) yielded the most advantageous outcomes. This was expected and in line with a meta-analysis<sup>55</sup> and an autonomy-supportive oral healthcare intervention.<sup>11</sup> Both of those studies indicated that those with autonomy-oriented personalities showed a greater training or intervention effect than did participants who were less autonomy-oriented. This interaction effect is expected to be related to the autonomous personality experiencing more congruence with the manager's autonomy-supportive behaviours. That is, the autonomous people feel this type of support is more appealing than less autonomous people, because behaving in an autonomous manner is more integrated with their values and goals.<sup>15</sup> That being said, we are not suggesting that less autonomous people desire or benefit from being in controlling contexts, as all individuals require support for satisfaction of their basic psychological needs. Controlled and impersonal persons just need some more time to adapt and adjust to an autonomy-supportive managerial style before desired changes in motivation, behaviour and achievement are attained.<sup>15,55-58</sup>

#### 4.1 | Implications for dental hygienists

It is promising that the majority of dental hygienists belong to the most autonomous profile, yielding the most advantageous outcomes. However, about one out of three dental hygienists seem to be challenged by impersonal and/or control causality orientations, and/or controlling management styles. The question then remains: How can employees reduce their high control and/or high impersonal causality orientations and become more autonomous at their workplace? It

is suggested that persons high in control and/or impersonal causality orientations can learn to respond to autonomy support and develop their autonomy causality orientation.<sup>42</sup> Both continuing education and frequent supervision giving competence and encouraging learning in an autonomy-supportive way are expected to stimulate employees to internalize values, beliefs and goals in treatment of their patients over time. Hence, frequent autonomy-supportive education and supervision at the workplace might be important and result in better quality outcomes, such as increased self-determined work motivation and perceived job competence. This is shown for dental patients' treatment motivation and oral healthcare competence but have not yet been studied in relation to dental hygienists' own work motivation and perceived work competence. Hence, among dental patients, cross-sectional and experimental studies indicate that highly autonomy-supportive treatment, relative to standard care or controlling treatment styles, is linked with positive motivation outcomes, such as increased self-determined treatment motivation, increased perceived oral healthcare competence and improved health. In addition, dental hygienists' autonomy-supportive behaviour has been shown to be positively associated with performance indications and well-being among dental patients.<sup>10,24,57</sup> Among persons high in control and/or impersonal causality orientation, this process of continuing education and frequent supervision is expected to require time before desired changes in motivation, behaviour and achievement are attained.<sup>58</sup> In the development process, employees are likely to become more self-initiating of and responsible in relation to their work behaviours, become more autonomously engaged at work and less impersonal oriented when they experience increases in their work-related competence and that behaviours actually affect desired outcomes.<sup>15</sup>

#### 4.2 | Strengths, limitations and future directions

There are some strengths and limitations in the present study. *First*, self-reports were appropriate for causality orientations and BPS beliefs. However, observations and/or self-reports from managers regarding their managerial styles, as well as observations of dental hygienists' giving autonomy support to their patients, would have strengthened the design of the present study. Conversely, we used only validated measures in the present study. Hence, the present use of self-report measures with construct validity is a strength.<sup>59</sup> *Second*, because the sample included 29.82% of the members in the Norwegian Dental Hygienist Federation, and descriptive statistics of gender, age and geographical counties closely fit the national statistics, we suggest the results to be generalizable within this particular population. *Third*, the outcomes related to fit or conflict between motivational forces at the contextual and personal levels should be more closely examined in future research. *Fourth*, the use of LPA is supposed to be a strength because the dental hygienists under study are mostly in full-time positions with a tenure of 23 years. *Fifth*, one advantage with a prospective cohort design is the possibility to specify temporal separation between independent and dependent variables. This temporal separation fulfils the first of three criteria

for making causal claims (i.e. x must precede y temporally).<sup>60</sup> In addition, the significant associations between baseline and distal measures fulfil the second of the three causal criteria.<sup>61</sup> Nevertheless, regarding the third criteria, the design does not rule out the possibility that the relation between x and y may be explained by other causes (60, p. 1086). Thus, conclusions regarding causality cannot be inferred from non-intervention studies without randomization between groups.<sup>61</sup> Hence, this prospective cohort study is a solid basis for future intervention studies manipulating managerial contexts among employees with different causality orientations to examine its causal effects on outcomes. Another strength is supposed to be the temporal separation between the independent and dependent variables, which has been shown to decrease the risk of common method bias, but this advantage has been questioned and discussed in relation to other aspects of the design such as cover stories used and the length of the separation.<sup>35</sup>

### 4.3 | Clinical relevance

Scientific rationale: To advance knowledge of managerial autonomy support at dental clinics and dental hygienists' autonomy orientation for hygienists' BioPsychoSocial (BPS) beliefs and their autonomy support given to patients.

Principal findings: Managers' autonomy support and dental hygienists' autonomy orientation are prospectively positively related to dental hygienists' BPS beliefs and autonomy support given to patients after 18 months.

Practical implications: Autonomy support and BPS beliefs can be learned. This has practical implications for hygienists' being more autonomy-supportive towards their patients, which increases patients self-determined treatment motivation, increases their oral healthcare competence, increases oral healthcare behaviours and improves their oral health.

## 5 | CONCLUSION

The results revealed that the majority of dental hygienists belong to the most autonomous profile, as opposed to the profiles described by the most controlled and most impersonal dental hygienists. Furthermore, the most autonomous dental hygienist profile was associated with higher levels of BPS beliefs and autonomy-supportive behaviour in treatment of patients after 18 months. This is important, because BPS beliefs and giving of autonomy support are found to increase health-related behaviours and to improve health among patients. However, future research should direct special attention towards dental hygienists' perceived controlling management of dental clinics and dental hygienists' control and impersonal orientations, because these factors impede their BPS beliefs and autonomous work functioning.

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## CONFLICT OF INTEREST

The authors report no conflicts of interest.

## AUTHOR CONTRIBUTIONS

AH, AI, HH, KED, AO, BES, ELD and GW made substantial design, survey and interpretation contributions. AI and BES analysed the data. AH and HH drafted the paper and received critical revisions from the other co-authors. All authors have approved the submitted manuscript.

## ETHICAL APPROVAL

Approval from the Norwegian Center for Research Data was obtained prior to data collection (project number 53264).

## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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