

ORIGINAL ARTICLE

Study on self-assessment regarding knowledge of temporomandibular disorders in children/adolescents by Swedish and Saudi Arabian dentistsAMAL AL-KHOTANI^{1,2}, OLOF BJÖRNSSON³, ARON NAIMI-AKBAR⁴,
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Abstract

Objective. To estimate the degree of self-assessed knowledge among dentists in Sweden and Saudi Arabia regarding temporomandibular disorders (TMD) in children and adolescents using a summative form of assessment and further to investigate the possible factors that may influence the self-assessed knowledge. **Materials and methods.** A questionnaire survey covering four domains (*Etiology; Diagnosis and classification; Chronic pain and pain behavior; Treatment and prognosis*) regarding TMD knowledge was used. Out of 250 questionnaires (125 in each country) a total of 65 (52%) were returned in Sweden and 104 (83%) in Saudi Arabia. **Results.** Self-assessed individual knowledge was significantly associated to the level of actual knowledge among the Swedish groups in the domains *Etiology; Diagnosis and classification and Treatment and prognosis* ($p < 0.05$). However, in the Saudi Arabian groups a corresponding significant association was only found in the domain *Diagnosis and classification* ($p < 0.05$). **Conclusions.** This study showed that there is a difference in the accuracy of self-assessment of own knowledge between the dentists in Sweden and Saudi Arabia. The Swedish dentists have a better ability to assess their level of knowledge compared to Saudi Arabian dentists regarding TMD in children and adolescents. This difference could be related to several factors such as *motivation, positive feedback, reflection, psychomotor, and interpersonal skills*, which all are more dominant in the Swedish educational tradition.

Keywords: Children, adolescents, temporomandibular disorders, knowledge, self-assessment

Introduction

There are several methods of assessment in the dental and medical field with the purpose to revise the caregivers' knowledge and/or skills in order to ensure progress in their professionalism [1–3]. Assessment methods have been used to evaluate the levels of 'knows' in the Miller's pyramid in order to reach a professional level of competence. However, without assessing the lower level of this pyramid (knowledge), the level of competence cannot be assessed [4–6]. Therefore, several assessment methods have been widely used in medical and dental educations to assess students' knowledge and skills reflecting their achievements in specific areas or subjects. One

method is self-assessment by which the reflective ability of an individual is assessed. This will help the learners to focus on their strengths, highlight their weaknesses and consequently protect the community from unskilled graduates [3,5].

Self-assessment was defined as 'the involvement of learners in making judgments about their own learning, particularly about their achievements and the outcomes of their learning' [7]. Many previous studies suggested that self-assessment is not used only as a means to measure dental students' and practitioners' knowledge, experience and beliefs related to their specialty, but also to develop a life-long learning way to reach a high professional level of competence [8–12].

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One review study hypothesized that the relation between self-assessment of an individual's own knowledge and cognitive learning is strongly influenced by many factors, the most important factors are; the learner's affective and motivational status, the quantity and quality of feedback the learner received, the interpersonal and psychomotor skills for the learner and the practice of how to report acquired knowledge [10]. In 2009, Mattheos et al. [11] suggested that various forms of summative assessment methods should be incorporated within the curriculum design in order to mirror the cognitive learning outcomes of dental education in implant dentistry.

Orofacial pain (OFP) and temporomandibular disorders (TMD) are common in children and adolescents, with a prevalence of 4–21% among Swedish and Saudi Arabian children and adolescents, depending on country and age [13–18]. It is very important to early detect and treat OFP/TMD in children and adolescents. This is not just in order to reduce the risk of pain chronicity and to prevent possible irreversible articular tissue destruction leading to growth impairment [19,20], but also since OFP/TMD may result in significant health problems negatively affecting the daily activities and the quality-of-life. However, the knowledge base regarding OFP/TMD in children and adolescents seems to be low, since a recent study from our group showed that the knowledge is at least moderately limited among both Swedish and Saudi Arabian dentists. Nevertheless, in the Swedish groups the knowledge base was more accurate than in the corresponding Saudi Arabian groups (2014, personal communication).

The aim of the present study was to estimate the degree of self-assessment of knowledge among dentists in Sweden and Saudi Arabia regarding OFP/TMD in children and adolescents and further to investigate the possible factors that may influence self-assessment of knowledge.

Materials and methods

Questionnaire

The questionnaire used in this study was adopted from Tegelberg et al. [19]. It was chosen since it is valid, reliable, relevant and summative, which meets the basic assessment guidelines summarized in the report by Manogue et al. [1]. Further, it is identical to that used in a recent study from our group (2014, personal communication) and has previously also been used by many researchers [19,21–23]. Since the questionnaire was distributed in two countries, the English language was chosen in order to provide equal conditions for all participants.

The questionnaire was divided into four domains regarding TMD knowledge, with a total of 37 statements. In the domain 'Etiology' there were nine

statements, in the domain 'Diagnosis and classification' 11 statements, in the domain 'Chronic pain and pain behavior' seven statements and in the domain 'Treatment and prognosis' 10 statements.

In addition to these 37 statements, 10 more statements were added in the questionnaire. These statements concerned which type of education (undergraduate, postgraduate or continuous) that had provided the knowledge regarding TMD as well as a self-assessment of the current individual degree of knowledge.

To assess the degree of agreement for each statement an 11-point scale was used where 0 represented 'completely disagree', 10 represented 'completely agree' and 5 represented 'neutral'. Further, there was also a 12th answer option of 'Don't know/Not applicable'.

Pilot revision

Before finalization of the content and layout of the questionnaire, pilot questionnaires were tested on 10 dentists from each country and their comments were considered in the final modification of the questionnaire.

Participants

A total of 250 questionnaires were distributed to general dentists, specialists in TMD, oral and maxillofacial surgeons, orthodontists and pediatric dentists in Sweden and Saudi Arabia (125 in each country).

Study design

In Sweden, the questionnaire was sent by regular mail to the participants. The questionnaires were sent to both general dentists and specialists. The general dentists in Sweden worked in large (> six dentists) dental clinics both in the public dental service in Stockholm (Folktandvården Stockholms län AB) as well as in the private sector. The specialists worked in the public dental service and private sector, but also at the university dental faculties in Stockholm, Gothenburg, Umeå and Malmö. If the participants did not respond to the questionnaires within 1 week after the final date a reminder was sent by regular mail and if no answer was received after 3 weeks a second reminder was sent.

In Saudi Arabia, the questionnaires were distributed to both general dentists and specialists. The general dentists were recruited from large (> six dentists) dental clinics both in the public dental service and in the private sector in Jeddah. The specialists worked in the public dental service and private sector, but also at the university dental faculties in Jeddah, Makkah and Riyadh. The questionnaires were handed over to each participant and an appointment for

collecting the questionnaire was made. The questionnaires were then collected when agreed.

Since this study was an anonymous survey study not revealing any patient or personal data that could be linked to the participating person it had an exemption from ethical approval.

Statistics

The participants were divided into two groups depending on their country, i.e. a Swedish group and a Saudi Arabian group.

To analyze the level of knowledge among dentists in each of the four domains regarding TMD knowledge the number of questions that was correct was calculated for each dentist. The Swedish TMD specialist group was used as a reference group (2014, personal communication) and for the statements where the Swedish TMD specialist showed agreement (either agree or disagree on a statement) the 25th and the 75th percentile were analyzed. An answer was regarded correct if it was within the 25th and 75th percentile of the reference group.

Quantile regression was used to analyze if the dentists' own self-assessment of their knowledge was predictive to the median number of correct answers. A statement about the dentists own self-assessed knowledge (Range = 0–10, where 0 equals insufficient knowledge and 10 sufficient knowledge) modeled as a continuous variable was included and a separate analyses for each of four different statements about knowledge was performed. The analyses were performed stratified on country. *P*-values were based on 100 bootstrap samples. All analyses were performed in STATA 12 SE. *P*-values lower than 0.05 were considered statistically significant.

Results

The response rates were 52% in Sweden and 83% in Saudi Arabia. The demographic data from the individuals that responded to the questionnaire from both Sweden and Saudi Arabia is shown in Table I. When the drop-out rate for each sub-group of dentists was analyzed in Sweden there was a drop-out rate of 50% for general dentists, of 36% for oral and maxillofacial surgeons, of 36% for orthodontists and pediatric dentists and of 15% for TMD specialists. In Saudi Arabia these figures were 13% for general dentists, 40% for oral and maxillofacial surgeons and 12% for orthodontists and pediatric dentists.

Reference group

In total, 29 out of the 37 statements, i.e. 78% of the Swedish TMD specialist reached a consensus. When each domain was analyzed separately consensus was reached in 89% of the statements in the domain

'Etiology', 64% in the domain 'Diagnosis and classification', 71% in the domain 'Chronic pain and pain behavior' and 100% in the domain 'Treatment and prognosis'.

Self-assessment of individual knowledge in relation to actual knowledge

There were several associations between the self-assessed knowledge and the actual degree of knowledge in both the Swedish and the Saudi Arabian dentists, when the domains were analyzed separately. These associations are presented below for each domain separately (Tables II and III).

Etiology

There were significant associations among Swedish dentists regarding their self-assessed knowledge and their actual knowledge ($p < 0.01$) (Table II) in the domain 'Etiology'. However, there were no such associations among the Saudi Arabian dentists (Table III).

Diagnosis and classification

In the domain 'Diagnosis and classification' the associations between the actual degree of knowledge and the self-assessed degree of knowledge were significant among the dentists in both countries, yet the regression coefficients were slightly higher among the Swedish dentists ($p < 0.01$) (Tables II and III).

Chronic pain and pain behavior

In this domain there was only one significant association found among the Swedish dentists' self-assessed knowledge and their actual knowledge ($p = 0.01$) (Table II). It was regarding the statement 'I have sufficient knowledge about temporomandibular disorders in general to diagnose and treat those patients with confidence according to the most recent scientific and clinical knowledge'. Among the Saudi Arabian dentists no associations were found (Table III).

Treatment and prognosis

The Swedish dentists showed significant associations between their self-assessed degree of knowledge and their actual degree knowledge within this domain ($p < 0.03$) (Table II). However, there were no such associations among the Saudi Arabian dentists (Table III).

Source of knowledge

The general dentists, in both countries, seem to mainly have acquired their knowledge regarding TMD during their undergraduate studies, while the specialists in both countries seem to have acquired

Table I. Demographic data on the 250 questionnaire responders in Sweden and Saudi Arabia.

	Age (years)				Gen der, M/F	Experience (years)			
	Median	Percentile		<i>n</i>		Median	Percentile		<i>n</i>
		25 th	75 th				25 th	75 th	
<i>Reference group</i>									
Swedish TMD specialists	47	37	56	18	7/11	7	2	11	15
<i>Sweden</i>									
General dentists	33	30	45	15	7/8	4	3	6	14
Oral and maxillofacial surgeons	50	46	56	15	12/3	10	6	20	14
Orthodontists and pedodontists	52	40	59	33	11/22	6	3	9	32
<i>Saudi Arabia</i>									
General dentists	27	26	28	36	18/18	0	0	2	34
Oral and maxillofacial surgeons	41	31	54	13	8/5	6	3	16	11
Orthodontists and pedodontists	37	32	43	51	29/22	3	1	10	50

their knowledge during postgraduate studies and clinical experience (Table IV).

Discussion

The main finding of this study is that there is a substantial difference between Swedish and Saudi Arabian dentists regarding their self-assessed degree of knowledge vs their actual degree of knowledge in TMD in children and adolescents. Among the Swedish dentists, there is a strong association between self-assessed knowledge and the actual knowledge, meaning that Swedish dentists are well aware of the level of their knowledge as well as the limitations of their

knowledge regarding TMD in children and adolescents. However, such an association between the self-assessed knowledge and the actual degree of knowledge was not found in the Saudi Arabian groups.

The Swedish dentists seem to be well aware of their level of knowledge, except for the domain 'Chronic pain and pain behavior'. However, in the domain 'Treatment and prognosis', Swedish dentists show a higher magnitude of knowledge and a strong association between the self-assessed knowledge and the actual knowledge compared to the Saudi Arabian dentists. In Sweden, TMD is taught as a separate subject in the undergraduate curriculum for an average of 9 weeks. The subject is taught in blocks spread

Table II. The association between self-assessed knowledge and the actual degree of knowledge among Swedish dentists. The regression coefficient and the *p*-values retrieved from analyses with quantile regression are presented.

Statements	Domains							
	Etiology		Diagnosis and classification		Chronic pain and pain behavior		Treatment and prognosis	
	Coeff.	<i>p</i> -value	Coeff.	<i>p</i> -value	Coeff.	<i>p</i> -value	Coeff.	<i>p</i> -value
I have sufficient knowledge about temporomandibular disorders in general.	0.5	0.00	0.50	0.00	0.25	0.20	1.00	0.01
I have sufficient knowledge about temporomandibular disorders in children and adolescents.	0.25	0.15	0.50	0.00	0.00	1.00	0.67	0.01
I have sufficient knowledge about temporomandibular disorders in general to diagnose and treat those patients with confidence according to the most recent scientific and clinical knowledge.	0.5	0.00	0.30	0.00	0.25	0.01	0.80	0.00
I have sufficient knowledge about temporomandibular disorders in children and adolescents to diagnose and treat these patients with confidence according to the most recent scientific and clinical knowledge.	0.4	0.00	0.40	0.00	0.00	1.00	0.50	0.03

Coeff., Coefficient regression factor.

Table III. The association between self-assessed knowledge and the actual degree of knowledge among Saudi dentists. The regression coefficient and the *p*-values retrieved from analyses with quantile regression are presented.

Statements	Domains							
	Etiology		Diagnosis and classification		Chronic pain and pain behavior		Treatment and prognosis	
	Coeff.	<i>p</i> -value	Coeff.	<i>p</i> -value	Coeff.	<i>p</i> -value	Coeff.	<i>p</i> -value
I have sufficient knowledge about temporomandibular disorders in general.	0.00	1.00	0.25	0.04	0.13	0.20	0.25	0.09
I have sufficient knowledge about temporomandibular disorders in children and adolescents.	0.00	1.00	0.25	0.01	0.10	0.11	0.20	0.90
I have sufficient knowledge about temporomandibular disorders in general to diagnose and treat those patients with confidence according to the most recent scientific and clinical knowledge.	0.00	1.00	0.20	0.10	0.10	0.09	0.00	1.00
I have sufficient knowledge about temporomandibular disorders in children and adolescents to diagnose and treat these patients with confidence according to the most recent scientific and clinical knowledge.	0.00	1.00	0.20	0.04	0.10	0.20	0.00	1.00

Coeff., Coefficient regression factor.

during the entire dental education including theoretical lessons, clinical practice, as well as clinical and theoretical evaluations. With this in mind and taking the quality as well as the quantity of education regarding TMD in Sweden into consideration, one cannot ignore the importance of the incorporation of theoretical and clinical education in TMD as an integrated part of the dentistry program in both the

undergraduate curriculum and the post-graduate board specialty program (2014, personal communication). Moreover, by using various teaching methods including self-assessment and reflection, the students are taught and given the opportunity to practice how to assess their acquired knowledge, helping them to keep this knowledge lifelong [8,10]. Many studies concluded that multiple exposures to objective

Table IV. Median degree of agreement (0–10, where 0 is ‘completely disagree’ and 10 is ‘agree completely’) to each statement by Swedish and Saudi Arabian general dentists (GD), oral and maxillofacial surgeons (OMS) and orthodontists and pedodontists (OP) regarding how and when the knowledge was obtained.

Statement	Sweden			Saudi Arabia		
	GD	OMS	OP	GD	OMS	OP
<i>How and when the knowledge was obtained</i>						
My knowledge about temporomandibular disorders in general is mainly from my undergraduate studies.	7	2	3	8	3	5
My knowledge about temporomandibular disorders in children and adolescents is mainly from my undergraduate studies.	7	7	3	7	2	3
My knowledge about temporomandibular disorders in general is mainly from my clinical work.	5	7	5	3	6	5
My knowledge about temporomandibular disorders in children and adolescents is mainly from my clinical work.	5	7	6	2	7	5
My knowledge about temporomandibular disorders in general is mainly from reading articles, books and personal interest.	3	7	6	5	10	7
My knowledge about temporomandibular disorders in children and adolescents is mainly from reading articles, books and personal interest.	3	7	7	5	10	6

feedback and reflection of own knowledge is crucial in order to obtain accuracy of self-assessment of knowledge [24–26]. As a consequence of this learning environment, interpersonal skills as well as psychomotor skills are developed while the relation between the mentor and the learner that was formed depended mainly on the motivation and encouragement. With this way of teaching; the attraction of students' interests is assured and affection will be created [10]. In order to illustrate how these possible factors affect the relation between the self-assessment of an individual's own knowledge and the individual's cognitive learning they are summarized and collected in Figure 1 (hereby named SPIREA-model). These factors are considered the most important ones in respect of strengthening the ability of self-assessment of knowledge among the students.

On the other hand, Saudi Arabian dentists showed awareness of the level of own knowledge only in the domain 'Diagnosis and classification'. This can be explained by the fact that there still is no TMD specialty and no specific undergraduate education in Saudi Arabia (2014, personal communication). Since the TMD subject in Saudi Arabia is incorporated within the other dental subjects, this may result in a lower level of knowledge (2014, personal communication). In total, TMD is taught during 4 h within the oral and maxillofacial subject and 2 h in the prosthodontic subject. In addition to that there is a 1-h lecture regarding occlusion within the orthodontic subject as well as 1-h in the pedodontic subject in all undergraduate as well as postgraduate dental curricula. Low level of knowledge has been shown to affect the subjective assessment of the individual knowledge, i.e. the lower your actual level of knowledge is; the more you think you know [27]. This was clearly shown in a study by Falchikov [28]; where students did a self-evaluation, the low achievers graded their own degree of knowledge with higher grades than the students that were high achievers. This was also reported by Kruger and Dunning [29] in 2009 where the conclusion was less competent individuals distended their self-assessment more than highly competent individuals. Indeed, self-teaching from books, articles and personal interest, which was dominant among the Saudi Arabian dentists, seem to provide a limited degree of knowledge in TMD, while it at the same time provides them with feelings of having the knowledge.

Regarding the education in Saudi Arabia, the undergraduate teaching is still based on traditional teaching only, such as lectures and demonstrations, without any time or encouragement for self-assessment and/or personal reflection on their own knowledge [30–33]. This means that their written and oral presentations and examinations are the only provided opportunities for feedback of the students' level of knowledge without any chance for personal

reflection regarding their own knowledge. Furthermore, the faculty advisors' seems to pose a strong and negative impact on the students by a teaching culture that includes negative feedback, criticism and the use of their evaluative authority. This resulted in poor inter-personal relationship, boredom, increased stress level as well as loss of motivation, joy and satisfaction [30,31,33,34]. There is a risk, as a result of this way of learning, that the students will reach both lower levels of competency and professional behavior and also might affect the self-assessment of knowledge in a negative way. The results of the present study are further supported by a study where unprofessional behaviors were recorded from ~40% of the Saudi Arabian undergraduate and graduate dental students. Further, the same study stressed the need for a more positive role model, including encouragement and support from the educators, in order to improve the professional behavior. It also recommended an increase of the teaching quality and a continuous assessment of knowledge and behavior [35].

Although there are some studies showing that several teaching methods have become involved in the last years in medical education such as problem-based learning and student-centered learning [36], there are far more studies supporting the findings from the present study suggesting that there is a need for innovations in the dental as well as medical education in Saudi Arabia, such as improving teaching strategies, development of professional educational programs, encouraging group work, and also sharing of mutual responsibility between mentor and learner [30–33]. One such innovation for this improvement in Saudi Arabia could be the use of the suggested educational SPIREA-model (Figure 1).

The strong degree of agreement among the Swedish TMD specialists strengthens this study. Hence, the reference standard the responders were compared to had current and relevant knowledge and any difference to this reference standard should be a reflection of a true difference, not the least since mainly dentists interested in TMD are expected to answer.

One might consider the amount of drop-outs as a limitation of this study. However, this result is not surprising since the response rates in questionnaire studies have declined during many years [37]. A review showed already in 1994 that the mean response rate was 61% [38] and these are similar to the results from this study (52% in Sweden and 83% in Saudi Arabia). Some explanations for the low interest in responding questionnaires are the rising amount of questionnaires sent out and lack of time to complete them [39,40] and one other reason could be the way of distribution of the questionnaires, explaining the higher number of drop-outs in Sweden, since the questionnaires and the reminders were sent by regular mail. Another reason might be the attached

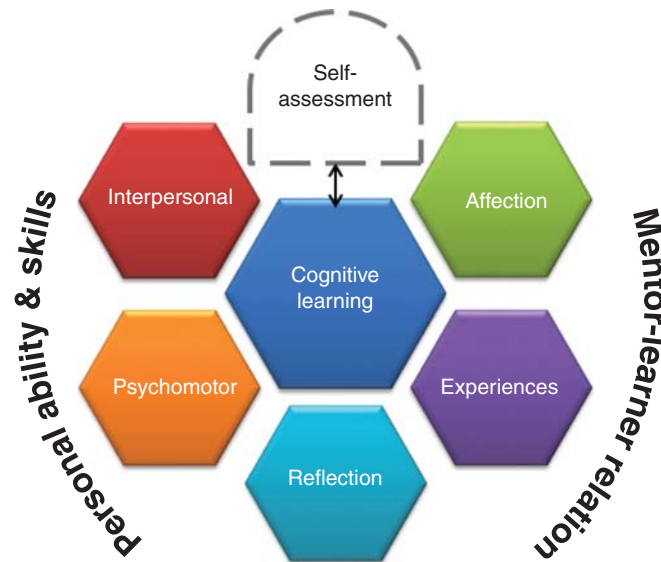


Figure 1. Illustration of the SPIREA-model. The SPIREA-model summarizes how different teaching methods including objective feedback and reflection, together with self-assessment, provide a learning environment that offers an opportunity for the students not just to improve their theoretical knowledge but also their interpersonal as well as psychomotor skills. Hence, the SPIREA-model illustrates how these factors affect the relation between the self-assessment of an individual's own knowledge and the individual's cognitive learning.

cover page where a paragraph about Juvenile idiopathic arthritis was included. This might have caused misunderstanding in Sweden regarding the main aim of the questionnaire. However, this was avoided in Saudi Arabia since the distribution was made by hand and the participant was able to get answers to any inquiries regarding this issue. Another possible reason might be the use of the English language in the questionnaire for the participants. The Swedish participants may have felt a resistance to answer due to this fact, since the Swedish language is the main language in dental education and in clinical situation, whereas in Saudi Arabia the English language is considered the main language in dental and medical educations.

In conclusion, this study shows that there is a difference in the accuracy of self-assessment of own knowledge between Sweden and Saudi Arabia. The Swedish dentists more accurately assess their level of knowledge compared to Saudi Arabian dentists regarding TMD in children and adolescents. This difference could be related to several of the factors stated in the SPIREA-model (Figure 1), such as *affection (motivation)*, *experience (positive feedback)*, *reflection*, *psychomotor* and *interpersonal skills*, which all are more dominant in the Swedish education tradition.

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