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Research Article

How do Trained and Prospective Physiotherapists and Radiologic Technologists Face Knee Joint Effusion Profession-Specifically and Interdisciplinary?-A Cross-Sectional Study

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Abstract

Objective: Knee osteoarthritis (OA) is often accompanied by joint effusion that requires accurate detecting and diagnosing. In an interprofessional evidence-based practice (EBP) approach to this, physiotherapists (PTs) and radiologic technologists (RTs) should be included. While researchissults regarding the 1st pillar (external clinical evidence) and the 2nd (patients´side) pillar of EBP are available, these are still missing concerning the 3rd pillar (clinical experts´ side). Therefore, the aim of this study is to investigate how PTs and RTs deal with knee joint effusion detection in the course of knee OA patients' profession-specifically as well as how they rate the other occupational group´s competencies.

Methods: An online survey consisting of open and closed questions was conducted in the period from 31st of January 2023 till 6th of March 2023 to collect data. PTs, RTs as well as physiotherapy students (PTSs) and radiologic technology students (RTSs) were defined as target groups. A structuring content analysis was used to evaluate open questions. Descriptive and inferential statistics were used to analyses closed questions.

Results: PTs and PTSs determined at least one of the cardinal symptoms of inflammation, inspection, palpation, the patellar tap test, and circumference measurement as knee effusion detection possibilities in patients´ with knee OA. In contrast, the modified stroke test and the bulge sign were hardly mentioned. The

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majority of RTs and RTSs stated that MRI was the first-choice imaging to detect effusion followed by sonography. Focusing on specific signs in radiologic imaging modalities fluid on T2 sequences in MRI, hypoechoic area on sonography, swelling on conventional radiography, fluid accumulation on CT and radionuclide uptake on scintigraphy were frequently mentioned. Among all 4 participating occupational groups, PTs and RTs were among the top 5 mentioned professions that have knee effusion detection competencies. There is no significant difference regarding the other occupational group´s knee effusion detection competencies. The participants rated them consistently as "rather competent" most frequently.

Conclusion: The authors study results indicate that there are some discrepancies among PTs, PTSs, RTs and RTSs in regard to the 1st and 3rd pillar of EBP. All occupational groups show partly contradictory or lack of in-depth knowledge regarding frequently applied and suggested diagnostic procedures in literature. Implementing relevant training formats should be considered in the future.

Introduction

Osteoarthritis (OA) is a widespread disease and the most common disorder of joints [1]. It is characterized by cartilage degeneration, bony osteophytes´ development, subchondral bone sclerosis and also formation of subchondral cysts in an advanced state of OA [2]. Due to society´s increasing age and body weight, the prevalence of OA is rising. The lowest prevalence is in the younger population between 15 and 29 years of age, the highest in the age group from 75 years and above, namely 27.7% for men and 47.3% for women in Austria [3]. The most affected joints are the knees, hips and hands [4]. Specifically, knee OA can affect the medial, lateral and/or patellofemoral compartment of the joint [2].

The main symptoms are pain, joint stiffness, swelling, effusion (worth noting in the context of authors article is, that the term swelling is more general and may refer to extra- and/or intra-articular structures, whereas the latter is also called effusion, specifically) [5-7], joint dysfunction and deformity [4,8]. Consequently, these symptoms might affect joint mechanics and cause muscle weakness [8].

A disease-independent state-of-the-art patient care approach is evidence-based medicine (EBM) respectively evidence-based practice (EBP). EBM describes decision-making in individual patient´s care based on the current state of evidence. This means integrating individual clinical expertise with the best available external clinical evidence from systematic research [9]. EBP originates from EBM and makes clinical decisions through a combination of external evidence, clinical expert's experience and patient's preference [10]. In this context increased expertise is reflected in many ways such as more effective and efficient diagnosis including the clinical examination [9]. In addition to the medical profession, this approach is also suitable for various health care professions [10,11].

Besides that, interprofessional collaboration approaches are recommended to provide optimum patient-centred care [12,13]. Current guidelines on knee OA don´t necessarily name involved professionists explicitly, but

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an indirect derivation on the basis of given recommendations is possible [14-17].

Besides physicians, those are physiotherapists (PTs) and radiologic technologists (RTs) among others. In terms of interprofessional collaboration EBP, an accurate diagnosis regarding joint effusion in the course of knee OA, due to its´ mechanic and muscle activity influencing potential [8], is crucial.

Regarding the 1st EBP pillar, external clinical evidence, MRI and ultrasound are possible radiologic imaging modalities to detect knee swelling and effusion [18-20]. MRI imaging can be used to differentiate between extra-articular knee swelling and effusion in T2 TSE sequences due to effusion´s high signal intensity [21]. Effusion can be quantified by measuring liquid volume [22]. Due to its narrow scan field, ultrasound cannot estimate whole knee swelling or measure diameters. However, effusion can be quantified measuring the hypoechoic field cranial to the patella [23].

Besides radiologic possibilities, mentioned clinical tests are the patellar tap test, bulge sign and the modified stroke test that can be combined with circumference measurement and inspection to detect knee swelling in physiotherapeutic practice [24,25]. The visible swelling inspection might be related to joint effusion. Inter-observer reliability shows the highest kappa at the infrapatellar site, fair reliability over the medial gutter and poor reliability over the suprapatellar and prepatellar sites [25].

Related to the 2nd pillar of EBP, from the patient's or general lay people's point of view, knee joint swelling is mainly identified by the typical signs of the cardinal symptoms of inflammation, namely limited function, pain, warmth, swelling and redness. Besides that, an unspecified increase in visual circumference was mentioned as a characteristic of swelling [26].

Additionally, a recent study investigated the association between subjective and objective swelling in patients with knee OA, showing that some people with knee pain experience subjective knee swelling without any ultrasonography detected objective swelling [27].

Regarding the 3rd pillar of EBP, the clinical experts´ side, evidence is still missing at the current time. This concerns the PTs´ and RTs' profession-specific knee swelling detection state of knowledge and related application in daily practice. Additionally, no studies could be found that investigate an interdisciplinary approach of these 2 professions to do justice to the interprofessional collaboration EBP approach named above.

Therefore, the objective of this cross-sectional study is to investigate how PTs and RTs face knee effusion profession-specifically and their competence rating regarding the other profession´s role in detecting knee effusion.

Methods

To answer the research question, an anonymous online survey was planned. On the part of the ethics committee of the Province of Carinthia, there were no ethical objections to the project.

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The target group was defined as Austrian PTs, RTs as well as physiotherapy students (PTSs) and radiologic technology students (RTSs) in their 2nd and 3rd year of training. Due to the authors´ and target group´s different professions resulting in profession-specific terminology, it was necessary to define a common language prior to developing the survey. The survey consisted of open and closed questions and was divided into four main parts: sociodemographic, physiotherapy-specific, radiologic technology-specific and interdisciplinary. Within the scope of the piloting, 3 PTs, 4 PTSs, 3 RTs and 2 RTSs completed the survey and were asked to give feedback especially regarding suggestions, queries, comprehension problems and lack of choices. Based on the feedback, some minor adaptions, like wordings, additional clues, or the possibility for personal general feedback, have been made to finalize it.

The survey was open from 31st of January 2023 till 6th of March 2023. Various channels were used to get in touch with the target group and recruit participants: national professional associations, Austrian universities of applied sciences, regional internship partners, profession-specific social media groups and selected Austrian in- and outpatient clinics. First, all participants were asked to answer sociodemographic questions like age, job setting and experience in knee OA patients´ care (6 questions for professionals and 5 for students). That was followed by a profession-specific part about physiotherapeutic effusion detection options (11 questions) and radiologic technology practice regarding effusion in the context of knee OA (26 questions). Last, they completed with an interdisciplinary part (8 questions). For this study, the following questions according to the research questions were analyzed:

- "How do you recognize a patient´s knee joint effusion during the physical examination?"
- "Which of the following options for assessing knee joint effusion do you use in daily physiotherapy practice?" Answer Choices: bulge sign, inspection, modified stroke test, palpation, patellar tap test, circumference measurement, other
- "As a radiologic technologist, which of the following radiologic imaging modalities would you choose or recommend for the representation of knee joint effusion?" Answer choices: computed tomography (CT), fluoroscopy, magnetic resonance imaging (MRI), positron emission tomography (PET), PET/CT, conventional radiography (CR), scintigraphy, sonography (Note: RTs and RTSs were instructed to rank them from 1st to 6th, with rank 1 indicating the modality considered most appropriate).
- "How would you recognize a patient´s knee joint effusion during the imaging examination (please answer, specifying the modality)?"
- "Which occupational group(s) can detect knee joint effusion?"
- "How competent do you rate RTs/PTs in detecting knee joint effusions?" Answer choices: competent, rather competent, rather not competent, not

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competent (Note: PTs and PTSs were asked to rate radiology technologists and vice versa).

A structuring content analysis was used to evaluate qualitative data. The participant´s complete answer was defined as evaluation and context unit, single words as coding unit [28,29]. Each open question was analysed separately. Most frequently, an inductive approach was used to form the categories. Regarding the physiotherapeutic part, a combined deductive and inductive approach was used to analyse the question about knee effusion detection possibilities in the course of the physical examination. Derived categories from literature were the patellar tap test, bulge sign, modified stroke test, inspection and circumference measurement [24,25]. A combined inductive and deductive approach was also used in the radiologic technology part of the survey. Six categories were derived from literature: CT, fluoroscopy, MRI, PET, PET/CT, conventional radiography, scintigraphy and ultrasound [17]. An inductive approach was used to analyse the question about knee joint effusion detection competent professions. After categorising, a frequency analysis was performed to examine the data. IBM SPSS® version 28 was used to analyse quantitative data via descriptive and inferential statistics. Figures and Tables were created in Microsoft Excel.

Results

A total of 305 participants, 105 PTs, 45 PTSs, 119 RTs and 36 RTSs took place in the survey. On average, the participants needed 8 min (SD = ± 9) to complete the survey. 171 (55.7%) participants completed the questionnaire in full. Socio-demographic characteristics are shown in (Table 1).

	Gender (sex)	**Age (years)**	**Professional experience (years)**
Physiotherapists	77 (74%) females 27 (26%) males	39.40 ± 11.95 36.41 ± 8.94	15.50 ± 11.70 11.73 ± 8.61
Physiotherapy students	30 (68.2%) females 14 (31.8%) males	22.00 ± 3.34 25.00 ± 3.90	Not applicable
Radiologic technologists	95 (79.8%) females 24 (20.2%) males	39.67 ± 11.61 42.22 ± 11.62	16.52 ± 11.47 17.90 ± 12.58
Radiologic technology students	28 (80%) females 7 (20%) males	22.32 ± 2.48 29.83 ± 14.13	Not applicable
Total	230 (76.2%) Female 72 (23.8%) male	35.12 ± 12.74 35.46 ± 11.45	15.96 ± 11.58 14.81 ± 11.11

Table 1: Annotation: Values regarding gender are displayed in n with percentage in brackets, age and professional experience in M ± SD.

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To detect patient´s knee joint effusion in the course of the physical examination, the participating PTs as well as the PTSs referred to the cardinal symptoms of inflammation (fPT=102; fPTS=34), predominantly. Swelling (fPT=31; fPTS=11), functional limitations (fPT=31; fPTS=5) and pain (fPT=19; fPTS=7) were the most frequently mentioned ones in that context. Furthermore, they recognize it via inspection (fPT=32; fPTS=7), palpation (fPT=28; fPTS=8), the patellar tap test (fPT=25; fPTS=7) and circumference measurement (fPT=11; fPTS=4). PTs are named the medical history (fPT=7), the modified stroke test (fPT=6) and the bulge sign (f=4) less frequently. The PTSs hardly considered these factors with one response for the medical history, and the bulge sign and no response for the modified stroke test.

Regarding the multiple-choice question about knee effusion assessment options used in daily physiotherapy practice, 70.4% of the participating PTs selected inspection and palpation respectively, 59.3% circumference measurement and the patellar tap test, 18.5% the bulge sign and 11.1% the modified stroke test. 64.3% of the PTSs chose palpation, 57.1% inspection, 50% the patellar tap test and circumference measurement respectively. One PTS selected the bulge sign and none of them the modified stroke test.

Asked to rank radiologic imaging modalities (CT, MRI, sonography, conventional radiography, scintigraphy, and fluoroscopy) from 1 to 6 according to their knee effusion visualization suitability, MRI (fRT=27, fRTS=7) was the most frequently selected first-place modality among RTs and RTSs, followed by sonography (fRT=23, fRTS=4) and conventional radiography (fRT =10, fRTS = 1). A similar distribution pattern was observed for the 2nd rank, particularly in the group of RTs, where MRI was selected 18 times, sonography 17 times and radiography 10 times. The RTSs chose MRI and conventional radiography 3 times each and once fluoroscopy. Concerning the 3rd ranked modalities, RTs selected MRI (fRT=15) most frequently, followed by conventional radiography (fRT=8) and CT (fRT=4). RTSs chose CT (fRTS=5) most often, followed by MRI, conventional radiography and scintigraphy (fRTS=1 each). Full results of the 3 most frequently mentioned modalities of the first 3 ranks for RTs are shown in figure 1 and for RTSs in (Figure 2).

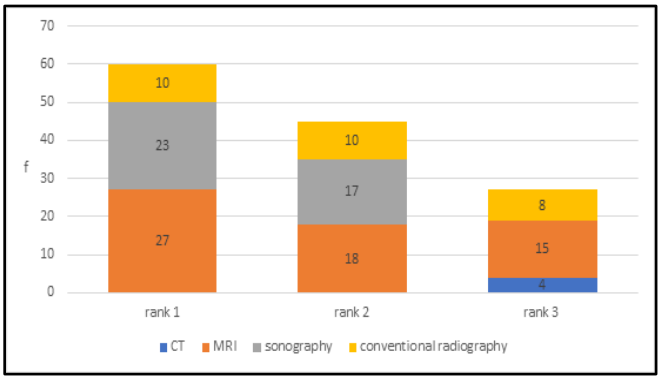

Figure 1: Annotation: The top three responses per rating are shown in this figure.

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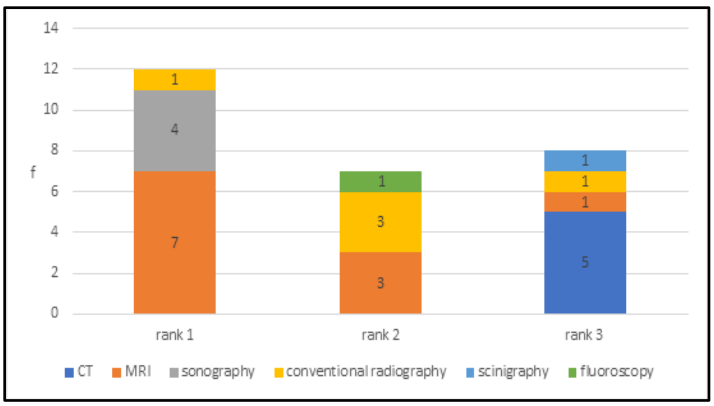

Figure 2: Annotation: The top 3 responses per rating except for rank 3 presenting 3 equal nominations are shown in this figure.

Asked about effusion signs during the imaging examination, most effusion signs named were within MRI (f=35), followed by sonography (f=32), conventional radiography (f=27), CT (f=27) and scintigraphy (f=16). On MRI, the participating RTs referred to fluid on T2 and T2-derived sequences (f=24), fluid on T1 sequences (f=2), whereas RTSs referred to fluid on T2 and T2-derived sequences (f=5) and mass (f=1), predominantly. Amidst RTs the most common declared sonographic effusion signs were fluid (f=21) representing hypoechoic, anechoic, black or "hypodense" structures and changes in echogenicity, as well as echo enhancement (f=2) representing changes in echogenicity and echoic structures.

RTSs identified hypoechoic fluid accumulation (f=2) as the first line echomorphological effusion sign as well as echo enhancement (f=1) and acoustical shadow (f=1). On conventional radiography RTs referred to masses (f=12) representing soft tissue shadowing and swelling as well as morphological joint changes (f=3). The RTSs is named mass or swelling (f=2). Regarding CT imaging, RTs referred to fluid accumulation (f=12), hypodense image appearance representing low Hounsfield Units (HU) (f=4) as knee effusion signs. Among RTSs the majority were named hypodense image impression (f=3) and fluid accumulation (f=1). In scintigraphy, RTs and RTSs specified radionuclide uptake (fRT=6, fRTS=5) as sign of effusion whereas RTSs declared also signal loss (f=1) as a typical sign for this pathology.

Further relevant results besides the dedicated knee effusion signs show that RTs as well as RTSs affirmed that sonography was the first-choice imaging modality for initial diagnosis of knee effusion (f=1 each) and RTs found sonography to be useful to detect damage in soft tissue and collateral ligaments (f=1). Two RTSs stated that effusion signs were not detectable in CT (f=2), 3 in scintigraphy. Asked about professions that are able to detect knee effusion, the 5 most frequently named were: physicians (f=182), PTs (f=99), RTs (f=43), nurses (f=33) and occupational therapists (f=30). Evaluated profession-specific, the following was shown regarding PTs and RTs: Among the participating PTs

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and PTSs, PTs are the 2nd (fPT=61; fPTS =19), RTs 4th (fPTS=6) respectively 5th (fPT=15) most frequently mentioned. Participating RTs named RTs and PTs ex aequo 2nd most frequently (fRT=17 each). Among RTSs, RTs were ranked 2nd (fRTS=5) and PTs 3rd (fRTS=2). The other occupational group´s knee effusion diagnosis competencies´ rating (meaning PTs and PTSs rated RTs´ competencies and vice versa) was similar. Most frequently, PTs (40%) and PTSs (58.3%) rated RTs "rather competent" (figure 3). Also, the RTs´ majority (62.3%) rated the PTs´ competencies "rather competent". RTSs rated them "rather competent" and "rather not competent" with 40% each, most frequently (figure 4). A Kruskal-Wallis test showed no difference regarding the competencies rating between PTs, PTSs, RTs and RTSs ($H(3)=4.123$, $p=.249$).

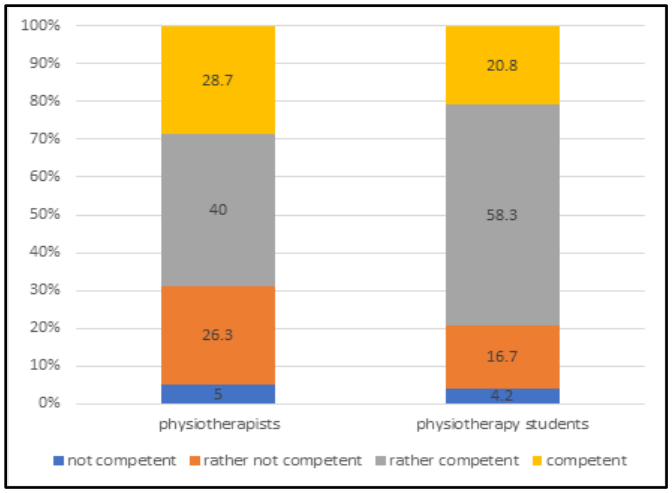

Figure 3: Radiologic Technologists´ Knee Effusion Diagnosis Competencies rated by physiotherapists and physiotherapy students.

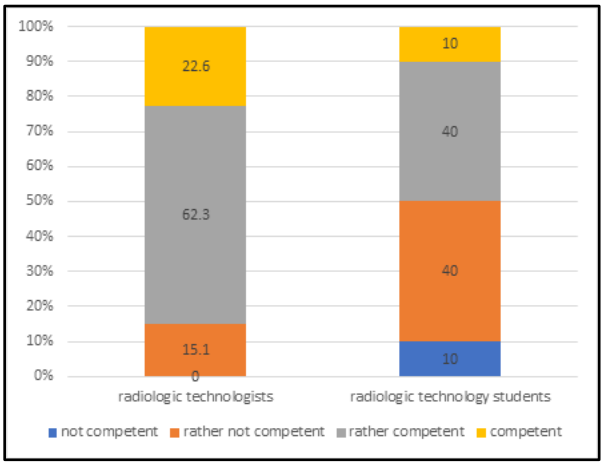

Figure 4: Physiotherapists´ Knee Effusion Diagnosis Competencies Rated by Radiologic Technologists and Radiologic Technology Students.

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As a component of the interdisciplinary part, the participants were also asked how much time they would spend on further training on knee effusion in the course of knee OA. In total, 155 participants answered the question. On average, PTs stated they would invest 6.6h (SD= ± 5.3), PTSs 9.2h (SD= ± 6.4), RTs 3.7h (SD= ± 3.1) and RTSs 5.1h (SD= ± 6.4) in corresponding training. 4 participants would not spend any time on that.

Discussion

Most frequently, PTs as well as PTSs referred to at least 1 of the cardinal symptoms of inflammation when asked about possibilities to detect patient´s knee joint swelling in the context of an open question. Furthermore, inspection, palpation, the patellar tap test and circumference measurements were named. PTs mentioned the modified stroke test and the bulge sign hardly, whereas PTSs almost didn´t name them at all. The same picture emerges with a closed question: Inspection, palpation, circumference measurements and the patellar tap test were frequently, the modified stroke test and the bulge sign hardly selected.

MRI, sonography and CT were regarded as the most suitable radiologic imaging modalities for detecting knee joint effusion. However, some variability could be observed in rankings both within and between RTs and RTSs. Undoubtedly, MRI is consistently considered the most suitable modality, obtaining the highest rankings in both groups. Overall, RTs and RTSs named most effusion signs concerning MRI. The most common in this context were fluid on T2 and T2-derived sequences. Furthermore, fluids as hypoechoic or anechoic structures on sonography and masses on conventional radiography were most frequently mentioned.

Coming to the interdisciplinary part, participants of all 4 occupational groups named PTs and RTs among the 2nd to 5th most frequently mentioned professions when asked about professions with knee effusion detection abilities. There is no significant difference regarding the other occupational group´s competencies rating. Meaning PTs and PTSs rated RTs´ competencies as “rather competent” and vice versa. Additionally, the vast majority of participants stated they would invest time in relevant training formats.

Discussing authors results from the perspective of a high-quality implementation of EBP to improve healthcare services, we detected some deficits and discrepancies in pillar 1 (external clinical evidence) and 3 (the clinical experts´ side). The researvhers results shows that from the physiotherapy perspective, the modified stroke test and the bulge sign are mentioned and applied less frequently to detect knee joint effusion as part of a complete physical examination, which is partly contrary to literature [24,25]. Conspicuous was that PTs and PTSs as well as lay people mentioned a change in the circumference as one indicator for knee effusion or swelling. Furthermore, they name at least 1 of the cardinal symptoms of inflammation in this context [26].

A study found that clinical experience and effusion depth may affect the accuracy of clinical examination in detecting knee

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effusion in patients with knee OA [30]. Reflecting this with authors results, it seems appropriate to act a step earlier: Building and extending the corresponding knowledge first before enhancing accuracy.

From an RT perspective, it is evident that the ranking regarding the suitability of radiologic imaging modalities in the context of knee effusion signs show a limited homogeneity within and between the RTs and RTSs. In order to interpret the data accurately, several assumptions must be considered:

- The number of participants who answered the question varied between RTs (fRT=119) and RTSs (fRTS=36). The limited number of rankings within the RTSs diminishes the accuracy of statistical statements and hinders the generalization of findings to the larger population.
- There may be a discrepancy in the assessment of RTs and RTSs due to the fact that RTSs might either be more confident in their rankings because of recent education, or less accurate in their ratings because they lack experience to all modalities or professional experience.
- On the other hand, daily work of RTs often involves rotation service, which can make it difficult to maintain a comprehensive overview and expertise in the interconnection between specific diagnoses and the most suitable modalities, especially if certain modalities are not encountered on a regular basis. Rotation of RT across different modalities has a negative impact on their performance and serves as a barrier to fully realizing their professional expertise [31]. This is also reflected by positive resonances after additional advanced training and education to deepen and/or refresh understanding different modalities [32,33]. An additional finding of this survey highlights an interest among participants regarding advanced training programs focused on knee joint effusion [32]. This presents an interesting opportunity for future implementation of such programs, providing the development of expertise to both RT and RTS.

While the data was purposefully split between RTs and RTSs to allow for better comparison between those groups, this division might be obsolete regarding the open question related to characteristic effusion signs across different modalities.

Notably, within the RTS group, only a very limited number of responses per modality were recorded. To address this limitation in future studies, an alternative approach could involve conducting a follow-up survey specifically tailored for a target audience of RTS, categorizing according to their respective semesters. By crosschecking the generated results for consistency across both groups, the validity of the findings within this study could be further ensured.

Like most of the participating RTs and RTSs affirmed correctly and corresponding to literature, MRI is highly sensitive for knee effusion imaging, especially when it comes to the use of fluid sensitive sequences like T2-

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weighted fat-suppressed or proton density-weighted sequences [34-36].

As previously published, the amount of effusion is often overestimated on T2 sequences, which has not been reported in the survey. To assess the true volume of knee effusion, contrast enhanced T1 sequences are required to differentiate between hyperintense synovitis and hypointense fluid, which are often seen together as a mass or swelling [18]. T1 sequence imaging of effusion was named but contrast media application was not specified, likely due to the fact that special indication is necessary to justify the risk of renal damage [37,38]. The majority of RTs and RTSs correctly identified hypoechoic fluid accumulation as a cardinal sign of knee effusion on sonography [23]. Sometimes the wording was less specific even in RTs like "black" or even "hypodense", which is a specific word in CT imaging. As published before, in both groups participants confirmed that sonography was a modality for initial diagnosis [39]. Other echomorphological definitions were misunderstood, i.e., echo enhancement may be seen dorsal to a cyst but not in an effusion [40]. Acoustic shadow is a sonomorphological sign of a dense structure reflecting ultrasound waves, which is false in case of effusion [41]. These two statements have been made by RTs, representing a lack of knowledge regarding this modality. As a cardinal sign in conventional radiography, mass and swelling was stated in RTs and RTSs even if it is a less specific definition of effusion in radiography. More accurate definitions would be suprapatellar fat-soft tissue like mass and fat pad separation sign in the lateral view of knee x-ray [42-44]. Some of the RTSs did not know that effusion can be seen on conventional radiography. As the first two important effusion signs on CT imaging both RTs and RTSs specified fluid accumulation and hypodense image impression with low HU, which is correct in case of liquid effusion but has to be differentiated from hemarthrosis, which shows higher density [45]. In scintigraphy the most important effusion sign is radionuclide uptake, which has been named by both RTs and RTSs corresponding to former studies [46].

A good basic knowledge of the correct use of radiologic imaging modalities and the most important effusion signs are shown throughout the survey. However, a lack of in-depth knowledge can be seen when it comes to the details. Though, this would be important for appropriate modality management and indication proof prior to the radiological examination, especially in the case of sonography. Surveys by the European Federation of Radiographer Societies show the difference in clinical skills development in diagnostic radiology and sonography with a duration of 1397 and 334 hours, respectively [47,48]. The implementation of sonography modality in European baccalaureate curricula varies from country to country, while Belgian RTSs even require clinical training, Austrian RTSs have to complete 20 examinations under the supervision of lecturers [49]. Furthermore, there are some differences between the 2 occupational groups, which require adapted knowledge enhancement. Regarding authors methodological approach, the mixed methods online-survey appears to be appropriate to get a first insight into the topic. The online setting seems to be suitable

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in view of the target group in the sense that most of the participants should be familiar with various online tools. In terms of the item construction, attention was paid to an occupation-specific as well as cross-professional comprehensible language in the corresponding parts of the survey in addition to general recommendations like for example items´ clarity or deliberately chosen order [50]. The following piloting was conducted with representatives of all targeted professions that can be seen as a plus. Despite this process, some adaptations could be identified that should be considered in future research. Complex and/or extensive item designs like ranking items that require in-depth knowledge should be avoided as this might be a possible reason for a drop-out. Furthermore, it should be determined whether a ranking approach provides any additional value at all compared to a single-choice approach. Given that answers corresponding to the guidelines were ranked as the most suitable ones, employing a single-choice approach would likely yield more explicit conclusions, enabling a clear ranking. Moreover, words like "daily work" should not be used in relation to students as they probably might not feel addressed. The target group was defined as Austrian PTs, PTSs, RTs and RTSs. Although, we used various channels, like national professional associations, Austrian universities of applied sciences or profession-specific social media groups, the sociodemographic data suggest, that we merely reached a part of authors target group. Therefore, the found results refer to a cross section of the Austrian PTs, PTSs, RTs and RTSs and cannot be further transferred. This means the external validity of researchers results is limited. Future research should focus on reaching a wider range of participants of all professions and including further professions that are involved in knee OA patients´ care. Before carrying out authors study, we conducted literature research. We searched databases like PubMed, PEDro, Cochrane Library and ScienceDirect. We could not find any articles that included an interprofessional approach between PTs and RTs. The authors results show that PTs, PTSs, RTs and RTSs do not think about the other occupational group primarily when asked about knee effusion detection competent professions.

However, they rate the other occupational group´s competences in this regard as rather competent. These results fit in with the findings that skillful screenings through PTs can facilitate appropriate referrals to orthopedic surgeons and provide cost-effective care [51].

Following authors argumentation even radiographers are confronted with some challenges in daily practice when authors try to implement valuable optimization strategies. An effective operationalization of EBP is not part of their daily practice [52].

In this context, authors study might be seen as a first contribution in this direction, further developing pillar 3. Furthermore, this could even help the single professions to fulfil their individual professional roles that are described in professional competence profiles [53] to further develop their job description. As a result, this could even help to improve the patient's health literacy and support the 2nd pillar of EBP.

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Conclusion

The authors study results provide a first insight on how Austrian PTs, PTSs, RTs and RTSs face knee joint effusion profession-specifically and rate the other professions′ competencies in this context. From a physiotherapeutic perspective, there is a gap between applied and suggested clinical tests in literature. From a radiologic technology perspective, the results suggest a lack of profound knowledge regarding specific modality application and effusion signs. Concluding the interdisciplinary part, PTs, PTSs, RTs and RTSs assess the other occupational group as mainly rather competent in detecting knee effusion. However, they do not think about the other occupational group primarily when asked about professions that have knee effusion detection competencies. Furthermore, authors results show the participants′ willingness for further corresponding training in this context. Due to limited external validity, the results cannot be transferred outside Austrian PTs, PTSs, RTs and RTSs. To sum it up, we detected a need for customised training formats in the context of knee effusion in knee OA patients with special focus on profession-specific input with interdisciplinary aspects. As already mentioned, this can help to enhance healthcare services and improve the quality of EBP especially in pillar 1 (external clinical evidence) and 3 (the clinical experts′ side). Both occupational groups have the potential to optimize patient-centered care, which for example might help to facilitate appropriate referrals to orthopedic surgeons and provide cost-effective care in the future.

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