Impact of different types of revision materials on the learning of musculoskeletal techniques

François Launay, Mathieu Ménard, Marylène Bourgin, Hakim Mhadhbi, Franck Sutre, Jerry Draper-Rodi

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Author details:

François Launay – francoislaunay77@gmail.com[ab]

Mathieu Menard - menard.m@io-rennes[a,c]

Marylène Bourgin - bourgin.m@io-rennes.fr[a]

Hakim Mhadhbi - mhadhbi.f@io-rennes.fr[a]

Franck Sutre - sutre.f@io-rennes.fr[a]

Jerry Draper-Rodi - jerry.Draper-Rodi@uco.ac.uk[d]

Author Affiliation:

[a] Institut d'ostéopathie de Rennes - Bretagne, rue Blaise Pascal, 36170 Bruz

[b] Maison Médicale Avicenne, 6 rue Félix Depail, 35250 Chevaigné

[c] Univ Rennes, M2S - EA 7470, F-35000 Rennes

[d] University College of Osteopathy, 275 Borough High Street, London SE1 1JE

Corresponding author: menard.m@io-rennes.fr

TITLE

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ABSTRACT

Background: This study aimed to measure the impact of different revision materials developed for osteopathy students, by studying their results, their perceptions and their behaviour when revising for exams.

Methods: A cohort of 68 second-year osteopathic students was allocated to three groups (pseudo-randomisation), each group being separately taught the same practical course, but provided with different types of revision materials (video, digital data sheet and no material). They were then assessed by an external examiner. Outcome measures were grades, time spent revising on the platform and student material perceptions collected via a practical assessment, by monitoring student visits on an education platform (Tactiléo®) and a questionnaire.

Results: The results showed that the mean exam grades for the Video group were 14% higher than those of the No Materials group ($p = 0.04$, $d = 0.94$) and 29% higher than the Digital Data Sheet group ($p < 0.01$, $d = 1.36$). In addition, an interesting result was that students from the Video group spent more time using the revision materials (+29%), consulted them more often (+25%) and repeated their techniques more often than students in the Digital Data Sheet group (+14%).

Conclusions: The use of video revision material improved participants' results while exerting a positive influence on their behaviour when revising but did not prevent surface learning. A structured teaching and learning approach will therefore need to be implemented if learners are to get all the benefits of video materials while being more engaged on a personal level.

KEYWORDS

Education

Learning

Osteopathic Manipulative Treatment

Revision materials

Teaching techniques

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BACKGROUND

Osteopathic practice requires practitioners to learn a wide range of manipulative techniques, particularly regarding the musculoskeletal, visceral and cranial cephalic regions (World Health Organization 2010). Education in manual therapy requires many hours of continuous training before students can acquire all the practical and psychomotor skills (Bowley and Holey 2009) necessary to practise osteopathy safely and effectively.

Traditionally, musculoskeletal techniques are demonstrated in class by a practising osteopath, in front of a group of students (Browning 2014). Students take notes during the demonstration to support their revision. Students then apply the techniques in a practical session under the tutor's supervision, and the tutor guides the students step by step through the technique (Browning 2010).

As well as learning the manipulation techniques and acquiring the foundations in fields such as anatomy or biomechanics, a number of challenges have been clearly identified in the literature, i.e. mastering the technical terminology (Harvey and Barras 2008), acquiring the necessary palpation skills (Aubin et al. 2014) and being able to choose the most appropriate technique for a given clinical situation (Mhadhbi et al. 2018). These challenges cause student anxiety, affect their self-confidence and impair their performance in the final exam (Weeks and Horan 2013, Tripodi 2018). Additional challenges, faced by tutors in any teaching and learning situation, include coordinating all the tutors teaching the same subject or across the same programme module, dealing with different learning abilities within the same group of students in a practical tutorial, and managing to cover the curriculum content within a given number of classroom hours; while other challenges are specific to osteopathy teaching, in particular, how to convey to the students a number of subjective notions

such as sensitivity and perceptiveness when practising the techniques (Browning 2010).

However, recent scientific findings relating to the teaching and learning of osteopathic manipulative and psychomotor practices, whether theoretical or methodological (Salina *et al.* 2012, Weeks and Horan 2013, Thilakumara *et al.* 2018) are not really implemented in the osteopathic curriculum. The resistance of educators to rely on evidence-based education and favour student-centred active approaches (Leach 2008, Slade *et al.* 2018, Sundberg *et al.* 2018, Weber and Rajendran 2018) can lead to students being confused, or getting lost when confronted with conflicting evidence.

To date, there is no universal agreement on how the fundamental musculoskeletal techniques should be taught in an osteopathic training programme. For example, in France, the implementation of the 2014 government decrees (*Décret n° 2014-1505* 2014) on osteopathy training have clarified and officialised the knowledge and skills required for professional practice, but few indicators have been implemented with regard to teaching practices. Musculoskeletal techniques alone represent a large part of practical teaching, taught during the first three years of the programme curriculum (118 hours, 106 hours and 62 hours respectively) comprising approximately 210 techniques at the Institut d'Ostéopathie de Rennes - Bretagne in 2019.

For some time now in education research, digital tools have been increasingly recognised as invaluable aids to the learning process (Bowley and Holey 2009, Shantikumar 2009, Weeks and Horan 2013, Tripodi 2018). E-learning tools have recently been shown to contribute significantly to the transmission and memorisation of osteopathic gestures (Le Bellu et al. 2010). Video is used in different healthcare education settings and is useful as an adjunct to usual face-to-face teaching

(Drummond *et al.* 2016, Alam and Voort 2017, Cheng *et al.* 2017, Wallace *et al.* 2018).

There is emerging evidence in osteopathy that video may be a useful teaching and learning aid (Tripodi 2018). Video helps reinforce student commitment and motivation: it is familiar, can be used anywhere and at any time, and allows students to organise their revision periods at will, whenever it suits them best, while favouring exchanges between students themselves and with their tutors (Boulos et al. 2006, Zhang et al. 2006). Furthermore, this type of media may allow students unlimited access to the learning aid, enabling them to quickly recall key items, facilitates understanding (Tripodi 2018), introduces variety in the learning process (Gormley et al. 2009), improves the overall learning experience (Sandars 2011) while encouraging teachers to cast a critical eye on their own teaching methods and update the content to make it more relevant and challenging for students (Gormley et al. 2009). It also meets some of the teacher's expectations by facilitating the production of support materials (with a smartphone, for instance) and the transmission of clear, objective information, without the loss or bias induced by note-taking or oral transmission from one student to another.

Few studies have been devoted to an experimental assessment of the impact of video revision material (compared to other types of materials) on the process of learning osteopathic techniques. A recent study (Burguete *et al.* 2019) has nevertheless shown the growing interest of students in filmed revision materials, based on "Video-recorded material made in class". This study was based on semi-structured interviews with students who used video recordings and sought to assess the "limitations, benefits and consequences of video-recorded material made in class

on osteopathic training" but stopped short of measuring the impact on the learning process.

The main aim of our study was to assess the impact of different types of musculoskeletal technique revision materials (data sheets and video recordings) on practical exam results. For this purpose, three groups of second-year students were assessed during practical skill exams, after following the same course and receiving different revision materials. The second aim was to assess student perceptions after that learning experience, and to see whether the type of materials provided influenced their behaviour when revising for their exams.

METHODS

The study protocol was approved by the Institut d'Ostéopathie de Rennes - Bretagne Research Ethics Committee in September 2018 and met the requirements of the Declaration of Helsinki for research on education and human beings. Students who took part in the study signed a consent form prior to taking part in the study.

Study population

Second-year students at the Institut d'Ostéopathie de Rennes - Bretagne were invited to take part; they had sufficient practical experience in techniques, while still having a number of techniques to learn. The number of participants in the study was therefore determined pragmatically according to the number of students in this cohort (68 enrolled).

Randomisation and group allocation

Students from the classes were placed in three separate groups depending of their rank order when placed in alphabetical order (pseudo-randomisation). The three groups separately followed the same practical class and were allocated different

revision materials: video resources (referred to as the Video group), no materials at all (the No Materials group) or a digital technical data sheet (the Digital Data Sheet group) (Figure 1).

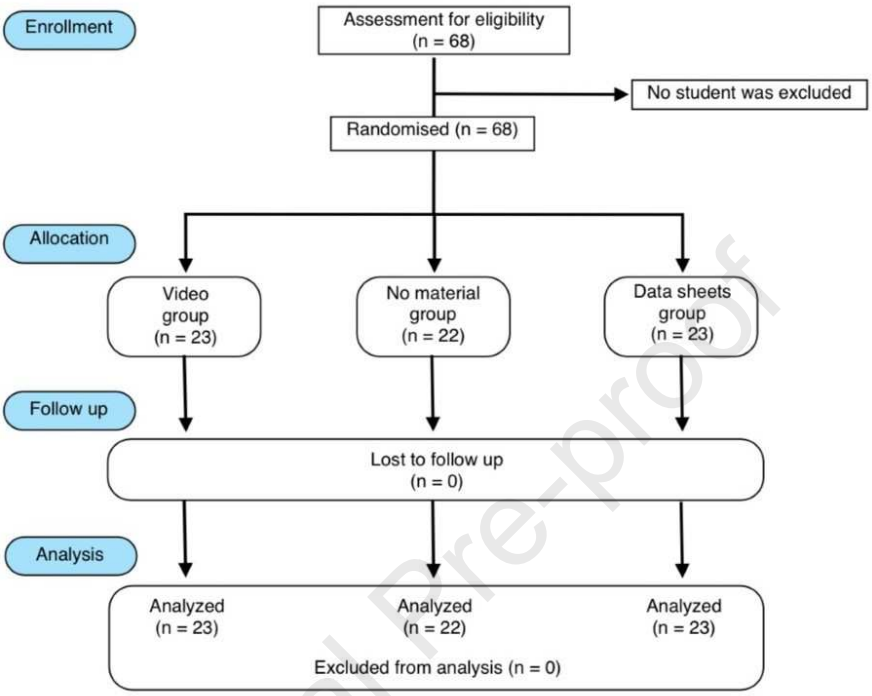

Figure 1: Flowchart of the study

After being given information on the study, those students who volunteered to take part gave their informed agreement, which was recorded in a written document. By agreeing to take part in the study, the participants agreed verbally to not disclose the specific materials allocated to their group and to only practise the techniques outside the class with members of their own group. The groups provided with revision materials were only informed of the fact at the end of the class, so as not to influence their behaviour, in particular with regard to notetaking.

Settings measured

This study aimed to assess the impact of different types of musculoskeletal technique revision materials. These materials were video recording, an online education platform (Tactiléo®) (Pérez et al. 2015) and a musculoskeletal technical data sheet.

The video support material consisted of 5 videos produced in December 2017 at the Institut d'Ostéopathie de Rennes - Bretagne. These five videos illustrated five high-velocity, low-amplitude (HVLA) techniques that were taught at the Institute within the same course unit. These techniques were introduced for the first time in the second year of study and required a second-year student level of technical competence. The videos were recorded using a smartphone (Iphone® 5S), a digital camera (Panasonic Lumix® FZ1000) and a lapel microphone (Boya®). The recordings were posted online on a Vimeo® private access video sharing platform. A sample video used for the study can be viewed by scanning the following QR code (Figure 2).

Figure 2. Extract of one of the videos used for the study, with the corresponding QR code on the right.

An education platform (Tactiléo® online multimedia platform) was used to make videos available to students. This digital platform was used by the faculty to share written, audio and video documents with students. One of the advantages of using this platform is that it allows you to choose precisely which student will receive a given document. Students could access the education platform (Tactiléo® online multimedia platform) via their smartphone, after downloading the platform application, or via a computer.

A digital musculoskeletal data sheet was produced by the teaching staff responsible for that area of the curriculum. The five data sheets were taken from a technical data sheet compendium (Launay et al. 2015) which is used as a reference tool for the teaching of musculoskeletal techniques at the Institute. The compendium of 210 technical data sheets is divided into 14 chapters, each focusing on one anatomical area. Each sheet specifies the different stages of the therapeutic manipulation.

In addition, to assess student perceptions after the learning experience, **a satisfaction questionnaire** was developed for this study using 4-point Likert Scale questions (Jamieson 2004). The questionnaire's psychometric properties have not been measured. Eleven questions covered the students' perception of their learning experience, their assessment of the revision materials they had and whether the revision material (if applicable) had been useful for them, whether they would have found a podcast useful in addition to the revision material, the usefulness of video as revision material, the relevance of paper technical data sheets in addition to video recordings, their ideal type of revision material, the improvements they would have liked to make to the material they received, how frequently they consulted the material compared to what they normally did, and where they consulted it (please see Appendix 1).

Experimental protocol and procedures

The study was carried out at the Institut d'Ostéopathie de Rennes - Bretagne. The faculty agreed on five techniques that covered different aspects of the curriculum but that had not already been taught to the students who participated in the study. The classes took place in December 2017 and the students were assessed in mid-February 2018, after a two-month revision period.

The class was identical for all three groups and was delivered by the same teacher on three different dates in close succession. Students in the Video and Digital Data Sheet groups were informed at the end of the class of the type of revision material they would have access to, then they were briefed on the importance of confidentiality and non-disclosure of the materials, and asked to sign a non-disclosure undertaking. The satisfaction questionnaire was sent to the Video group and the Digital Data Sheet group after the class was delivered (but not to the No Materials group). Students only learned that they would receive revision materials at the end of the manipulation technique demonstration class. Students from the Video and Digital Data Sheet groups were handed an explanatory sheet on how to connect to the platform. Two weeks before the evaluation date, the videos of the five techniques taught in class were sent to the examiner by e-mail, with instructions on how to conduct the evaluation and with an evaluation grid previously used in the institute but adapted on the work of Van Hecke *et al.* (2020). The examiner had been a member of the institute teaching staff for 5 years with 15 years of experience in evaluating students in the field of musculoskeletal and other osteopathic practices. It should be noted that the external examiner, like the students, was unaware of the purpose of this study. Each technique was assessed according to a bespoke grid in agreement with the course team and based on a structure common to all the grids: overall presentation, patient position, practitioner position and technique performance.

Outcomes of interest

The evaluation took place in mid-February 2018 at the institute. The examiner assessed the whole second-year cohort over a single day, to reduce the risk of students passing on information or advice to each other. Each student was allocated

a 7-minute presentation slot and another student as a model not always from the same group so as to blind the examiner. The order of the presentations was randomised (using the Random® application) to mix the groups and revision materials. Each student performed a randomly picked technique (using Random®). The examiner was asked not to make any comments to the students, to decrease the possible risk of contamination of those not yet examined. The students were told not to pass on any information about the evaluation.

Statistical Analysis

To assess the impact of the revision material, a one-way ANOVA with a fixed factor was conducted. The target variable represented the marks and the 3 factor modalities corresponded to the 3 different revision materials. As a significant main effect was found, a post hoc analysis was conducted (Tukey multiple comparisons of means). We tested the usual assumption of one-way ANOVA, that the errors are independently, identically, and normally distributed with the same variance. All effects were considered significant when p values < 0.05 and were adjusted when multiple comparisons were performed. Whenever a significant difference was found between the recorded values, a paired sample Cohen's d effect size test was carried out to determine whether the effect was small ($0.25 < d < 0.49$), medium ($0.5 < d < 0.8$) or large ($d > 0.8$).

RESULTS

Participants

Sixty-eight students were willing to take part in the study (27 men and 41 women, mean age: 21.5 years) and participants were allocated (pseudo-randomisation) to

one of three groups (two groups of 23 students and one of 22). No difference was observed in gender or age when the comparison was made within each group.

Practical exam

The effect on practical exam results of the different revision materials was found to be significant ($p < 0.01$). More precisely, the post hoc tests suggested that the overall grades in the final assessment in the Video group (14.4 ± 1.8) were significantly higher than the No materials group (12.7 ± 1.8) ($p = 0.04$, $d = 0.94$) and the Digital Data Sheet group (11.2 ± 2.8) ($p < 0.01$, $d = 1.36$) (Table 1). No significant differences were observed between the No Materials group and the Digital Data Sheet group ($p = 0.08$, $d = 0.64$).

	Video (n = 23)	**No Materials** (n = 22)	**Digital Data Sheet** (n = 23)
Final assessment *(grade / 20)*	14.4 ± 1.8	12.7 ± 1.8	11.2 ± 2.8
4 Specific items			
1 - Overall presentation *(grade / 4)*	2.9 ± 0.3	2.8 ± 0.4	2.4 ± 0.6
2 - Patient position *(grade / 4)*	2.5 ± 0.6	2.2 ± 0.5	2.2 ± 0.6
3 - Practitioner position *(grade / 4)*	2.8 ± 0.4	2.4 ± 0.4	2.2 ± 0.5
4 – Technique *(grade / 8)*	6.2 ± 0.9	5.3 ± 1.2	4.3 ± 1.6

Table 1: Mean final evaluation grades (Mark out of 20) and standard deviation for each of the three groups and each separate item (Mark out of 4 for the first three and mark out of 8 for the last one)

Based on the final assessment results, we were able to investigate the impact of the revision material used by the students on each of the items in the evaluation grid. The marks awarded for each of the items are detailed in Table 1. A significant effect

of the different revision materials was found on the following specific items: 1 – Overall presentation ($p < 0.01$), 3 – Practitioner's position ($p < 0.01$) and 4 – Technique ($p < 0.01$). No significant differences were observed between the three groups regarding item 2 – Patient position ($p = 0.10$). The post hoc tests suggested differences between the Video group and the Digital Data Sheet group regarding item 1 – Overall presentation ($p < 0.01$, $d = 1.05$), item 3 – Practitioner position ($p < 0.01$, $d = 1.32$) and item 4 – Technique ($p < 0.01$, $d = 1.46$). Differences were also observed between the No Materials group and the Digital Data Sheet group for items 1 – Overall presentation ($p = 0.04$, $d = 0.78$), item 3 – Practitioner position ($p = 0.01$, $d = 0.44$) and item 4 – Technique ($p = 0.04$, $d = 0.70$). The results also found differences between the Video group and No Materials group for item 3 – Practitioner position ($p < 0.01$, $d = 1.32$).

Platform visits

Most of the students (88%) accessed the data sheets from home, 59% at the institute, 23% in roaming mode and 6% from another student's home. Most of the responses referred to the digital data sheet on line access difficulties. The students felt that the video revision materials were satisfactory (35%) or very satisfactory (65%), while the few negative remarks focused mainly on Internet or the education platform (Tactiléo® online multimedia platform) connection difficulties. When asked what improvements would be needed, they suggested adding a brief summary of the content at the beginning or at the end of each recording, to help them perform the technique while watching the video during their practical revision sessions outside the classroom. The vast majority of students in this group accessed the videos from home (83%), only 9% at the Institute, and 4% in roaming mode.

Satisfaction questionnaire

The satisfaction questionnaire showed that half the students in the Digital Data Sheet group (53%) who had access to the digital data sheets when revising felt they were “not very satisfied” or “moderately satisfied” with the experience, even though 71% considered the material to be “satisfactory” (59%) or “very satisfactory” (12%). Moreover, 65% thought that the digital data sheets had not provided any additional benefit compared to their traditional revision material (i.e. the paper data sheets). Regarding the video-based revision materials, the results showed that 100% of the Video group students “liked” the material (21.7%) or “liked it very much” (78.3%). They found the video material “very satisfactory” (65.2%) or “satisfactory” (34.8%). More specifically, the main feedback comments mentioned that the video material helped them “remember” better (70%), enhanced their performance and effectiveness (13%) and gave them more confidence (18%) on the day of the exam.

DISCUSSION

The impact of the type of revision materials used by second-year osteopathy students on the musculoskeletal technique learning process was analysed in terms of grades in the final assessment (overall grade and detailed grade by item), the students' behaviour during the revision period and their perception of the revision material they were given.

Summary of findings and comparison to known literature

The results showed that compared to other revision materials, video-based revision materials had a significantly positive effect on the learning process for most students, which is in line with several previous studies (Shantikumar 2009, Weeks and Horan 2013). The existence of this positive effect was supported by the better exam results

of the Video group in comparison with the other two groups. An item by item analysis allowed a better understanding of where video had the greatest impact. Two items showed a significantly greater impact than the others and interesting findings for education. The first was practitioner position including the practitioner's physical posture (position relative to the patient, stability and position of the feet on the ground, hip and torso orientation, eye contact and direction of gaze), hand position (related to the practitioner's knowledge of palpatory anatomy techniques), the type of pressure exerted, the precise part of the practitioner's hands or body in contact with the patient (and with the table or the cushion), and forearm direction (an essential feature in structural techniques). This item seems to be essential to the successful performance of a technique and particular attention is payed to it during the final evaluation. The second item, "Technique performance" is awarded the highest weighting in the evaluation grid (8 marks out of 20) and assesses the student's ability to follow the different stages of the technique, precisely identify muscle stretching and carefully identify more subjective notions such as freedom of motion and technique effectiveness. A comprehensive description of this item on a technical data sheet would be impossible to understand, while a short video recording can precisely detail every step, including fine details such as the direction of a skin fold or a muscle stretching parameter that increases the chances of success of the technique. Sometimes, it appears difficult to explain such details when conducting the technical demonstration, either consciously, to avoid information overload during the demonstration, or because the practitioner forgets to provide the explanation. It was expected that this type of detail, albeit only partially included in the technical data sheets, would boost the results of the Digital Data Sheet group compared to the No materials group, but this appeared not to be the case. In fact, the group provided with

the technical data sheets performed worse overall than the No Materials group. A possible explanation is that the students, who had been used to consulting paper data sheets, felt the online version took too long to load, did not allow them to take notes or to have an overview of all the sheets. This may have motivated them not to use this revision material.

Practical applications for education, practice and research

One of the challenges of training adults is to find a way of facilitating the transition from academic learning to training for their future profession. To help learners through the different learning stages, teachers need to be familiar with the behaviour and thought-processes of their own generation and of those they are teaching, so they can understand their environment, their learning habits, their expectations and the type of problems they are likely to encounter (Roberts et al. 2012). The exponential development of new technologies means that generational habits are now changing very quickly, giving rise to a new generation, with very different habits from the previous ones, about once every 10 years, whereas in the past, a new generation emerged every 20-25 years (Ivanova and Smrikarov 2009). The attraction to digital technologies certainly may explain why 100% of students in the Video group gave positive (22%) or very positive (78%) feedback on the learning experience and judged their revision material to be very satisfying (65%) or satisfying (35%). Whilst this could merely be due to the novelty of this type of material at the institute, it suggests a genuine feeling that video was a useful learning tool.

Video produces a reliable record of the technical gestures that is less open to interpretation than a data sheet or note-taking and it is this reliability that probably explains why students felt more confident (18%), more effective (13%) and especially, better prepared to remember the technique (70%). The learning of a new

technical gesture involves an acquisition phase by actively observing the demonstration, in class or on video, and the student engages in vicarious learning or modelling (Bandura 1980). This is where video seems to be a particularly effective tool for the student, making it easier to break down a complex motion into successive steps and to learn to repeat them, while helping the student to build up a detailed mental image of the gestures required to perform a given action (Schmidt and Debû 1993, Merian and Baumberger 2007) in the symbolic coding stage (Bandura 1980). This mental image will then be refined during repeated viewings of the video, which will lead to successive coding processes for the gesture. The movement can then be refined, either by repeated viewing of the gesture, or by corrections suggested by an external observer, called external feedback, which is particularly important in the initial acquisition phase. Learners then gradually internalise the sensations linked to the correct performance of the technique, which will enable them to use these proprioceptive sensations as a second form of internal feedback (Merian and Baumberger 2007).

Video revision materials may not only have a positive impact on students' grades, but also on their behaviour during the revision period. The influence of video is particularly interesting because many studies in a range of different areas, and in high level sports in particular, have highlighted the importance of repetition in the acquisition of competence in performing a complex task (Silverman and Subramaniam 1999, Guadagnoli et al. 2002, Merian and Baumberger 2007).

Study limitations

A major limitation of this study was that, despite the precautions taken (student involvement and practical examination), it was difficult to control and assess the

between-group contamination before the exam. The second main limitation was the use of a non-validated questionnaire to assess student satisfaction.

In addition, our study included bachelor students who were competent enough to imitate tutors, i.e. learning new technical gestures. Videos might be less efficient if students are to reflect and adapt their techniques to patient situations. Moreover, the record of video viewing collected on the video sharing platform (Vimeo®) shows an exponential growth in the number of times videos were accessed in the weeks and days preceding the exam (80% during the last month), while no-one accessed the videos in the three months following the exam. This raises an interesting point, i.e. that despite all the previously mentioned advantages, students see video materials as an efficient revision tool, but it has no effect on their fundamental commitment to their training for their future profession and does not prevent surface learning. Furthermore, if misused, it could even become a formidable vector for surface learning. Something we want to avoid. What we could well see in future is students waiting in the corridor before going into the exam room with smartphone or tablet in hand instead of the traditional paper revision cards and notes, so they can quickly visualise the key information they need and have it stored in their short-term memory just as long as needed for the exam. If video is not to be used merely for cramming for the exam, it needs to be included in a structured teaching and learning strategy such as “blended learning” (Mącznik et al. 2015) where it will be just one of the elements in the learning process (Wieling and Hofman 2010). This kind of hybrid, blended learning approach combines different types of media. It also usually combines independent work by the student through e-learning and face-to-face contact with a tutor in class. Implementing this kind of structured learning strategy entails a substantial amount of work for the teaching staff, starting with a general

agreement on the fundamental theoretical knowledge and practical skills that students need to have acquired by the end of their course. This kind of training strategy requires close cooperation between all the teachers involved to ensure a coherent progression in the curriculum in each osteopathic field to overcome the barriers between the different disciplines within a holistic approach to student progression over the whole course. Future studies with a larger sample, more examiners, over different student years and in different institutions are needed to confirm the benefits of video materials on the learning of musculoskeletal techniques.

Perspectives for education

Videos may constitute a reference that is not open to interpretation and that tutors can use to revise detailed gestures before each class or exam session, thus greatly facilitating technique coordination within the faculty teams and making sure that external practical session tutors remember to demonstrate important details. Once this knowledge and skills base have been defined, new teaching and learning paradigms needs to be put in place, based on a student-centred learning approach ("flipped classroom" for example). Students can then add to and customise their knowledge and skills base through the books and articles they read, the classes they follow, the videos they view, and their interaction with other students and teachers, thus producing a unique learning experience for each and every student, as recently with medical students (Gillispie 2016). This deeper involvement of students and teachers should reduce surface learning because students will be proactive participants and designers of their own study programme and will be much more personally engaged. Implementing this method, especially in the initial stages, is very time-consuming, and this is seldom compatible with the busy schedules of osteopathy teachers. Many of them have private practices as well as teaching, with

the heavy workload this implies. This dual activity is beneficial for the students, who get to be taught by practising professionals with constantly updated field experience. However, it also has its disadvantages, due to the scheduling problems it causes and the lack of time to prepare course materials, train in teaching methodology, knowledge management, and master digital technologies, discuss the implementation of digital tools with the other members of the teaching staff and harmonise evaluation practices. These considerations on teacher training could lead to a holistic approach to building a reference framework for osteopathy curricula.

CONCLUSION

This study found advantages of using Video materials to prepare osteopathy bachelor students for their practical exams. The effect of these materials was measured on the basis of the students' exam results and also through their perception of the learning experience as evidenced by a questionnaire. The results of the study also showed that the students who benefitted from the video materials performed best in the most complex and detailed parts of the assessment. The challenge for course leaders is therefore to adapt programmes to the new generation of students by capturing their attention and incentivising them through a wide range of learning experiences that are tailored to their expectations. Since the four-hour lecture or technical demonstration alone has become less relevant for the transmission of knowledge or manipulative techniques, tutors will have to develop new skills and learn how to master the digital tools available, be familiar with the different learning phases, manage knowledge in a way that helps students to focus on and structure the masses of information generated by the explosion in content driven by the development of digital technologies, and finally change from the

traditional role of “Sage on the stage” to a new role closer to that of guide, coach or mentor, i.e. the “Guide on the side” (Gillispie 2016). Video-based material can also encourage cross-fertilisation, by breaking down the barriers between different osteopathic subject areas within a same course module and might offer students an overarching view of several areas or a reminder of all the techniques taught in the module. This complex but comprehensive approach would thus increase the student's engagement, making him or her an active player in a bespoke, unique and exciting learning experience.

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Table 1: Mean final evaluation grades (Mark out of 20) and standard deviation for each of the three groups and each separate item (Mark out of 4 for the first three and mark out of 8 for the last one)

	Video (n = 23)	**No Materials** (n = 22)	**Digital Data Sheet** (n = 23)
Final assessment *(grade / 20)*	14.4 ± 1.8	12.7 ± 1.8	11.2 ± 2.8
4 Specific items			
1 - Overall presentation *(grade / 4)*	2.9 ± 0.3	2.8 ± 0.4	2.4 ± 0.6
2 - Patient position *(grade / 4)*	2.5 ± 0.6	2.2 ± 0.5	2.2 ± 0.6
3 - Practitioner position *(grade / 4)*	2.8 ± 0.4	2.4 ± 0.4	2.2 ± 0.5
4 – Technique *(grade / 8)*	6.2 ± 0.9	5.3 ± 1.2	4.3 ± 1.6

Declaration of interests

☑ The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

☐The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: