No Relation Between Social Media Use During Teacher-Supervised Activities and Exam Results in Students Medicine and Biomedical Sciences

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Abstract

In addition to the potential benefits of mobile technology in (bio)medical education, mobile technology can also be used for personal use and access to social media. In this study, we explored the relation between (study-related) use of social media and exam results in a cohort of 259 Dutch students enrolled in Medicine (n=211) and Biomedical Sciences (n=48) programs. Self-reported social media use was scored for the use of internet, Facebook, Twitter, Whatsapp and SMS during teacher-supervised activities (e.g. lectures, interactive lectures and group assignments). Subsequently, students scored whether use was study-related on a continuous scale. We found a highly prevalent use of social media during teacher-supervised activities (97%), with a relatively small portion being study-related (30±24%). We divided students into: 1.Low user+low study-related, 2.Low user+high study-related, 3.High user+low study-related, and 4.High user+high study-related. Exam results did not differ between groups (ANOVA; P=0.45). Moreover, we found no relation between exam result versus social media use ($r^2=0.002$, P=0.49) or study-related social media use ($r^2=0.007$, P=0.18). In summary, we found no evidence that the amount and/or type of social media use during teacher-supervised activities significantly relate to exam results in a cohort of Dutch (bio)medical students.

Keywords: social media; internet; exam results; medical education; medicine

Case study description

We are living, learning, teaching and practicing medicine in the digital era. Consequently, the use of mobile technology, including smartphones, tablets and laptops, in (bio)medical education is common practice (Ellaway et al., 2014). Previous work has demonstrated the potential benefits of these devices for educational and clinical purposes, as social media use may improve knowledge (e.g. exam scores), attitude (e.g. empathy, learner engagement) and skills (e.g. reflective writing) (Cheston, Flickinger and Chisolm, 2013). However, potential
negative aspects relate to distraction from learning (Khan et al., 2009) and the risk of inappropriate use (Wallace, Clark and White, 2012). Currently, little is known about the impact of social media use on exam results. For this purpose, we explored whether the use of social media during teacher-supervised activities (i.e. lectures, interactive lectures and group assignments) affected exam results in Dutch students (bio)medical science. We also explored if the type of social media use affects the relation between social media use and exam results.

In our institution, we run an annual, 4-week programme for students Medicine (1st study year) and Biomedical Science (2nd study year). This programme does not contain social media-based learning, whilst students are free to use mobile technology during teacher-supervised activities. This created an opportunity to examine students’ use of social media in relation to exam results, relatively free of other confounding factors. After their exam, students were invited to fill in an online questionnaire about their social media use during teacher-supervised activities (lectures, interactive lectures and group assignments). This research was conducted upon approval from the local ethics committee and followed the principles of the Declaration of Helsinki. Participants scored the social media use (quantified as ‘none’ (0), ‘sometimes’ (1), ‘often’ (2), or ‘always’ (3)) for separate domains: internet, Facebook, Twitter, Whatsapp and SMS. This resulted in a "social media"-score that ranged from 0 (i.e. no use of social media) to 15 (i.e. always use of all 5 domains of social media). An average was taken from the 3 separate teacher-supervised activities (lectures, interactive lectures and group assignments) for the "social media"-score. In addition, students indicated how much of their social media-use was study-related (i.e. 0%=no study-related activities, 100%=only study-related activities). Finally, we calculated social media use for (home-based) learning activities, including self-study assignments, self-study activities and exam preparation.

Out of the 429 students eligible for participation, 259 students (60% respondent rate, 28.2% men, 19.3±1.1 years, 81.5% medicine, 18.5% biomedical science) responded to our online questionnaire (Table 1). Students adopted a range of (multiple) technological devices, including mobile phone (7.8%), smartphone (91.0%), tablet (18.0%), laptop (81.6%) and desktop (12.1%). The use of (study-related use) of social media was lower during teacher-supervised activities compared to (home-based) learning-related activities (Table 1). Whatsapp was the dominant domain of social media during teacher-supervised activities (89%, 67% and 77% for lectures, interactive lectures and group assignments, resp.), followed by internet (78%, 48% and 79%, resp.), Facebook (73%, 39%, and 54%, resp.), SMS (34%, 18% and 26%, resp.) and Twitter (13%, 8% and 10%, resp.). During (home-based) learning activities, internet was most commonly used (98%, 96% and 95% during self-study assignments, self-study and exam preparation, resp.), followed by Whatsapp (92%, 89% and 84%, resp.), Facebook (93%, 86%, and 82%, resp.), SMS (44%, 39% and 34%, resp.) and Twitter (14%, 14% and 11%, resp.). These data demonstrate the high frequency of social media use, which depend on the types of (learning) activities, with only 30% of its use being study-related.

In subsequent analysis we explored whether social media use during teacher-supervised activities was related to exam results. For this purpose, we divided the students into 4 groups based on high versus low social media use (i.e. above/below the median "social media"-score) and made further distinction in high versus low study-related use of social media (using the median score again). This resulted in 4 distinct social media groups: 1) low user + low study-related, 2) low user + high study-related use, 3) high user + low study-related, and 4) high user + high study-related (Table 1). Interestingly, no significant differences were found in exam results between groups (Table 1, P=0.45). Moreover, we found no significant correlation between the (study-related) "social media"-score and exam result ($r^2=0.002$ and 0.007, $P=0.49$ and 0.18, respectively). These results suggest that social media use during teacher-supervised activities does not relate to exam results.

Using the median-score to divide our groups may have resulted in relatively mild differences in (study-related) use
of social media between groups. For this purpose, we performed additional analyses in which we compared the highest 10% versus lowest 10% in (study-related) social media use. Despite the presence of more pronounced differences in the social media score between groups (lowest 10%: 0.3±0.3 vs highest 10%: 7.3±1.0, P<0.001), we found no differences in exam result (7.2±1.0 vs 7.1±0.8, respectively, P=0.87). Similarly, no differences in exam result were found (7.5±1.1 vs 7.2±1.0, respectively, P=0.21) between students with the highest study-related use of social media (83±12%) compared to students with the lowest use (0.9±1.1%, P<0.001). These data reinforce our main observation that social media use does not relate to exam outcomes, a finding independent of the study-related use of social media.

One may question whether social media use during (home-based) learning activities relates to exam results. Interestingly, the use of social media during (home-based) learning activities is markedly higher than during teacher-supervised activities, with a larger component being study-related (Table 1). Furthermore, moderate correlations were present between (study-related) use of social media in teacher-supervised versus (home-based) learning (r=0.39 and r=0.66, respectively, both P<0.05). Subsequently, we have repeated the original analysis, but now used the (study-related) "use of social media"-score during (home-based) learning activities. This analysis confirmed our original analysis, in that no significant differences were found between the exam results between groups (ANOVA P=0.67).

Some limitations of our study must be considered. The use of online questionnaires may have introduced selection bias of students with stronger interest around this topic. In addition, the self-reported component may have caused social desirability bias, leading to an underestimation of the true use of social media (and overestimation of the study-related component of it). Nonetheless, we expect that such bias similarly affected high and low-responders to the questionnaires, thereby unlikely altering the main outcomes of our study.

Studies have reported both negative impact (e.g., attention, (superficial) learning, memory) (Khan et al., 2009; Wallace, Clark and White, 2012; Uncapher, M and Wagner, 2016) and positive effects (e.g., collaborative approach) (Bullock and Webb, 2015). Nonetheless, results from our observational study among 259 Dutch (bio)medical students found no relation between social media use during teacher-supervised activities and exam results, a finding independent of whether the use of social media was study-related. Acknowledging the positive and negative effects of social media use, other factors than social media use may be more relevant in influencing academic performance, such as (intrinsic and extrinsic) student characteristics (Woolf, Potts and McManus, 2011; Adam et al., 2015; Hayden, Jeong and Norton, 2016). The practical implication of our finding is it is supportive for the various initiatives integrating mobile technology in teacher-supervised activities to improve learning experiences.

**Table 1:** Impact of (study-related) social media use on exam results in students (bio)medical science (n=259), divided into groups based on high/low "social media"-use and high/low study-related social media use. Comparisons were made using a one-way ANOVA (for continuous data) or Chi-square (for categorical data). Post-hoc significantly different for *low vs high social media use or #low study-related vs high study-related (P<0.05, including correction for multiple comparisons using Bonferroni).

| Subject characteristics | Pooled | Low user | | High user | | | | P-value |
|-------------------------|--------|----------|---|----------|---|---|---|---|
|                         |        | Low study-related | High study-related | Low study-related | High study-related |         |         |         |
| Number of students (n) | 259    | 63       | 80      | 65       | 51       |         |         |         |
| Age (years)             | 19.3±1.1 | 19.4±1.3 | 19.5±1.4 | 18.8±0.9* | 19.4±1.3 | 0.01    |         |         |
| Sex (% female)          | 71.8   | 77.8     | 68.8    | 73.8     | 66.7     | 0.52    |         |         |
| Medicine / Biomedical Science (%) | 81.5 / 18.5 | 75 / 25 | 82.5 / 17.5 | 89.2 / 10.8 | 78.4 / 21.6 | 0.18 |
|-----------------------------------|------------|--------|------------|------------|------------|-----|
| Times participated (% first time) | 99.2       | 100    | 97.5       | 100        | 100        | 0.26 |
| Exam                              | 7.2±1.0    | 7.1±0.9| 7.4±1.0    | 7.1±1.0    | 7.2±0.9    | 0.45 |

**Social media use (teacher-supervised)**

| Social media-score (0-15) | 3.4±2.0 | 2.1±0.9 | 1.8±1.0 | 5.5±1.4* | 4.9±1.4* | <0.001 |
|----------------------------|---------|---------|---------|---------|---------|-------|
| Lecture (0-15)             | 4.5±2.6 | 3.1±1.4 | 2.4±1.6 | 7.0±1.8* | 6.2±1.9* | <0.001 |
| IL (0-15)                  | 2.2±1.9 | 1.2±1.0 | 0.8±1.0 | 3.8±1.7* | 3.6±1.7* | <0.001 |
| GA (0-15)                  | 3.6±2.5 | 2.1±1.4 | 2.3±1.5 | 5.7±2.4* | 5.0±2.2* | <0.001 |
| Study-related social media use (%) | 30±24 | 11±8 | 54±22* | 12±7 | 43±15* | <0.001 |
| Lecture – study-related (%) | 19±21 | 8±10 | 32±27* | 8±7 | 29±20* | <0.001 |
| IL – study-related (%)      | 20±26 | 6±7   | 37±33* | 8±9   | 39±28* | <0.001 |
| GA – study-related (%)      | 46±31 | 22±18 | 74±24* | 22±15 | 62±20* | <0.001 |

**Social media use (learning activities)**

| Social media-score (0-15) | 6.1±2.2 | 5.1±1.8 | 5.0±1.8 | 7.5±2.2* | 7.2±2.0* | <0.001 |
|----------------------------|---------|---------|---------|---------|---------|-------|
| SSA (0-15)                 | 6.7±2.2 | 5.8±1.5 | 5.6±2.0 | 8.2±2.1* | 8.0±1.9* | <0.001 |
| Self study (0-15)          | 6.0±2.4 | 5.0±1.7 | 4.8±2.0 | 7.4±2.4* | 7.2±2.4* | <0.001 |
| Exam preparation (0-15)    | 5.6±2.6 | 4.6±2.0 | 4.6±2.0 | 7.0±2.9* | 6.7±2.5* | <0.001 |
| Study-related social media use (%) | 56±22 | 50±24 | 67±18* | 44±22 | 62±18* | <0.001 |
| SSA – study-related (%)    | 50±23 | 44±22 | 60±20* | 40±20 | 53±23* | <0.001 |
| Learning – study-related (%) | 55±26 | 50±28 | 65±22* | 42±24 | 60±21* | <0.001 |
| Exam preparation – study-related (%) | 65±25 | 59±29 | 77±20* | 53±26 | 73±19* | <0.001 |

IL: interactive lecture, SSA: self study assignment, GA: group assignment

**Take Home Messages**

We found no evidence that the amount and/or type of social media use during teacher-supervised activities relate to exam results in a cohort of Dutch (bio)medical students.

**Notes On Contributors**

MTEH, ALMV and TMHE designed the study. All authors contributed to the collection of the data. DHJT and TMHE performed the statistical analyses. All authors contributed to data interpretation. DHJT and TMHE drafted the manuscript. MTEH and ALMV critically revised the manuscript and contributed to the scientific discussion of the data.

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Appendices

None.

Declarations

The author has declared that there are no conflicts of interest.

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Ethics Statement

Ethical approval was waived by the local Institutional Review Board of the Radboud University Medical Center due to low burden of the study proposal (questionnaires). Nevertheless, the ethical principles of the Declaration of
Helsinki were taken into account during the study design, data collection and data analysis phases, whereas all students provided written informed consent upon enrolment in the study.

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