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Published in:
Educational Psychology

DOI:
10.1080/01443410.2014.992393
10.1080/01443410.2014.992393

Publication date:
2014

Document Version:
Submitted manuscript

Citation for published version (APA):

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Download date: 23. Oct. 2023
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Published online: 23 Dec 2014.

To cite this article: Chang Zhu & Lies Van Winkel (2014): A virtual learning environment for the continuation of education and its relationship with the mental well-being of chronically ill adolescents, Educational Psychology: An International Journal of Experimental Educational Psychology, DOI: 10.1080/01443410.2014.992393

To link to this article: http://dx.doi.org/10.1080/01443410.2014.992393

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A virtual learning environment for the continuation of education and its relationship with the mental well-being of chronically ill adolescents

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(Received 25 January 2014; final version received 6 November 2014)

Research has shown that the continuation of education by chronically ill adolescents is an important way to avoid social isolation, psychosocial problems and the accumulation of learning difficulties. In this light, virtual learning environments (VLEs), which connect sick adolescents to their schools, play an important role in ensuring that the sick adolescents continue their education, and in contributing to their mental well-being. This study investigated the extent to which a VLE supports the continuation of education and school interactions among sick adolescents and how it is related to their mental well-being. The results show that the VLE had a positive impact on supporting the continuation of education and school interactions among chronically sick adolescents and was considered very helpful to their mental well-being.

Keywords: virtual learning environment; educational needs; social needs; mental well-being; chronically sick adolescents

Introduction

Adolescence is characterised by several developmental tasks such as gaining independence, developing a realistic vocational goal and constructing a positive self-image (Harter, 1999; Pinquart, 2013; Woodgate, 1998; Zashikhina & Hagglof, 2014). Adolescents faced with a long-term illness have to manage additional issues related to their illness (Pinquart, 2013; Woodgate, 1998). Many damaging pedagogical, psychological and social consequences can result from long-term absence from the classroom and friends (Bleyer, 2002; Davis, 1989; Madan-Swain, Katz, & LaGory, 2004; Sexson & Madan-Swain, 1995; van Wageningen, 2004). According to previous studies, successful school experiences seem to be a strong factor in predicting a feeling of ‘normalcy’ among sick children (Bessell, 2001; Morin, Maïano, Marsh, Nagengast, & Janosz, 2013; Shiu, 2001). Maintaining connection with school seems vital for the academic, social and emotional development of adolescents (Lightfoot, Wright, & Sloper, 1999; Porter, 2008; Wallander, Eggert, & Gilbert, 2003; Wallander & Varni, 1989). Falling behind at school and being socially isolated from peers can undermine adolescents’ self-esteem and is risky, because it could lead to the development of depression or feelings of anxiety (Myers, Willse, & Villalba, 2011; Sexson & Madan-Swain, 1995; Vanderfaeillie & Vandeplas, 2005;
Whyte & Smith, 1997). This points out the fact that connecting chronically sick children to their school is very important, because it enables them to continue their education and ensures their mental well-being.

**Mental well-being of chronically ill adolescents**


Harter (1999) developed five scales of self-esteem that are relevant for adolescents: physical appearance, social acceptance, athletic competence, scholarly competence and behavioural conduct. According to Harter (1999), the multidimensional character of self-esteem is influenced by internal and external mediators. Previous studies show that the self-esteem of a person, especially during adolescence, is closely related to acceptance and integration by peers. Corsano, Majorano, and Champretavy (2006) suggested that one’s perception of good friendships is a protective factor against psychological maladjustment. Previous studies indicated that children with a chronic illness were more at risk of developing psychosocial problems (Bessell, 2001; Harris, 2009; van Wageningen, 2004). If an adolescent’s confidence in his or her ability to manage his or her physical condition declines, it may possibly result in decreased self-esteem or increased social withdrawal (Dahlbeck & Lightsey, 2008; Servitzoglou, Papadatou, Tsiantis, & Vasilatou-Kosmidis, 2008; Suris, Michaud, & Viner, 2004).

**The role of VLE in supporting the continuation of education and mental well-being of chronically sick adolescents**

A virtual learning environment (VLE) has the advantage of providing equivalent virtual access to classes, class content, tests, homework, assessments and other learning resources. It is also a social space where students and teachers can communicate and interact. Virtual learning can take place synchronously or asynchronously. In synchronous systems, participants meet in ‘real time’, and teachers and students meet in virtual classrooms and can communicate synchronously. The students are able to talk to other students and the teachers, collaborate with each other and answer or pose questions. The VLEs can connect the students to the school by overcoming the physical constraints (Beauchamp & Kennewell, 2010; Gombeir, 2007; Leask & Meadows, 2000; Zhang, Zhao, Zhou, & Nunamaker, 2004). VLEs are considered to be useful for keeping in contact with the school, classmates and for the continuation of education and social life of sick adolescents (Di Fiore, Jorissen, Vansichem, & Van Reeth, 2007; Lombaerts, Veevaete, Schuurman, Hauttekeete, & Valcke, 2006; Nicholas et al., 2007; Tielen, 2003). Previous studies suggested that the use of VLE can help chronically sick adolescents to overcome their physical barriers and keep up to date with the learning and social activities at school (Asbjørnslett &
Hemmingsson, 2008; Beauchamp & Kennewell, 2010; Gombeir, 2007; Leask & Meadows, 2000; Zhang et al., 2004). However, available empirical research which investigated the contribution of VLEs to the educational and social needs of sick adolescents and its relationship with their mental well-being is insufficient.

Previous studies suggest that maintaining social and instructional connection with the school is crucial in guaranteeing a smooth reintegration of sick children into the class and in the development of a positive self-esteem (Bessell, 2001; Harter, 1999; Lombaerts et al., 2006; Maslow, Haydon, McRee, Ford, & Halpern, 2011; Porter, 2008). Adolescents who grew up with a chronic illness were at increased risk of educational difficulties (Servitzoglou et al., 2008). When they fall behind at school, their academic motivation can be undermined, resulting in low self-esteem and thus, fear of returning to school (Thies, 1999). However, when sufficient support is provided, the chronically ill adolescents could perform as good as their healthy peers at school (Porter, 2008; Vanderfaeillie & Vandeplas, 2005). Therefore, connecting with the school, especially with their peers and classmates play a very important role in the mental health of long-term sick adolescents.

As pointed out by other researchers, the role of VLEs can go beyond the support for learning activities (Battles & Wiener, 2002). One of the most important aspects is that children’s self-esteem can be increased, because they can keep up with school and continue to develop lifelong learning skills. In this way, they can feel more confident about themselves (Gültekin & Baran, 2007; Nicholas et al., 2007). There are very few studies that have attempted to examine the role of VLEs in supporting education and its relationship with the mental well-being of chronically sick adolescents (Nicholas et al., 2007). In order to gain knowledge on the use of VLEs for chronically sick adolescents, the present research investigates the role of VLEs in the continuation of education and its relationship with the mental well-being of chronically sick adolescents.

Research questions

This study attempts to answer two main research questions: (RQ1) to what extent does the VLE with a multicomponent intervention support the continuation of education and school interactions among chronically sick adolescents? (RQ2) to what extent is the satisfaction with the use of the VLE for the continuation of education and social contacts related to the mental well-being of chronically sick adolescents?

Method

The research setting and the VLE

In Flanders, Belgium, a decree stipulates that the continuation of the education needs of long-term absent children should be ensured. In order to connect the long-term absent sick children to their school, a two-way real-time audio and video connection over the Internet was established. It offers a VLE and synchronous communication between the long-term absent sick students and their class. This is a regional arrangement in which interested hospitals, families and schools in Flanders can get support for setting up this VLE. The sick students at home or at a hospital can be connected with their classes via the VLE and follow the class from home or the hospital. The VLE includes functions such as virtual blackboard, virtual bookshelf
(teachers and students can share pictures and documents), windows to draw attentions, webcam, scanning and sending of documents, class agenda, live chat, etc. From 2007 to 2011, more than 200 long-term sick students (primary and secondary students) used this VLE to follow lessons from home or the hospital. The objective of the VLE is to minimise the negative effects of a long-term illness on school children. Through the interactive VLE, a sick student at home or in the hospital is able to follow the lessons, participate in class activities and group work, raise questions, answer questions, gain the attention of the teacher, take pictures of the blackboard, chat with the classmates, etc.

**Participants**

The relevant users (secondary students at the time of the research) of the VLE during the 2011–2012 academic year were contacted by emails and regular mails to inquire whether they were willing to participate in the study. The secondary school students chosen as the target subject of this research were adolescents. Reminders were sent to the students after 4 weeks of the first invitation. In total, 28 students gave their consent and participated in the study. The consents of parents were also obtained through written letters.

**Research methods and instruments**

Both questionnaires and in-depth interviews were used in this study; a concurrent mixed-methods research design. The mixed-methods design can help us to understand the status of participants’ needs, satisfaction as well as their mental well-being, and to gain a deep view of how the VLE is related to the continuation of their education, school interactions and mental well-being.

The structured questionnaire included participant demographic and background data, technical use and satisfaction with the use of the VLE to ensure continuity in education and school interactions (seven subscales regarding the continuation of education and five subscales regarding the social interactions with the school). The level of satisfaction with the use of the VLE was assessed on a five-point Likert scale. The mental well-being of the adolescents was assessed based on the (Competentiebelevingsschaal voor Adolescenten [CBSA], 2002) scales. The CBSA (in Dutch) was constructed based on Harter’s Self-Perception Profile for Adolescents (SPPA). Based on the SPPA instrument (1999), the full version of CBSA includes seven subscales, namely scholarly competence, social acceptance, athletic competence, physical appearance, behavioural conduct, close friendships and global self-esteem. The CBSA is considered suitable for this study as it measures self-esteem for hospitalised adolescents and has been validated in Flanders in several previous studies (Harter, 1999; Treffers et al., 2002). The CBSA is a multidimensional model with a profile approach of someone’s sense of adequacy across relevant life arenas. This approach can be useful in understanding special groups of individuals such as adolescents with various medical disorders who are faced with challenges related to their self-perceptions (Harter, 1999; Treffers et al., 2002). Five scales from the CBSA (scholarly competence, social acceptance, behavioural conduct, close friendship and global self-esteem) were used in this study in order to assess the mental well-being of chronically sick adolescents. The selection of the five scales was to meet the objectives of this study as well as to keep the questionnaire relatively short.
for the participants. The CBSA scales were based on a four-point Likert scale. The reliability of the CBSA scales in this study was satisfactory; Cronbach’s α ranged from .74 to .89.

The in-depth interviews took place at the home of each student. Twenty-eight respondents participated in both the survey and the interviews. When possible, a separate interview was conducted with a parent of the participant. In total, eight parents participated in the interview. The interviews with the long-term sick adolescents included the following important questions: What are your educational and social needs as a long-term absent student? Can the VLE meet your educational and social needs? What do you think is the role of the VLE in helping you to keep up to date with school and peers? Does the use of the VLE have an influence on your positive thinking, future-related thoughts and mental well-being? The interviews with parents were useful to gain additional information about the academic and social impact of the VLE and about the mental functioning of the adolescents. It also served the purpose of verifying whether the adolescents had given socially desirable answers.

**Data analysis**

Data from the questionnaire were analysed with SPSS (version 20). First, reliability and descriptive analysis were used. Second, Spearman’s R correlation analysis was conducted between the satisfaction obtained from the use of the VLE and the mental well-being of the sick adolescents. The interview data were transcribed and analysed with maxQDA.

**Results**

Below the descriptive results and the results in relation to the research questions are reported.

**Demographic and background variables of the participants**

Among the participants, 10 were male students, while 18 were female students. The students’ ages ranged from 10 to 18 years with an average age of 14.64. Eight of them were from 10 to 13 years old, 14 of them were from 14 to 16 years old, while six of them were from 17 to 18 years old. As for the learning tracks of the students, 17 of them were in general secondary education, nine of them were in technical secondary education, while two of them were in vocational secondary education. With respect to how long they had been using the VLE, 18 of them used it for 2–5 months, two of them used it for 6–10 months, three of them used it for 11–20 months, while five of them used it for more than 20 months. Regarding the hours of usage of VLE per week, eight of them used it for 2–10 h per week, 14 of them used it for 10–20 h per week, while six of them used it for more than 20 h per week. Among the interviewed parents, seven were mothers, while one was a grandmother.

**Satisfaction level of chronically sick adolescents with the use of VLE in supporting the continuation of their education**

The results regarding the students’ views on how VLE was useful in helping them continue their education and school interactions are presented in Table 1. The results
show that the respondents were satisfied with the help they received for lessons from classmates via the VLE (Mean = 4.73), the technical use of the VLE (Mean = 4.41), staying up to date with the educational process through the VLE (Mean = 4.38) and receiving help from teachers via the VLE (Mean = 4.12). The respondents were also satisfied with the opportunity of asking questions to teachers or classmates via the VLE, participating in group work via the VLE and receiving feedback from teachers via the VLE (Mean = 4.00, 3.63 and 3.54, respectively). The ranking of students’ satisfaction with these aspects is presented in Table 1. In addition, the respondents were also satisfied with the social interactions with teachers and classmates. They were very satisfied with the formal and informal contacts with classmates. The respondents reported that they felt that they were part of the class and could keep the peer relationships via the VLE (Mean = 4.42 and 4.38, respectively).

The interview results show that all respondents considered school to be very important to them. Sixty per cent of the respondents said that their school was important to them for their social contacts, and the other respondents said that continuing their school education was important for their future, for getting a diploma and being able to start higher education or finding a future job. One-third of the participants said that having a daily routine of attending lessons was important to them.

More than two-thirds of the respondents were satisfied that they could ask questions and interact with teachers and classmates supported by the VLE. Half of the
Sixty-five per cent of the respondents mentioned that staying up to date with school was their most prominent need. The results show that all respondents reported that using the VLE helped them to keep up to date with the school more easily than without it. All respondents reported that receiving specific explanations from their teachers synchronously online helped them a lot in their schoolwork. One third of the students said explicitly that using the VLE helped them to have less stress in doing their schoolwork. Twenty-six out of 28 respondents reported that lessons were fairly easy to follow via the VLE. The majority of the respondents were satisfied with the way their teachers worked with the VLE. Respondents within the age group of 17–19 years reported that they could work more independently, since they started using the VLE, compared with the previous period without it. As one student mentioned, ‘Since I used the VLE, I could work more independently for my school work than before [when there was no such connection with school]’.

**Satisfaction level of chronically sick adolescents with the VLE in supporting school interactions**

All respondents reported that they could have informal contacts with classmates or teachers via the use of the VLE; they were especially positive about the informal contacts with classmates through the use of the VLE. For example, one student said ‘the chat with my classmates could still go on … I am happy that I could still follow what is happening with my friends at school’. Two respondents reported that their classmates visited them more often, because they could keep in contact on a daily basis through the VLE. Eight respondents also said that they felt less stressed to return to school, because their relationships with the class continued. Sixteen of the respondents said that they could benefit from the VLE for social connections with their school (keeping contacts with classmates, making new friends from the class, having a sense of belonging, etc.). For example, one student said before my classmates considered me as a ‘tourist’ [a tourist] as I could only attend the school once in a while; now through the VLE, my classmates could see me regularly and could see that I also work hard for the school. I feel better as I am considered part of the group by my peers, even I am not physically in the class.

Both the questionnaire results and the interview data show that the majority of the respondents felt connected to their class with the support of the VLE. The results show that the VLE played an important role in reducing the social stress of the long-term sick adolescents, because they could maintain social contacts with teachers and classmates. In addition, half of the respondents reported that having more routine activities pertaining to schoolwork played an important role in their daily life, especially that it reduced their focus on their physical problems or pain.

Being connected to the class was a good motivation for the sick adolescents in their school work. One student said, ‘I am very motivated to work hard. I am happy that through the VLE I can show to the teachers and the classmates that I am working hard for the schoolwork.’ Twenty-two of the respondents said they were able to keep themselves motivated for lessons with the support of the VLE. Most of the respondents were positive about their reintegration into school. Majority of the interviewed mothers confirmed that using the VLE reduced the desperation of the sick
adolescents about returning to school. More than half of the respondents reported that they could follow the lessons easily through the VLE. However, the other students (5 out of the 28) reported that it was harder for them to concentrate, due to physical pain or distraction by other things at home.

The relationship between satisfaction with the use of the VLE and the mental well-being of chronically sick adolescents

The results show that the mental well-being of the participants was at a low level before they started using VLE. The mean scores of the participants based on CBSA are presented in Table 2. The results show that the participants reported rather positively regarding their ‘close friendship’, ‘Social acceptance’, ‘Behaviour conduct’ and ‘Global self-esteem’.

During the interview, half of respondents mentioned explicitly that using the VLE had increased their self-esteem due to the educational and social contacts maintained with school, compared with the situation when they had no VLE to connect with school. The other respondents did not explicitly mention whether the use of the VLE had influenced (either positively or negatively) their self-esteem. More specifically, the participants who were positive about the effect of the use of the VLE reported that the use of the VLE contributed to their educational and social interactions with school, which helped them to eliminate social barriers (such as social isolation and exclusion from classmates), and reduce educational barriers (such as falling behind school work, and not being able to participate in group work in the class). The results from the interviews also indicate that most of the respondents (70%) were confident about themselves regarding their educational and social situation. A number of benefits after the use of the VLE were mentioned by the respondents; they include bringing them out of social isolation, distraction from physical pain and reducing the extent to which they were lagging behind in schoolwork. These findings were confirmed in our interviews with their parents. For example, one mother reported that her daughter felt better about herself, because of the positive social experiences she had while using the VLE. The mother of another respondent reported that her son’s academic self-esteem increased after the use of the VLE. In addition, the survey results suggested that participants who used the VLE for a longer period reported a higher ‘global well-being’ compared with the participants who used the VLE for a shorter period.

Table 2. Mental well-being (based on the CBSA instrument) of the chronically sick adolescents using the VLE.

<table>
<thead>
<tr>
<th>Rank*</th>
<th>Female Mean (SD)</th>
<th>Male Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close friendship</td>
<td>3.13 (.59)</td>
<td>3.17 (.65)</td>
</tr>
<tr>
<td>Social acceptance</td>
<td>2.54 (.70)</td>
<td>2.41 (.72)</td>
</tr>
<tr>
<td>Behavioural conduct</td>
<td>2.72 (.67)</td>
<td>2.77 (.64)</td>
</tr>
<tr>
<td>Global self-esteem</td>
<td>2.52 (.69)</td>
<td>2.60 (.66)</td>
</tr>
<tr>
<td>Scholarly competence</td>
<td>2.12 (.69)</td>
<td>2.29 (.68)</td>
</tr>
</tbody>
</table>

*Based on the mean score of the mental well-being scales.

**Mean score based on four-point (1–4) Likert scale.
Regarding the role of the VLE in supporting the continuation of education and school interactions of chronically sick adolescents and their classmates, and its association with their mental well-being, we analysed the relationship between the satisfaction scales with the use of the VLE and the mental well-being scales of the long-term sick adolescents through Spearman’s R correlation analysis. Specifically, the relationship between the satisfaction with the VLE and three key variables of mental well-being (Scholarly competence, Social Acceptance and Global self-esteem) were analysed.

Regarding the relationship between satisfaction with the use of the VLE and self-reported ‘Scholarly Competence’, the results show that the more the participants were satisfied with the use of the VLE in helping them continue their education, the higher the ranked scores of Scholarly Competence scale (Spearman’s R = .35, p < .01). The interview data show that 80% of the respondents said that their well-being in terms of Scholarly Competence would have scored much lower if they did not use the VLE to continue with their school education. The respondents reported that after the use of the VLE, they felt more confident that they can catch up with their school work. For example, one male respondent said that using the VLE helped him to have less school-related worries. Another respondent said that using the VLE helped her to feel that she was part of the class, which contributed to the feeling of being ‘competent for school work’ and ‘not being prejudiced by the classmates’. During the interviews, one mother reported that her son’s academic self-esteem grew since he began using the VLE, as he became more confident that he could succeed in his studies.

Regarding the relationship between satisfaction with the use of VLE and self-reported ‘Social Acceptance’, we analysed the Spearman’s R correlation between the satisfaction scales with the use of VLE and the dimension of ‘Social Acceptance’ of the long-term sick adolescents. The results indicate that the more the participants were satisfied with the use of the VLE for their social connection with the school, the higher the ranked scores of the scale Social Acceptance of the CBSA (Spearman’s R = .40, p < .01). Being connected and eliminating social isolation was considered the biggest advantage for the long-term sick adolescents. More than 60% of the respondents agreed that ‘using the VLE helped me to feel better’. One female respondent commented that using the VLE reduced her social worries, because she could have a more positive vision of her life after the use of the VLE to connect with school. One respondent was very happy about the use of the VLE, because she felt being socially accepted by her class for the first time in her life. Five of the interviewed parents confirmed that their children became happier after the use of the VLE to connect to their school and their classmates. For example, one mother commented positively that her daughter’s self-esteem clearly grew because of the positive social experience she had with the school using VLE: ‘she became much happier because she could keep contacts with her classmates for school work; connecting with the school in this way was absolutely useful’.

Regarding the relationship between satisfaction with the VLE and ‘the global self-esteem and feelings about future’, the results show that the more the participants were satisfied with the use of the VLE, the more they reported on the dimension Global Self-esteem (Spearman’s R = .29, p < .05). The results also suggest that the longer the participants used the VLE, the more they were positive about the contribution of the use of VLE to their mental well-being and their Global self-esteem (Spearman’s R = .25, p < .05). This was also demonstrated by the interview data.
For example, one parent reported that since the use of the VLE by her son for one year and a half, he became more positive about his future. Some other respondents mentioned that after the use of VLE, they had less negative feelings such as ‘nobody wants to know about me’. In addition, three respondents said that they became more positive about the future and less anxious about going back to the school since they started using VLE. Half of the respondents reported that they were positive about their future. For them, keeping up with the school was crucial to their future. Eighty-two per cent of the respondents agreed that using the VLE had made school a certainty in their life. This was also confirmed by the parents, as one mother said

my daughter became positive again about her school; before [the use of the VLE], she had a lot of worries about the school and herself; now she is confident that she can finish her school year without problem. Most importantly, she is positive about herself and her future.

Discussion

**The role of VLE in supporting the continuation of education and school interactions**

Our findings show that chronically sick adolescents were satisfied with the use of VLE; it helped them to keep up to date with school and maintain social interactions with teachers and classmates. Most of the respondents felt themselves part of the class and being supported by their classmates and the teachers. The advantage of using the VLE was reported in some previous studies as it is place and time independent (Tielen, 2003). The role of the VLE for the continuation of education was also suggested by previous research (Abdous & Yoshimura, 2010; Beauchamp & Kennewell, 2010; Gombeir, 2007; Lombaerts et al., 2006; Lou, Bernard, & Abrami, 2006). The present study contributes to the knowledge community by investigating the influence of the use of VLE on the mental well-being of chronically sick adolescents. There were scarce empirical data available in previous studies regarding the role of VLEs and the mental well-being of chronically sick adolescents. This study is the first to contribute to the understanding of the relationship between the use of a VLE and the mental well-being of chronically sick adolescents. The VLE played a significant role in preventing social isolation of chronically ill adolescents. Our results indicate that what the respondents missed the most was their involvement with their classmates and the possibility of joining group work with other classmates. This gives support to previous findings that receiving specific group-based instructions and keeping contacts with the class was essential for a positive reintegration (Anderson & Rourke, 2004; Bessell, 2001; Fels, Williams, Smith, Treviranus, & Eagleson, 1999; Madan-Swain et al., 2004; Porter, 2008).

**The relationship between the use of the VLE and mental well-being of chronically sick adolescents**

The participants reported an increase in their social and academic self-esteem due to the benefits they experienced from the VLE. The respondents also reported that they will be less stressed in the process of reintegration into the school, because of the
continuation of education through the use of the VLE. They felt themselves being part of the class and not prejudiced by their classmates. In addition, we found that the respondents who were more socially and educationally satisfied with the VLE, considered themselves more socially and scholarly competent compared with those who were less satisfied with the VLE. More importantly, using the VLE helped them to feel confident about their reintegration into school, their future and has contributed to their mental well-being. The results indicate that the more the respondents were satisfied with the VLE, the higher they reported on the dimensions of mental well-being, including Social Acceptance, Scholarly Competence and Global Self-esteem. Furthermore, due to the support of the VLE, the chronically sick children became more positive about their life and their future. This also contributed to their self-esteem. These findings provide empirical support to some of the previous arguments about the social, educational and psychological impact of ICT-supported learning (e.g. Fels & Weiss, 2001; Lombaerts et al., 2006).

Implications and limitations

This research contributes to the literature and the scientific community regarding the relationship between the use of a VLE and the educational and social connection with school and the mental well-being of chronically sick adolescents. The results indicate that the respondents were satisfied with the use of the VLE. For the respondents, keeping in touch daily with classmates and being part of the class through the VLE was very important and contributed to their mental well-being.

The importance of ICT and VLEs in supporting chronically ill children has been noticed in different countries (Anderson & Rourke, 2004; Battles & Wiener, 2002; Nicholas et al., 2007). However, there are insufficient empirical studies examining the educational, social and psychological effect of the use of VLEs for chronically sick children. This study is one of the few empirical studies that have investigated the educational, social and psychological impact of a VLE for chronically sick adolescents. The results of the current study indicate that the use of the VLE had positive effects on the social interactions, educational benefits and the mental well-being of the chronically sick adolescents. The use of the VLE has contributed to their mental well-being as they felt more scholarly and socially competent, and less isolated from school. This study provides empirical evidence that VLEs can play a role for the educational and social needs, and the mental well-being of chronically sick children.

This study has a number of limitations. First, the sample of this study was limited. This was because on one hand, the population of concern in the relevant context was limited; and on the other hand, not all targeted subjects could participate in the current research due to their physical conditions, privacy issues, etc. As the participation in the study was voluntary and based on approved consent, we are not sure whether this has an impact on the sample and whether the participants of the study were completely representative of the whole target group. Therefore, the constraints of the sample size call for caution in the generalisation of the results. Secondly, the effect of the VLE was examined through a mixed-methods research, but the current research was not of a longitudinal nature. Future research with a longitudinal design would be useful to yield results regarding the impact of the VLE on the mental well-being of chronically sick children over time. In addition, a comparative study involving VLE users and non-users might also be helpful to bring more
insights regarding the role of the VLE on the well-being of chronically sick children. For example, the educational and social effect of the VLE could be compared with the effect of homeschooling (Searle, Askins, & Bleyer, 2003). Thirdly, the adolescents might have the tendency to deny the conflicting aspects of their emotional life by using denial or other psychological defence mechanisms typical for this phase of life (Nardi et al., 2008; Servitzoglou et al., 2008). To counter this limitation, the interviews with the parents yielded some useful results and confirmed the findings from the interviews with the sick adolescents. Future research should involve more parents and teachers in order to investigate further the effect of the VLE on teaching and learning for chronically sick children.

In summary, this research shows that the VLE in this study can help chronically sick adolescents to counter their isolation from school, connect sick students and their class, support their social and learning needs and contribute to their mental well-being. Through the VLE, the chronically sick adolescents involved in our study easily caught up with their school work, maintained contact with peers and teachers and received educational and social support from their school. Based on the findings of this study, the benefits of the VLE for chronically sick adolescents do not just lie in the academic and scholarly support, but go beyond these and contribute to the well-being and self-esteem of this vulnerable group of young people. Yet the positive impact of the VLE can be influenced by how the VLE is made use of and how the teachers, peers and parents provide support to the students (technically, scholarly and socially). More research in this domain and more support for chronically sick children (technically, pedagogically and socially) would benefit this special group of adolescents tremendously. With the positive potential of VLE, we hope that more and more chronically sick students can get supported, and thus the negative pedagogical, psychological and social consequences of long-term absence from school can be reduced.

References
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