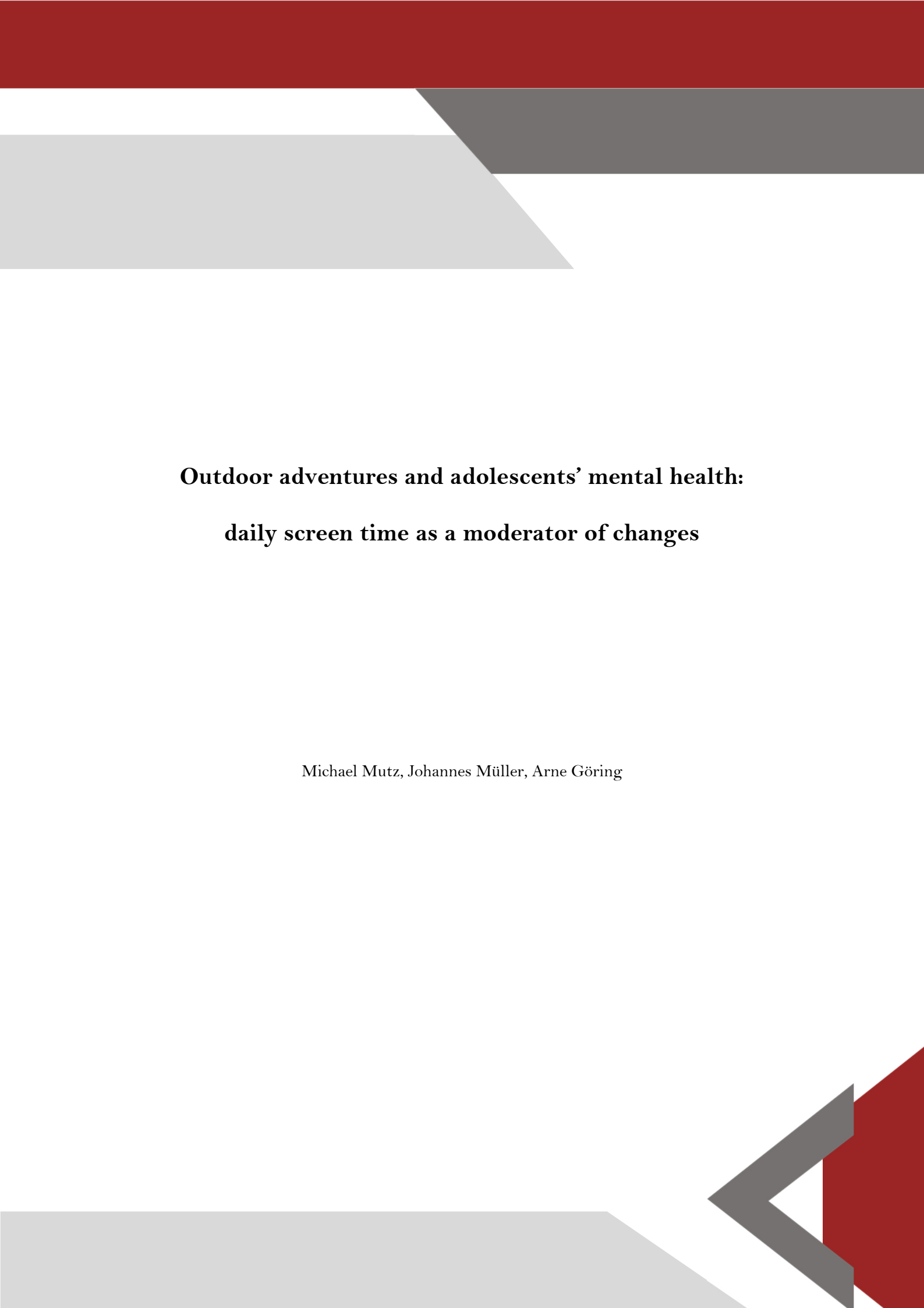




Outdoor adventures and adolescents' mental health: daily screen time as a moderator of changes

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Abstract

Research provided ample evidence that excessive screen time (ST) in adolescence has detrimental effects on psychosocial health. This paper argues that structured outdoor programs can serve as an antidote to negative health impacts of exaggerated ST. For youth with a high level of regular ST, outdoor adventures imply a break with their 'normal' (mediatized) lifestyle, so that greater progress in mental health can potentially arise. This hypothesis is tested in a sample of adolescents, who took part in a 10-day outdoor program. Pre-to-post program mean comparisons for stress, hedonic balance and life satisfaction show significant positive changes. However, benefits of the program are markedly greater among youths with a high level of daily ST compared to youths with low-to-moderate levels.

Keywords

adventure education; outdoor activity; resilience; well-being; perceived stress

1. Introduction

Today's children and adolescents are growing up surrounded by media and consume online and offline media content in a yet unprecedented scale. As studies show, daily screen time (ST) – usually including time spent with television, computer and video games – of youths in Western societies reaches mean levels of roughly 3 to 6 hours daily, depending on age and gender (Bucksch et al., 2014; Bucksch et al., 2016; Olds et al., 2010; Marshall et al., 2006; Spengler et al., 2015). International data from the 'Health Behaviour in School-aged Children' study (Bucksch et al., 2016) shows that daily ST has increased constantly in almost all of the 30 participating countries from 2002 to 2010. This trend was triggered by the fact that adolescents spent ever greater amounts of time with computers, for gaming but also non-gaming activities. Studies also have concurrently shown that youths from lower socioeconomic strata engage in more screen-based sedentary behaviour (Tandon et al., 2012; Fairclough et al., 2009) and boys spend more time in screen-based pursuits than girls (Bucksch et al., 2016; Iannotti et al., 2009; Marshall et al., 2006; Spengler et al., 2015).

Prior research indicates that excessive ST can impact negatively on youths' health: For instance, it is associated with a high body mass index, overweight and obesity (Barnett et al., 2010; Costigan et al., 2013; Eisenmann et al., 2008; Maher et al., 2012; Burke et al., 2006), increased cardiovascular health-risks (Byun et al., 2012; Grøntved et al., 2014), sleep disturbances (Costigan et al., 2013; Parent et al., 2016) as well as back pain (Bélanger et al., 2011) and unhealthy eating (Garcia-Contiente et al., 2014). Current studies indicate that excessive ST can also impact negatively on mental health. Mental health can be understood as the absence of mental disorders, but also more broadly as a state of subjective well-being, perceived autonomy, as well as psychological resilience in terms of stress and adversity, as defined by the World Health Organization (WHO, 2002). Systematic reviews demonstrated that ST is associated with more depressive symptomatology (Liu et al., 2016), less self-esteem (Tremblay et al., 2011), negative body image and eating disorders (Brown & Bobkowski, 2011) and less psychological well-being (Costigan et al., 2013; Iannotti et al., 2009; Suchert et al., 2015). Moreover, statistical estimations suggest that replacing one hour of video gaming with one hour of outdoor play leads to improved mental health in youths (Janssen, 2016).

Due to the negative health impact of excessive ST, national authorities in many countries, recommend limiting the total amount of entertainment screen time to less than 2 hours per day for children and youths (Tremblay et al., 2011; Herrick et al., 2014; Council on Communications and Media, 2013). In Germany, the Federal Centre for Health Education (2014) recommends 60 minutes of TV watching and gaming as a maximum daily amount for 10- to 13-year olds. However, new US recommendations, published in 2016, abstain from limiting ST to a specific amount of time per day and instead recommend that ST should not conflict with sleeping, talking, outdoor playing, reading and physical activities (Council on Communications and Media, 2016).

This paper aims to look at the potential benefits of outdoor and adventure programs for countering negative mental health impacts of ST. We argue that outdoor adventure programs may produce different effects for youths with high vs. low daily ST levels and that excessive media consumers may profit the most from said programs. This notion, which has not been subject of scientific scrutiny before, is justified in the paragraphs below. Afterwards, the moderating effect of ST for mental health outcomes of outdoor adventures is empirically evaluated by using a pre-post-test research design and a sample of German youths.

2. State of Research

Since their very beginnings in the 1940s, when Kurt Hahn founded Outward Bound (which can be called the first version of adventure programming) in Wales, outdoor programs were designed to counter the assumed negative influences of modern life (Freeman, 2011; Hopkins & Putnam, 1997; Priest & Gass, 2005). Hahn proposed Outward Bound as a way to combat a perceived decline of fitness, leadership, spirit of enterprise, and self-discipline, which he regarded as negative by-products of industrialization and urbanisation (Freeman, 2011). However today, it is no longer the industrial life that deeply affects the living conditions of youths in Western societies but instead the media-based lifestyle with yet unprecedented levels of ST, which likely has unfavourable consequences for physical and mental health (Shiue, 2016).

Previous research regarding outdoor and adventure programs has documented the positive impact of such programs ranging from a more positive self-concept and self-esteem (e.g. Boeger et al., 2006; Fengler & Schwarzer, 2008; Gehris et al., 2010; Probst & Koesler, 1998; Goldenberg & Soule, 2015), higher resiliency (Neil & Dias, 2001; Hayhurst et al., 2015; Whittington et al., 2016), higher academic

efficacy (Widmer et al., 2014), reduced school truancy (Ang et al., 2014), more prosocial behaviour (Cook, 2008) to improved levels of well-being (Mutz & Müller, 2016). Hattie, Marsh, Neill and Richards' (1997) meta-analysis found small to medium effects with an average pre-to-post-program change of .34. Average effect sizes varied among different domains of outcomes, e.g. emotional stability (.49), social competence (.43), confidence (.33), and well-being (.24).

However, only a few studies have addressed participant characteristics which are likely to moderate outcomes. This academic void is mostly owed to the small group settings in which outdoor programs take place due to which effects usually cannot be differentiated for different groups of participants. So far, limited research has pointed to higher effects in younger age groups and among individuals without previous outdoor adventure experience (Sibthorp et al., 2007). In a meta-analysis on challenge ropes courses, Gillis and Speelman (2008) found larger effect-sizes for participants in middle-school and high school age compared to university age. Some studies also pointed to gender differences. For instance, Propst and Koesler (1998) reported lower levels in self-efficacy among female participants in a pre-test just before the start of an outdoor excursion but not in the post-test afterwards, so that the changes from pre- to post-test appear to be greater among females. In a German controlled study with 14-year old pupils, more positive long-term effects of an adventure project were found for females compared to males (Boeger et al., 2006). Besides sociodemographic characteristics of the participants, Ewert and Sibthorp (2009) argue that prior knowledge and experience can tremendously impact on the outcome of an outdoor education program. Pupils, for instance, who perceived themselves as having relatively poor personal and social skills appeared to gain most benefit and then lose the least after attending a residential week of outdoor adventure education (Scrutton, 2015). To our knowledge, however, no previous study has addressed differential effects according to daily levels of ST, so that the present study can add to existing research.

Theoretically, the assumption that greater program benefits are likely for youths with higher daily levels of ST seems compelling for three reasons: 1) From a program perspective it can be argued that effects must be larger for youths with high ST levels, given that respective programs have aimed at compensating for negative side effects of modern life since their very beginning (Freeman, 2011; Howden, 2012). Hence, under the premise that these programs are effective, greater positive

developments should come along for those youths who make up the core target group, i.e. those who actually have a 'shortcoming' in nature experience, physical activity, or outdoor play time which then may be alleviated by said programs. 2) In this regard, it can be further claimed that several program features are only effective under the condition that they enable youth to gather new experiences that transcend those from their everyday life worlds (D'Amato & Krasny, 2011; Deane & Harré, 2013). Only novel, positive experiences and impressions as well as the mastery of yet unknown challenges are assumed to trigger personality development, self-worth, self-efficacy, well-being and happiness (Walsh & Golins, 1976; Dean & Harré, 2013; McKenzie, 2003; Luckner & Nadler, 1997). Hence, new experiences that involve a disruption of normal life have by far a greater impact compared to those which have already been witnessed in similar situations elsewhere. It can be assumed that for youths with high ST levels participation in an outdoor adventure program means a far greater 'break' of normalcy, i.e. of their mediatized daily routines, so that experiences made in the program have a higher degree of unfamiliarity and novelty. This assumption is backed empirically by studies which have shown that longer ST usually comes at the expense of outdoor play and outdoor sporting activities (Costigan et al., 2013). When low levels of regular outdoor activity are a characteristic of those youths with excessive daily ST levels, then outdoor programs may indeed include much more 'novelty' for these youths. 3) Besides such content-related considerations, it can be further argued that a statistic baseline effect is likely to exist, according to which youths with a high daily ST level enter the program at a lower level of mental health, as suggested by previous research (Janssen, 2016; Liu et al., 2016; Suchert et al., 2015). Starting at a lower level of mental health provides greater potential for positive change during an intervention. And vice versa, it can be assumed that only marginal positive changes can be expected among youths who already enter the program with high levels of mental health.

According to these considerations, we assume that outdoor adventure programs have benefits for mental health, i.e. with regard to perceived stress and subjective well-being, among youth (*Research Question #1*), but that effects are greater for youths with high daily ST levels compared to youths with low to moderate daily levels of ST (*Research Question #2*).

3. Methods

Participants

Participants of the study were 108 adolescents, aged 13 to 20 ($M = 17.8$; $SD = 1.26$), who took part in a 10-days outdoor and adventure program in the French Tarn-et-Garonne department, a region famous for its hiking, climbing and canoeing opportunities. All participants joined the program voluntarily within a school excursion or a youth recreation trip. They visited the camp between May and July 2016. The group size was in the range of 15 to 20 youths and each group was accompanied by teachers or adult supervisors. Prior to the study, the parents of the participants were informed about the program evaluation and asked for consent. Only parents of two adolescents did not allow their child to take part in the study, all others gave permission. With the exception of these two, 108 youths agreed to participate in the study and filled out the questionnaire handed out on the first day of the program. To allow for matching the data from the start and the end of the program, self-generated identification codes were used consisting of four elements. However, 32 participants provided inconsistent identification codes, so that t_1 and t_2 questionnaires could not be matched definitely. However, for 76 of 108 youths t_1 and t_2 data were matched, resulting in a matching success rate of 70%. Literature on self-generated identification codes considers such a rate as good (Schnell et al., 2010).

The sample only includes German-speaking adolescents who visited the camp in the respective period. Groups from non-German-speaking countries (e.g. France) have not been included. Moreover, only those groups taking part in the adventure program for the entire 10-day period are represented in the sample, whereas groups who could not join the full program (e.g. because of time restrictions) or participants who could not attend the program activities (e.g. because of health problems) have not been included in the evaluation. The final sample consists of 28 female and 48 male youths. With regard to the socio-economic status of their families, participants predominantly represent the German middle-class. As usual in outdoor adventure evaluations, the sample is not representative for a wider population.

Program Characteristics

Youths and young adults are the target group of the outdoor and adventure education program that is organized by a German youth association, arranging several adventure camps in France and

Slovenia. The core educational goal of the program is personal development and team building. During the 10-day program, participants stay at a base camp on a non-public campsite where they sleep in tents and are responsible for the organization of the camp, including cooking. The campsite as well as the surrounding area has neither access to the internet and television nor service for mobile phones.

Under the leadership of qualified personnel (in the field of experiential education), the following activities are provided in the course of the program:

- a) *canoeing*: participants canoe on a wild river, thereby overcoming obstacles and rapids;
- b) *rappelling*: participants rappel down from a 40 m cliff and down from a rock inside a cave;
- c) *cave expedition*: participants explore a narrow and widely ramified cave without any technical aids;
- d) *fixed rope route*: participants need to accomplish a fixed rope route on their own;
- e) *canyoneering*: participants cross a steep riverbed where it is necessary to swim, to jump from high cliffs, to rappel along a waterfall and to pass a rope bridge;
- f) *rock climbing*: participants climb different levels of difficulties;
- g) *hiking tour*: participants do a 2-3 days hiking tour with overnight stay in caves.

Youths in each excursion group are able to choose from these activities. Since the group size for each activity is limited, parallel activities are offered by the personnel. This allows youths to join activities according to their preferences. This procedure implies, however, that not all youths can take part in the same activities or accomplish activities in exactly the same chronological order. Moreover, activities are organized according to the principle 'challenge by choice' (Rohnke, 1989), hence participants themselves can select and control the level of challenge. In line with the paradigm of experiential education (Kolb, 1984), all activities take place in natural surroundings, include physical challenges and limit group size to a maximum of 10 participants. Any problems and potential conflicts that may occur during an activity should be resolved by the group members themselves. Finally, each activity is followed by a short discussion and reflection chaired by the camps' staff.

Design

A pre-post-test research design was applied where individuals were questioned at two different points in time. The first assessment was carried out on the arrival day of the program (t_1), prior to the activities. The second assessment took place in the evening of the last day (t_2) when a reflection of the

whole trip was scheduled. At both occasions, participants filled out a paper-and-pencil questionnaire which included identical measures for mental health.

Measures

Perceived Stress was assessed with the Perceived Stress Questionnaire (PSQ, Levenstein et al., 1993). This instrument is designed to measure subjectively experienced stress in multiple dimensions. The German translation and validation of the original scale (Fliege et al., 2001) has demonstrated that PSQ items can be arranged into four subscales, ‘worry’, ‘tension’, ‘joy’, and ‘demand’. The subscale *worry* refers to the perception of sorrow, inner conflicts, fear and anxiety (e.g. ‘Your problems seem to be piling up’; ‘You are afraid of the future’), hence to internal stress reactions in the individual. The *tension* subscale has a stronger focus on bodily symptoms like fatigue as well as the inability to relax and to become calm (e.g. ‘You feel mentally exhausted’; ‘You have trouble relaxing’). The subscale *demand* captures external demands that are addressed at the individual, for instance time pressure and work overload (e.g. ‘You have too many things to do’; ‘You feel you’re in a hurry’). The subscale *joy* addresses positive affect and the absence of strain (‘You are light-hearted’; ‘You enjoy yourself’). The PSQ scales are widely recognized in research on stress and well-being (Fliege et al., 2005; Kocalevent et al., 2007; Sanz-Carillo et al., 2002).

Subjective well-being can be measured with long-term life satisfaction as well as a persons’ short-term hedonic balance (Diener, 1984; Diener et al., 1999). *Life satisfaction* was captured with the question, ‘On the whole, how satisfied or not are you with the life you lead’. This question is widely used in survey research, for instance, in dozens of waves of the Eurobarometer Surveys conducted since 1973. Short-term well-being was measured according to Bradburn (2015) with the *hedonic balance* of the last week, i.e. the recently experienced positive and negative emotions. Precisely, respondents were asked how often they had experienced positive emotions (elation, happiness, vigour, enjoyment of life) and negative emotions (sorrow, sadness, sluggishness, loneliness) during the last week. Similar items are used in the so-called ‘well-being core module’ of the European Social Survey to measure affective well-being. The mean score of negative emotions was then subtracted from the mean score of positive emotions ($M_{\text{pos}} - M_{\text{neg}}$), so that the final measure captures ‘hedonic balance’, i.e. the relative dominance

of positive affective states over negative ones.

Daily leisure time *screen time* was measured by questionnaire at t_1 . Participants were asked to indicate the time they spend in front of television, computer and game console in their leisure time on an average week-day and an average weekend day. Answers categories ranged from (1) 'less than 1 hour' up to (6) 'more than 5 hours'. Based on these data average daily leisure time ST was calculated and the sample was split into high media consumers with $ST > 3$ hrs and low-to-moderate consumers with $ST \leq 3$ hrs per day.

Analyses

To assess differences between pre-excursion (t_1) and post-excursion scores (t_2), paired-sample T-test were run for the two groups of media consumers (>3 hrs vs. ≤ 3 hrs). However, we do not solely discuss statistical significance but put effect sizes (Cohen's d) to the foreground. The magnitude of the change is particularly insightful, as this paper is driven by the assumption that program effects are greater in the group of high media consumers compared to low and moderate consumers. Furthermore, 2x2 General Linear Models (GLM) for repeated measurements were calculated to test for the significance of the time*group interactions, hence whether or not the changes in both groups of media consumers differ significantly.

4. Results

Paired-sample T-tests were run separately for high and low-to-moderate media consumers to assess whether the means for one or both of these groups have changed significantly from t_1 to t_2 . Results reveal mostly significant changes in all six aspects of mental health for both groups of media consumers. However, the effect sizes were higher for excessive media consumers compared with low-to-moderate consumers (Table 1). First, high media consumers indicated reduced stress according to the PSQ subscales for worries ($d = -0.73, p < .001$), tension ($d = -0.75, p < .001$) and demand ($d = -0.77, p < .001$), whereas the scores for joy increased considerably ($d = 0.74, p < .001$). Significant and positive effects were also found in the group of low-to-moderate media consumers, however with effect sizes between $d = -.36$ and $d = -.57$, changes were less pronounced in this group compared to high media consumers.

Table 1. *Mental Health Scores Before and After the Outdoor Excursion*

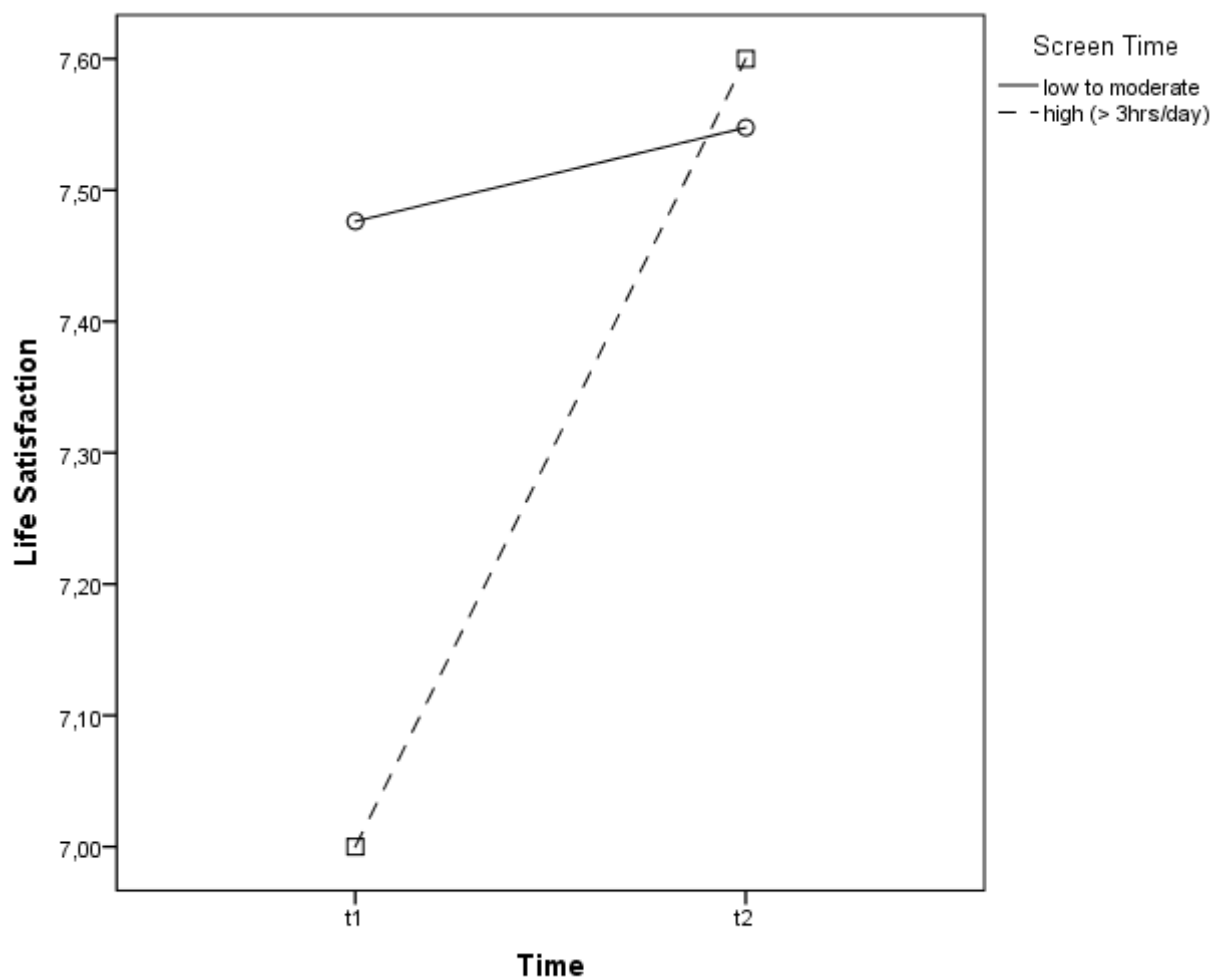
Mean comparison (<i>t1</i> vs. <i>t2</i>)						
<i>High media consumers</i>	<i>M_{t1}</i>	<i>M_{t2}</i>	<i>Diff</i>	<i>SD_{diff}</i>	<i>d_e</i> with 95% CI	<i>p</i>
PSQ worry	2.22	1.75	-0.46	0.63	-0.73 [-0.37, -1.09]	<.001
PSQ tension	2.27	1.74	-0.53	0.71	-0.75 [-0.39, -1.10]	<.001
PSQ demand	2.22	1.64	-0.58	0.75	-0.77 [-0.42, -1.13]	<.001
PSQ joy	2.79	3.16	0.37	0.50	0.74 [0.38, 1.10]	<.001
Hedonic Balance	1.07	2.96	1.89	1.70	1.11 [0.75, 1.47]	<.001
Life satisfaction	7.00	7.60	0.60	1.16	0.52 [0.16, 0.88]	.008
<i>Low to moderate media consumers</i>	<i>M_{t1}</i>	<i>M_{t2}</i>	<i>Diff</i>	<i>SD_{diff}</i>	<i>d_e</i> with 95% CI	<i>p</i>
PSQ worry	2.10	1.79	-0.31	0.59	-0.53 [-0.23, -0.82]	.001
PSQ tension	2.33	2.07	-0.26	0.72	-0.36 [-0.06, -0.66]	.022
PSQ demand	2.44	2.04	-0.40	0.70	-0.57 [-0.27, -0.87]	<.001
PSQ joy	2.92	3.15	0.23	0.60	0.38 [0.08, 0.68]	.015
Hedonic Balance	1.14	2.70	1.55	1.86	0.83 [0.53, 1.13]	<.001
Life satisfaction	7.48	7.55	0.07	0.75	0.09 [-0.21, 0.39]	.538

Note: *d_e* has been calculated according to Cohen (1988), p. 48.

Moreover, excessive media consumers reported large gains in hedonic balance from *t1* to *t2* ($d_e = 1.11$, $p < .001$), i.e. their relation of positive to negative emotions changed considerably to the positive during the outdoor adventure program. In addition, in the course of the 10-day program their life satisfaction ratings increased from 7.0 to 7.6 ($d_e = 0.52$, $p = .008$). Hence, the program was not only associated with a reduction of stress, but also with a significant gain in satisfaction and happiness. Once again were the effects larger in the group of high media consumers compared with low-to-moderate consumers. The latter group also reported a significant increase in hedonic balance, although the effect was somewhat weaker in size ($d_e = 0.83$, $p < .001$). Life satisfaction scores of low-to-moderate media consumers were hardly affected by the program ($d_e = 0.09$, $p = .538$). Hence, low-to-moderate media consumers did not profit as much as excessive consumers from the outdoor adventure (>3 hrs ST per day).

Additionally, a 2x2 General Linear Model (GLM) for repeated measurements was run. This procedure tests for the significance of time*group interactions, hence whether or not changes among excessive media consumers from t_1 to t_2 differ from the changes in the group of low to moderate consumers. Despite the weak test power of the GLM procedure that resulted from the small N in both groups, the GLM revealed a significant time*group interaction for life satisfaction ($F(1, 72) = 5.52$; $\eta^2_{\text{part}} = .07$; $p = .022$). Hence, the rise in life satisfaction was significantly larger for adolescents with a high regular ST of greater 3 hrs compared to the group of adolescents with a regular ST of up to 3 hrs (Figure 1). This effect was mostly due to a lower initial level of life satisfaction revealed for excessive media consumers which has also been shown in prior research on media consumption and happiness (Booker et al., 2015). For the other outcomes time*group interactions failed to reach significance.

Figure 1. *Changes in life satisfaction among high vs. low to moderate media consumers*



5. Discussion

Starting from research which reveals that adolescents' ST has recently increased and is now far beyond recommended levels, it was argued that outdoor adventure programs may counter some of the negative side-effects associated with exaggerated leisure time ST. Time spent in front of screens is usually passive; it neither involves face-to-face social interactions nor – in most cases – is it conducive for the development of cognitive, social and physical competencies (Ponti et al., 2017). Outdoor programs usually involve a break with normal life, insofar as participants spent time in 'real world' natural settings, small groups, and take part in physically challenging activities (Hopkins & Putnam, 1997). Thereby outdoor adventures transcend the mediatized life of today's youths. However, as ST varies among youths, it was hypothesized that the break with normalcy must be greater for excessive media consumers, who spent a substantial amount of time daily in front of screens compared to low-to-moderate media consumers.

The findings generally buttress these notions. A 10-days outdoor adventure program yields stronger mental health benefits for high media consumers compared to low-to-moderate consumers. This pattern was consistently revealed across different types of mental health measures, e.g. stress perceptions as well as indicators for well-being. Excessive media consumers profit more from being ten days 'offline' in the outdoors, however they also enter the program with lower initial levels of mental health and well-being. Hence, it can be concluded from the findings that outdoor adventures may – at least temporarily – compensate for some negative mental health conditions systematically associated with exaggerated ST.

These patterns make a case for advising ST limits, particularly for children and youths. However, in an era of digitalization reducing ST to healthy limits may become increasingly difficult. Therefore, our findings provide a strong argument for a wider utilization of adventure programs and outdoor sports in the field of health promotion (Clough et al., 2016), particularly in times of increasing digitalization of adolescent lifestyles. By interrupting daily routines that revolve around (passive) media consumption, an outdoor adventure enables youths to experience a different lifestyle – active, healthy and wholesome – whose benefits can be sensed directly and immediately. Such experiences of breaking away with 'normal' life may not only compensate for negative health impacts of leisure time ST, but at best also yield the potential to reflect and

maybe to change mediatized and sedentary lifestyles at home (D'Amato & Krasny, 2011).

Educational theorizing strongly suggests that experiences may only have enduring impacts if they are accompanied by proper reflection that facilitate the transference of lessons learned to very different contexts and settings (Deane & Harré, 2013). Given that a reflection of screen time habits was not yet part of the program evaluated here, we would suggest on-site discussions and reflections of screen-based behaviours to be a meaningful amendment to the course. Likewise, outdoor programs may exemplify the benefit of 'green exercise' (Pretty et al., 2005) to participants and may advert their integration into daily routines.

As a matter of course, only those can profit from outdoor adventures who have the possibility to participate. Since structured outdoor programs are not part of German schools' core curricula and programs of commercial providers are costly, youths from less privileged social groups probably have greater difficulties to take part in these programs and subsequently have less opportunities to profit from them. However, excessive media use is also most common in this group (Tandon et al., 2012; Fairclough et al., 2009; Spengler et al., 2015). Hence, accessibility of outdoor experiences for adolescents from socially disadvantaged milieus should be improved. A stronger integration of such programs into the school curriculum, as for instance in many Scandinavian countries, could be a reasonable step to enhance accessibility. In Norway, for instance, outdoor activities, ('Friluftsliv', see Henderson & Vikander, 2007) are part of the physical education curriculum. Students are not only taught outdoors for some days within a school year, but also engage in challenging activities (for instance, hiking, spending a night outdoors, winter sports) and, at the same time, learn about nature and nature protection.

Of course, this study has also some limitations. Firstly, there is a lack of a comparison group who did not participate in any outdoor adventure activities. Such a control group is necessary to allow for causal inferences, i.e. estimate the effects caused by the program. Despite this objection, the account presented here still allows for the conclusion that effects of the excursion differed between low-to-moderate and excessive media consumers. Secondly, we were not able to collect follow up data some weeks or months after the program. Hence, no conclusions can be drawn either regarding the durability of the effects or the variation of durability according to the ST levels of participants. Third, future studies should assess leisure time ST with more sophisticated measures that should allow for

distinguishing the way and purpose of usage. It likely can make a difference for a young person's state of mental health whether time is spent in front of a game console playing a first-person shooter or using a computer for creating music or searching for information. These fine differences were not captured with the measure applied here but could have helped to better understand mental health differences which appeared at the beginning of the program. Moreover, our measure for leisure time ST did not account for the use of smartphones and may thus underestimate the true levels of ST in youths. However, given that the time per day spent in front of smartphones is highly fragmented over the day, it seems hard to reliably assess this time by questionnaire.

References

- Ang, R.P., Fariyah, N. & Lau, S. (2014). An outcome evaluation of the implementation of the Outward Bound Singapore five-day 'intercept' program. *Journal of Adolescence*, 37, 771-778.
- Barnett, T.A., O'Loughlin, J., Sabiston, C.M., Bélanger, M., Van Hulst, A. & Lambert, M. (2010). Teens and screens: The influence of screen time on adiposity in adolescents. *American Journal of Epidemiology*, 172, 255-262.
- Bélanger, R.E., Akre, C., Berchtold, A. & Michaud, P.A. (2011). A U-shaped association between intensity of internet use and adolescent health. *Pediatrics*, 127, 330-335.
- Boeger, A., Dörfler, T., Schut-Ansteeg, T. (2006). Erlebnispädagogik mit Jugendlichen: Einflüsse auf Symptombelastung und Selbstwert [Project adventure with adolescents: Influence on psychopathology and self-esteem]. *Praxis der Kinderpsychologie und Kinderpsychiatrie*, 55, 181-197.
- Booker, C.L., Skew, A.J., Kelly, Y.J. & Sacker, A. (2015). Media use, sports participation, and well-being in adolescence: Cross-sectional findings from the UK Household Longitudinal Study. *American Journal of Public Health*, 105, 173-179.
- Bradburn, N.M. (2015). The Affect Balance Scale: Subjective approaches (3). In W. Glatzer, L. Camfield, V. Möller & M. Rojas (Eds.), *Global Handbook of Quality of Life* (pp. 269-279). Heidelberg: Springer.
- Brown, J.D. & Bobkowski, P.S. (2011). Older and newer media: Patterns of use and effects on adolescents' health and well-being. *Journal of Research on Adolescence*, 21, 95-113.
- Bucksch, J., Inchley, J., Hamrik, Z., Finne, E. & Kolip, P. (2014). Trends in television time, non-gaming PC use and moderate-to-vigorous physical activity among German adolescents 2002-2010. *BMC Public Health*, 14, 351.
- Bucksch, J., Sigmundova, D., Hamrik, Z., Troped, P.J., Melkevik, O., Ahluwalia, N., Borraccino, A., Tynjälä, J., Kalman, M. & Inchley, J. (2016). International trends in adolescent screen-time behaviors from 2002 to 2010. *Journal of Adolescent Health*, 58, 417-425.
- Burke, V., Beilin, L.J., Durkin, K., Stritzke, W.G., Houghton, S. & Cameron, C.A. (2006). Television, computer use, physical activity, diet and fatness in Australian adolescents. *International Journal of Pediatric Obesity*, 1, 248-255.
- Byun, W., Dowda, M. & Pate, R.R. (2012). Associations between screen-based sedentary behavior and cardiovascular disease risk factors in Korean youth. *Journal of Korean Medical Science*, 27, 388-394.
- Clough, P., Houge Mackenzie, S., Mallabon, L. & Brymer, E. (2016). Adventurous physical activity environments: A mainstream intervention for mental health. *Sports Medicine*, 46, 963-968.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale: Lawrence Erlbaum Associates.

- Cook, E.C. (2008). Residential wilderness programs: The role of social support in influencing self-evaluations of male adolescents. *Adolescence*, 43, 751-774.
- Costigan, S.A., Barnett, L., Plotnikoff, R.C. & Lubans, D.R. (2013). The health indicators associated with screen-based sedentary behavior among adolescent girls: a systematic review. *Journal of Adolescent Health*, 52, 382-392.
- Council on Communications and Media (2013). Children, adolescents, and the media. *Pediatrics*, 132, 958-961.
- Council on Communications and Media (2016). Media use in school-aged children and adolescents. *Pediatrics*, 138, e20162592.
- D'Amato, L.G. & Krasny, M.E. (2011). Outdoor Adventure Education: Applying Transformative Learning Theory to understanding instrumental learning and personal growth in Environmental Education. *Journal of Environmental Education*, 42, 237-254.
- Deane, K.L. & Harré, N. (2013). The Youth Adventure Programming Model. *Journal of Research on Adolescence*, 24, 293-308.
- Diener, E. (1984). Subjective Well-Being. *Psychological Bulletin*, 95, 542-575.
- Diener, E., Suh, E.M., Lucas, R.E. & Smith, H.L. (1999). Subjective Well-Being: Three decades of progress. *Psychological Bulletin*, 125, 276-302.
- Eisenmann, J.C., Bartee, R.T., Smith, D.T., Welk, G.J. & Fu, Q. (2008). Combined influence of physical activity and television viewing on the risk of overweight in US youth. *International Journal of Obesity*, 32, 613-618.
- Ewert, A. & Siphthorp, J. (2009). Creating outcomes through experiential education: the challenge of confounding variables. *Journal of Experiential Education*, 31, 376-389.
- Fairclough, S.J., Boddy, L.M., Hackett, A.F. & Stratton, G. (2009). Associations between children's socioeconomic status, weight status, and sex, with screen-based sedentary behaviours and sport participation. *International Journal of Pediatric Obesity*, 4, 299-305.
- Federal Centre for Health Education (2014). *Gut hinsehen und zuhören! Tipps für Eltern zum Thema „Mediennutzung in der Familie“* [Take a closer look: advice for parents regarding media use in the family]. Köln: BzgA.
- Fengler, J. & Schwarzer, C. (2008). Is there a self-concept change after participation in outdoor education programs? An evaluation study. *International Journal of Psychology*, 43, 137-138.
- Fliege, H., Rose, M., Arck, P., Levenstein, S. & Klapp, B.F. (2001). Validierung des "Perceived Stress Questionnaire" (PSQ) an einer deutschen Stichprobe. *Diagnostica*, 47, 142-152.
- Fliege, H., Rose, M., Arck, P., Walter, O., Kocalevent, R., Weber, C. & Klapp, B. (2005). The Perceived Stress Questionnaire (PSQ) reconsidered: validation and reference values from different clinical and healthy adult samples. *Psychosomatic Medicine*, 67, 78-88.
- Freeman, M. (2011). From 'character-training' to 'personal growth': the early history of outward bound 1941-1965. *History of Education*, 40, 21-43.
- Garcia-Contiente, X., Perez-Gimenez, A., Espelt, A. & Adell, N.M. (2014). Factors associated with media use among adolescents: a multilevel approach. *European Journal of Public Health*, 24, 5-10.
- Gehris, J., Kress, J. & Swalm, R. (2010). Students' views on physical development and physical self-concept in Adventure-Physical Education. *Journal of Teaching in Physical Education*, 29, 146-166.
- Gillis, H.L. & Speelman, E. (2008). Are Challenge (Ropes) Courses an Effective Tool? A Meta-Analysis. *Journal of Experiential Education*, 31, 111-135.
- Goldenberg, M. & Soule, K.E. (2015). A four-year follow-up of means-end outcomes from outdoor adventure programs. *Journal of Adventure Education and Outdoor Learning*, 15, 284-295.
- Grøntved, A., Ried-Larsen, M., Møller, N.C., Kristensen, P.L., Wedderkopp, N., Froberg, K., Hu, F.B., Ekelund, U. & Andersen, L.B. (2014). Youth screen-time behaviour is associated with cardiovascular risk in young adulthood: The European Youth Heart Study. *European Journal of Preventive Cardiology*, 21, 49-56.

- Hattie, J., Marsh, H. W., Neill, J. T., & Richards, G. E. (1997). Adventure Education and Outward Bound: Out-of-class experiences that make a lasting difference. *Review of Educational Research*, 67, 43–87.
- Hayhurst, J., Hunter, J.A., Kafka, S. & Boyes, M. (2015). Enhancing resilience in youth through a 10-day developmental voyage. *Journal of Adventure Education and Outdoor Learning*, 15, 40–52.
- Henderson, B. & Vikander, N. (2007). *Nature First. Outdoor Life the Friluftsliv Way*. Toronto: Natural Heritage Books.
- Herrick, K. A., Fakhouri, T. H. I., Carlson, S. A. & Fulton, J. E. (2014). *TV watching and computer use in U.S. youth aged 12–15, 2012*. National Center for Health Statistics.
- Hopkins, D. & Putnam, R. (1997). *Personal growth through adventure*. London: D. Fulton.
- Howden, E. (2012). Outdoor Experiential Education: Learning through the body. *New Directions for Adult and Continuing Education*, 134, 43–51.
- Iannotti, R.J., Janssen, I., Haug, E., Kololo, H., Annaheim, B., Borraccino, A. & the HBSC Physical Activity Focus Group (2009). Interrelationships of adolescent physical activity, screen-based sedentary behaviour, and social and psychological health. *International Journal of Public Health*, 54, 191–198.
- Iannotti, R.J., Kogan, M.D., Janssen, I. & Boyce, W.F. (2009). Patterns of adolescent physical activity, screen-based media use, and positive and negative health indicators in the U.S. and Canada. *Journal of Adolescent Health*, 44, 493–499.
- Janssen, I. (2016). Estimating whether replacing time in active outdoor play and sedentary video games with active video games influences youth's mental health. *Journal of Adolescent Health*, 59, 517–522.
- Kocalevent, R., Levenstein, S., Fliege, H., Schmid, G., Hinz, A., Brähler, E. & Klapp, B.F. (2007). Contribution to the construct validity of the Perceived Stress Questionnaire from a population-based survey. *Journal of Psychosomatic Research*, 63, 71–81.
- Kolb, D.A. (1984). *Experiential Learning*. Englewood Cliffs: Prentice Hall.
- Levenstein, S., Prantera, C., Varvo, V., Scribano, M.L., Berto, E., Luzi, C. & Andreoli, A. (1993). Development of the Perceived Stress Questionnaire: A new tool for psychosomatic research. *Journal of Psychosomatic Research*, 37, 19–32.
- Liu, M., Wu, L. & Yao, S. (2016). Dose-response association of screen time-based sedentary behaviour in children and adolescents and depression: a meta-analysis of observational studies. *British Journal of Sports Medicine*, 50, 1252–1258.
- Luckner, J.L. & Nadler, R.S. (1997). *Processing the experience: Strategies to enhance and generalize learning*. Dubuque: Kendall/Hunt Publishing Company.
- Maher, C., Olds, T.S., Eisenmann, J.C. & Dollman, J. (2012). Screen time is more strongly associated than physical activity with overweight and obesity in 9- to 16-year-old Australians. *Acta Paediatrica*, 101, 1170–1174.
- Marshall, S.J., Gorely, T. & Biddle, S.J. (2006). A descriptive epidemiology of screen-based media use in youth: a review and critique. *Journal of Adolescence*, 29, 333–349.
- McKenzie, M.D. (2003). Beyond 'The Outward Bound Process': Rethinking student learning. *Journal of Experiential Education*, 26, 8–23.
- Mutz, M. & Müller, J. (2016). Mental health benefits of outdoor adventures: Results from two pilot studies. *Journal of Adolescence*, 49, 105–114.
- Neil, J.T. & Dias, K.L. (2001). Adventure education and resilience: The double-edged sword. *Journal of Adventure Education and Outdoor Learning*, 1, 35–42.

- Olds, T.S., Maher, C.A., Ridley, K. & Kittel, D.M. (2010). Descriptive epidemiology of screen and non-screen sedentary time in adolescents: A cross sectional study. *International Journal of Behavioral Nutrition and Physical Activity*, 7, 92.
- Parent, J., Sanders, W. & Forehand, W. (2016). Youth screen time and behavioral health problems: The role of sleep duration and disturbances. *Journal of Developmental and Behavioral Pediatrics*, 37, 277-284.
- Ponti, M., Belanger, S., Grimes, R., Heard, J., Johnson, M., Maoreau, E., Norris, M. et al. (2017). Screen time and young children: Promoting health and development in a digital world. *Paediatrics & Child Health*, 22, 461-468.
- Pretty, J., Peacock, J., Sellens, M. & Griffin, M. (2005). The mental and physical health outcomes of green exercise. *International Journal of Environmental Health Research*, 15, 319-337.
- Priest, S. & Gass, M.A. (2005). *Effective leadership in adventure programming*. Champaign: Human Kinetics.
- Propst, D.B. & Koesler, R.A. (1998). Bandura goes outdoors: Role of self-efficacy in the outdoor leadership development process. *Leisure Science*, 20, 319-344.
- Rohnke, K. (1989). *Cowstails and cobras II: A guide to games, initiatives, ropes courses & adventure curriculum*. Hamilton: Project Adventure.
- Sanz-Carillo, C., García-Campayob, J., Rubiod, A., Santed, M.A. & Montoro, M. (2002). Validation of the Spanish version of the Perceived Stress Questionnaire. *Journal of Psychosomatic Research*, 52, 167-172.
- Schnell, R., Bachteler, T. & Reiher, J. (2010). Improving the use of self-generated identification codes. *Evaluation Review*, 34, 391-418.
- Scrutton, R.A. (2015). Outdoor adventure education for children in Scotland: quantifying the benefits. *Journal of Adventure Education and Outdoor Learning*, 15, 123-137.
- Shiue, I. (2016). Modeling indoor TV/screen viewing and adult physical and mental health: Health Survey for England, 2012. *Environmental Science and Pollution Research*, 23, 11708-11715.
- Sibthorp, J., Paisley, K. & Gookin, J. (2007). Exploring participant development through adventure-based programming: A model from the National Outdoor Leadership School. *Leisure Science*, 29, 1-18.
- Spengler, S., Mess, F. & Woll, A. (2015). Do media use and physical activity compete in adolescents? Results of the MoMo Study. *PLOS ONE* 10(12): e0142544.
- Suchert, V., Hanewinkel, R. & Isensee, B. (2015). Sedentary behavior and indicators of mental health in school-aged children and adolescents: a systematic review. *Preventive Medicine*, 76, 48-57.
- Tandon, P.S., Zhou, C., Sallis, J.F., Cain, K.L., Frank, L.D. & Saelens, B.E. (2012). Home environment relationships with children's physical activity, sedentary time, and screen time by socioeconomic status. *International Journal of Behavioral Nutrition and Physical Activity*, 9, 88.
- Tremblay, M.S., LeBlanc, A.G., Kho, M.E., Saunders, T.J., Larouche, R., Colley, R.C., Goldfield, G. & Gorber, S.C. (2011). Systematic review of sedentary behaviour and health indicators in school-aged children and youth. *International Journal of Behavioral Nutrition and Physical Activity*, 8, 98-112.
- Tremblay, M.S., LeBlanc, A.G., Janssen, I., Kho, M.E., Hicks, A., Murumets, K., Colley, R.C. & Duggan, M. (2011). Canadian sedentary behaviour guidelines for children and youth. *Applied Physiology, Nutrition, and Metabolism*, 36, 65-71.
- Walsh, V. & Golins, G. (1976). *The exploration of the Outward Bound process*. Denver: Colorado Outward Bound School.
- Whittington, A., Aspelmeier, J.E. & Budbill, N.W. (2016). Promoting resiliency in adolescent girls through adventure programming. *Journal of Adventure Education and Outdoor Learning*, 16, 2-15.
- Widmer, M.A., Duerden, M.D. & Taniguchi, S.T. (2014). Increasing and generalizing self-efficacy. The effects of adventure recreation on the academic efficacy of early adolescents. *Journal of Leisure Research*, 46, 165-183.
- World Health Organization (2002). *The World Health Report 2001. Mental Health: New Understanding, new Hope*. Geneva: WHO.