Dissemination of an Internet-Based Program for the Prevention and Early Intervention in Eating Disorders

Relationship Between Access Paths, User Characteristics, and Program Utilization

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Abstract: *Objective:* Research on the dissemination of e-mental health interventions is in an early stage, so that little is known about the reach, costs, participant characteristics, and patterns of program utilization associated with different recruitment strategies and access paths. This study investigated differences between user groups informed about an Internet-based program for the prevention and early intervention in eating disorders via different recruitment channels. *Method:* Participant characteristics and user behavior of 3548 participants in the Internet-based program ProYouth were analyzed. Participants were informed about ProYouth via different channels (e.g., print materials, high school, Internet). *Results:* Results indicate significant relationships between access paths and both user characteristics and program utilization. Participants who were informed about ProYouth at their high schools were more likely to be male, younger, and at lower risk of developing eating disorders. In contrast, other recruitment channels (e.g., Internet, print materials) resulted in participants with significantly higher risk and symptom levels who used the program more frequently and with higher intensity. *Conclusion:* Efforts aimed at the dissemination of Internet-based interventions should consider the effects that different recruitment channels and access paths may have on sample composition and utilization of the intervention.

Keywords: eating disorders, prevention, Internet, dissemination, access

Dissemination eines Internetbasierten Programms zur Prävention und Frühintervention bei Essstörungen: Zusammenhänge zwischen Zugangswegen, Teilnehmercharakteristika und Programmnutzung

Zusammenfassung: *Fragestellung:* Die Forschung zur Dissemination von E-Mental Health Interventionen befindet sich in den Anfängen. Bislang ist wenig darüber bekannt, wie beispielsweise Reichweite, Kosten, Teilnehmercharakteristika und Nutzungsverhalten mit unterschiedlichen Rekrutierungsstrategien und Zugangswegen zusammenhängen. Ziel der vorliegenden Studie war es deshalb, Unterschiede zwischen Nutzergruppen zu analysieren, die über verschiedene Kanäle für die Teilnahme an einem Internetbasierten Programm zur Prävention und Frühintervention bei Essstörungen rekrutiert wurden. *Methodik:* Es wurden Teilnehmercharakteristika und Nutzungsverhalten von 3548 Teilnehmern des Programms ProYouth analysiert, die auf unterschiedliche Arten (z. B. Printmaterialien, Schule, Internet) über das Programm informiert wurden. *Ergebnisse:* Die Ergebnisse zeigen signifikante Zusammenhänge zwischen den Zugangswegen zum Programm auf der einen und Teilnehmercharakteristika und Programmnutzung auf der anderen Seite. Teilnehmer, die an ihrer Schule über ProYouth informiert wurden, waren mit größerer Wahrscheinlichkeit männlich, jünger und wiesen ein geringeres Risiko für Essstörungen auf. Andere Rekrutierungswege (z. B. Internet, Printmaterialien) führten hingegen zu Teilnehmern, die ein signifikant höheres Risiko und stärkere Symptombelastung aufwiesen und das Programm häufiger und intensiver nutzten. *Schlussfolgerung:* Bei der Implementierung und Dissemination von Internetbasierten Interventionen sollten die Auswirkungen unterschiedlicher Rekrutierungsstrategien und Zugangswege auf die Stichprobenzusammensetzung und Programmnutzung berücksichtigt werden.

Keywords: Essstörungen, Prävention, Internet, Dissemination, Zugang

Introduction

Eating disorders are severe mental illnesses with a typical onset in adolescence and early adulthood (Nagl et al., 2016; Stice, Marti, Shaw, & Jaconis, 2009). They are asso-

ciated with substantial impairment of psychological, physical, and social well-being, and induce high utilization and costs of healthcare (Crow, 2014; Klump, Bulik, Kaye, Treasure, & Tyson, 2009). The widespread availability of effective programs for the prevention and early interven-

tion is considered essential to reducing the burden of illness associated with eating disorders on a population level. Two recent systematic reviews and meta-analyses describe the current evidence base in the prevention of eating disorder separately for universal, selective, and indicated approaches (Le, Barendregt, Hay, & Mihalopoulos, 2017; Watson et al., 2016). The use of Internet technology for developing such interventions makes intuitive sense for several reasons, including the fact that Internet-based programs are assumed to have a large reach at relatively low cost, that they may be managed by a central provider, and that participants may access them at any time and from anywhere. Thus, they may help to reach currently underserved populations and to improve access to preventive and therapeutic interventions (Aardoom, Dingemans, & van Furth, 2016).

To date, studies in the field of eating-disorder prevention have focused on the feasibility, acceptability, and efficacy of such programs with overall promising findings (Bauer, Kindermann, & Moessner, 2016; Beintner, Jacobi, & Taylor, 2012; Melioli et al., 2015). However, most of these studies have been conducted on relatively small samples evaluating the effects of Internet-based prevention programs in terms of risk-factor or symptom reduction. The few efficacy trials that have investigated the impact of Internet-based prevention programs on the actual rate of eating disorder onset – the most adequate outcome criterion in prevention research – led to mixed results and proved their efficacy only in subgroups of participants (Lindenberg & Kordy, 2015; Taylor et al., 2006; Taylor et al., 2016). There is a clear need for more rigorously conducted, large-scale, randomized and controlled trials (Ebert, Cuijpers, Muñoz, & Baumeister, 2017). Recently, Wade and Wilksch (2018) reviewed five studies on Internet-based prevention published since 2016. These trials investigated the efficacy of three different online approaches, i.e., cognitive dissonance, media literacy, and cognitive behavior therapy, demonstrating that all interventions were superior to a control condition with small-to-medium effect sizes.

Subsequent to the investigation of its efficacy and effectiveness, it is necessary to demonstrate that a preventive intervention may be disseminated to large samples under less controlled, routine conditions. This challenge of translating interventions from the research setting to real-world contexts has been discussed for the prevention of mental illness in general (e.g., Frantz, Stemmler, Hahlweg, Plück, & Heinrichs, 2015) as well as for the prevention of eating disorders in particular (Atkinson & Wade, 2013; Becker, 2017; Becker, Stice, Shaw, & Woda, 2009). Since the public-health impact of preventive efforts similarly depends on both their efficacy and their reach, studies on the latter are of utmost importance (Glasgow et al., 2012; Muñoz,

Beardslee, & Leykin, 2012). However, in the field of eating-disorder prevention, systematic research on the implementation, dissemination, and sustainability of Internet-based approaches is still at a very early stage (Bauer & Moessner, 2013; Paxton, 2013). Only recently have teams begun to address these aspects empirically in the context of the European initiative *ProYouth* (Bauer et al., 2013; Minarik et al., 2013; Moessner, Minarik, Oezer, & Bauer, 2016) and within the US-based *Healthy Body Image Program* (Fitzsimmons-Craft et al., in press; Jones et al., 2014; Kass et al., 2017).

One relevant, albeit understudied topic concerns the question of how target populations should be approached in order to engage them in an online eating-disorder prevention program. Participants may be recruited through conventional channels (e.g., print materials, press releases, presentations/workshops at high school or universities) as well as through various online channels (e.g., email campaigns, social media, postings to websites/online forums). So far, however, little is known about the reach, costs, participant characteristics, and patterns of program utilization associated with these different strategies. Research in other fields (e.g., smoking cessation) revealed that populations informed about an online intervention in distinct ways differ in terms of sociodemographic variables and impairment levels as well as in their rates of intervention uptake and intensity of program use (Ramo, Hall, & Prochaska, 2010; Smit, Hoving, Cox, & de Vries, 2012; Stanczyk et al., 2014). Against this background, the present study investigated differences between user groups that learned about an Internet-based program for the prevention and early intervention in eating disorders (“ProYouth”) via different channels. Specifically, we analyzed differences in user characteristics (age, sex, eating disorder risk and symptomatology) and utilization of the program.

Materials and Methods

The ProYouth Program

ProYouth is a comprehensive online platform integrating screening, prevention, and early intervention related to eating disorders. It was developed in particular to target young people aged 15 to 25 years, though participation is also possible for younger or older individuals as well, as long as the program is openly accessible on the Internet. ProYouth comprises both fully automated and personalized modules that participants may use flexibly depending on their needs and preferences. This clearly distinguishes ProYouth from most other online prevention programs, which are usually manualized/structured and

expect participants to work through a fixed number of sessions over several weeks. Following an initial *online screening* to assess individuals' level of risk for the development of an eating disorder, users are encouraged to register for participation in ProYouth if they endorse eating disorder-related risk factors or slight symptoms. Those who do not meet these criteria receive the feedback message that participation in the ProYouth program is probably not necessary (in case of low risk/no symptoms) or insufficient (in case of severe symptoms). However, these individuals may still register, as the program is publicly available on the Internet. Registered participants may access comprehensive information and psychoeducation materials. Furthermore, they may use the *supportive online monitoring* tool to help them to detect emerging problematic attitudes and behaviors, to track their development over time, and to receive automatized feedback on the course of their symptoms. Also, they may engage in moderated peer-to-peer discussions via an *online forum*, and they may seek support via *chat counseling by a psychologist in a group or individual setting*. In case participants report substantial impairment, ProYouth counselors support participants in accessing conventional care (for a more detailed description of ProYouth, see Bauer et al., 2013).

Following research on the feasibility, acceptability, and efficacy of previous versions of the program (Bauer et al., 2009; Lindenberg & Kordy, 2015; Lindenberg et al., 2011), ProYouth was launched in November 2011 in several European countries. Various strategies were applied to promote and disseminate the program, including print materials (flyers and posters) sent to schools and other educational institutions as well as presentations and workshops at counseling centers, high schools, colleges, and universities. Activities in high schools typically included a 45-minute introductory interactive presentation on eating disorders and the ProYouth program, and an additionally offered 45-minute workshop in the computer room with the possibility for students to directly register to ProYouth. We also contacted universities and colleges via email (e.g., student counseling centers and student representatives). In addition, various forms of online advertisement were applied (e.g., links placed in various online forums and on health-related websites, advertisement via google, etc.).

Measures

Participant Characteristics

Eating disorder-related risk factors and symptoms were assessed with the Weight Concerns Scale (WCS; Killen et al., 1994) and the Short Evaluation of Eating Disorders (SEED;

Bauer, Winn, Schmidt, & Kordy, 2005), which participants completed as part of the online screening. The WCS is a commonly used screening instrument in the area of eating-disorder prevention to assess the risk for the development of an eating disorder. It consists of five items measuring fear of weight gain, worries about weight and shape, the importance of weight, recent dieting behavior, and perception of fatness on a Likert scale. The total score ranges from 0 to 100. Large-scale longitudinal studies show that a WCS score above 57 is associated with an elevated risk of developing an eating disorder (Killen et al., 1994; Killen et al., 1996). The SEED is a six-item questionnaire to assess key eating disorder symptoms. It was used in the present study to assess the BMI (weight and height) as well as frequencies of binge eating, and compensatory measures used to counteract weight gain (e.g., low-caloric food, laxatives, self-induced vomiting, excessive exercising). The screening also included questions on age, sex, education, and past/present utilization of treatment for an eating disorder. Finally, participants were asked how they learned about ProYouth. This question was used to determine participants' access path to the program. Answer options included a) presentation at the high school, b) an online link, c) a recommendation by a friend, d) print materials (flyer/poster), or e) another source of information). All items measuring participant characteristics were assessed via self-report because of the online setting of the present study.

Program Utilization

Utilization of the different modules was documented automatically (server logs). For the present study we also analyzed number of logins, number of monitoring assessments, number of forum visits, number of forum postings, participation in chat consultation (yes/no), and number of page hits.

Analyses

Data were analyzed from participants in the German version of ProYouth who registered between the launch of the platform in November 2011 and end of March 2015. Their registration had to be at least 3 months prior to data extraction, in order to make sure that the minimum participation time was 3 months. We also analyzed the differences between groups using the various access paths, whereby differences in metric variables were tested with ANOVAs, differences in categorical variables were tested with X²-tests, and median tests were applied for variables with nonnormal distributions. Associations were investigated by Spearman rank correlations and odds ratios.

Results

During the study period, more than 8,000 individuals completed the online screening, 3,548 thereof registering for participation. Most registered users (77.2%) stated that they had learned about the program at their high school. 7.2% accessed the intervention via a link they found on the Internet, 4.0% followed a recommendation of a friend, 3.3% saw print materials (flyer or poster), and 8.3% mentioned some other access path.

The groups differed significantly in terms of user characteristics (Table 1). Participants who had been informed about ProYouth in their high school were younger and more often male. They endorsed less weight concerns and less eating disorder symptomatology than the other groups. In line with this finding, only a few of these participants (2.7%) reported experiences with eating disorder treatment. In contrast, in the group of participants who accessed ProYouth via a weblink, 34.9% reported treatment experiences. Participants who accessed ProYouth via a weblink also reported the highest level of eating disorder risk and symptomatology across all measures (Table 1).

The results show a huge variability regarding frequency and intensity of program utilization. The number of logins ranged from 0 to 1,565 ($M = 3.9$; $SD = 37.8$), the number of monitorings from 0 to 107 ($M = 1.3$; $SD = 5.3$), and the number of page hits from 0 to 6,094 ($M = 34.1$; $SD = 243.5$). The number of forum visits and forum posts varied between 0 to 3,255 ($M = 5.5$; $SD = 73.6$) and between 0 to 424 ($M = 0.5$; $SD = 9.6$) respectively. Group comparisons revealed that participants introduced to ProYouth at their high school used the program with the lowest frequency and intensity (Table 2).

In additional analyses we explored the relationship between participants' baseline risk/symptom level and their utilization of the program (Table 3). The results show that baseline characteristics were only loosely correlated with the number of logins, completed monitoring assessments, page hits, and forum visits, while stronger associations were found with the more intense parts of the intervention (forum posts and chat participations). In addition, age was correlated with utilization between $r_{\text{spearman}} = .17$ (age $\times$ logins) and $r_{\text{spearman}} = .25$ (age $\times$ forum visits; all $p < .01$). All correlations of BMI with utilization were below .1.

Table 1. Screening characteristics

		Total (<i>N</i> = 3548)	School (<i>N</i> = 2739)	Online link (<i>N</i> = 255)	Recommen- ded by friend (<i>N</i> = 141)	Flyer/ poster (<i>N</i> = 118)	Other (<i>N</i> = 295)	Test statistics	<i>p</i>
Age	<i>M</i> (<i>SD</i>)	16.6 (5.40)	15.0 (2.58)	22.3 (7.40)	20.9 (8.3)	23.2 (8.5)	22.5 (7.7)	$F_{(4,3542)} = 438.2$	<.001
Sex	% female	69.5	62.7	96.1	90.1	89.0	91.2	$\chi^2_{(4)} = 260.9$	<.001
BMI	<i>M</i> (<i>SD</i>)	20.76 (3.98)	20.68 (3.79)	20.94 (4.37)	20.50 (4.25)	21.21 (4.70)	21.26 (4.80)	$F_{(4,3486)} = 1.99$	.093
WCS	<i>M</i> (<i>SD</i>)	40.3 (28.3)	32.4 (24.1)	72.9 (22.0)	64.9 (26.3)	63.6 (26.1)	62.7 (25.6)	$F_{(4,3542)} = 310.2$	<.001
WCS > 57	%	29.0	17.4	78.8	65.7	63.6	63.1	$\chi^2_{(4)} = 812.7$	<.001
Bingeing ¹	%	36.5	27.3	76.9	66.0	63.6	61.7	$\chi^2_{(4)} = 449.1$	<.001
Laxatives ¹	%	5.7	2.8	21.6	10.6	12.7	13.9	$\chi^2_{(4)} = 215.1$	<.001
Vomiting ¹	%	11.4	4.5	47.5	29.1	28.8	28.1	$\chi^2_{(4)} = 619.0$	<.001
Low calorie food ¹	%	38.9	29.0	81.2	69.5	63.6	69.5	$\chi^2_{(4)} = 507.0$	<.001
Exercise ¹	%	48.2	46.7	58.0	61.0	52.5	46.4	$\chi^2_{(4)} = 23.0$	<.001
Bingeing and vomiting ¹	%	9.7	3.4	42.0	27.0	28.8	24.7	$\chi^2_{(4)} = 599.3$	<.001
Previous tx	%	8.9	2.7	34.9	29.1	22.0	28.9	$\chi^2_{(4)} = 584.5$	<.001

Note. BMI = body mass index; WCS = Weight Concerns Scale; tx = treatment for eating disorders; 1 = engaged in this behavior at least once in the past week.

Table 2. Utilization of the ProYouth online program

	Total (N = 3,548)	School (N = 2,739)	Online link (N = 255)	Recommended by friend (N = 141)	Flyer/poster (N = 118)	Other (N = 295)	Test statistics	p
Logins*	M (Md [IQR])	1.3 (1 [0–1])	13.4 (2 [1–5])	20.4 (1 [1–3])	6.2 (1 [0–3])	11.3 (1 [0–4])	$\chi^2_{(4)} = 327.6$	<.001
Monitorings*	M (Md [IQR])	1.3 (0 [0–1])	0.7 (0 [0–0])	2.6 (0 [0–2])	2.5 (0 [0–2])	3.7 (1 [0–3])	$\chi^2_{(4)} = 308.6$	<.001
Forum posts	%	3.3	1.4	11.4	9.9	10.2	$\chi^2_{(4)} = 150.2$	<.001
Chats	%	3.0	1.1	10.2	11.4	7.8	$\chi^2_{(4)} = 150.7$	<.001
Page hits*	M (Md [IQR])	34.1 (4 [0–15])	12.8 (2 [0–11])	129.7 (19 [2–53])	116.0 (13 [3–34])	63.4 (11 [0–28])	$\chi^2_{(4)} = 223.6$	<.001
Forum visits*	M (Md [IQR])	5.5 (0 [0–0])	1.1 (0 [0–0])	21.2 (1 [0–7])	27.4 (0 [0–3])	8.9 (0 [0–2])	$\chi^2_{(4)} = 585.2$	<.001

Note. Logins = number of logins to ProYouth; Monitorings = number of completed monitoring questionnaires; Forum posts = number of contributions to the forum; Chats = participation in online counseling chat session (group or individual); Page hits = number of pages accessed in the participant area (i.e., after login); Forum visits = number of pages accessed in the forum (i.e., after login); IQR = inter quartile Range; * = median test.

Table 3. Relationship between baseline characteristics and utilization (N = 3,548)

	Sex	WCS > 57	Bingeing	Laxatives	Vomiting	Low-calorie food	Exercise	Bingeing and vomiting	Previous tx
Logins	r_{spearman} .18**	.21**	.13**	.04**	.14**	.15**	.00	.14**	.14**
Monitorings	r_{spearman} .23**	.22**	.13**	.07**	.14**	.17**	.02	.17**	.14**
Page hits	r_{spearman} .17**	.21**	.14**	.05**	.14**	.14**	.00	.14**	.15**
Forum visits	r_{spearman} .18**	.25**	.17**	.13**	.20**	.19**	.01	.20**	.23**
Forum posts	OR [CI]	4.3 [2.3–8.1]	5.3 [3.6–7.9]	3.7 [2.2–6.1]	4.3 [2.9–6.4]	3.8 [2.5–5.7]	1.2 [0.8–1.7]	OR = 3.8 [2.5–5.8]	OR = 5.3 [3.5–8.0]
Chats	OR [CI]	47.7 [6.6–341]	10.6 [6.5–17.1]	3.8 [2.5–5.7]	5.4 [3.6–8.2]	7.5 [4.6–12.4]	1.4 [1.0–2.1]	OR = 4.6 [3.0–7.1]	OR = 2.9 [1.8–4.7]

Note. Logins = number of logins to ProYouth; Monitorings = number of completed monitoring questionnaires; Forum posts = number of contributions to the forum; Chats = participation in online counseling chat session (group or individual); Page hits = number of pages accessed in the participant area (i.e., after login); Forum visits = number of pages accessed in the forum (i.e., after login); WCS = Weight Concerns Scale; tx = treatment; OR = odds ratio; r_{spearman} = Spearman rank correlations; CI = confidence interval; **p < .01.

Discussion

There can be no doubt that successful eating disorder prevention requires scalable interventions. A recent simulation study revealed that increasing the reach of both eating disorder prevention and treatment programs is the most promising strategy for reducing the disease burden associated with eating disorders on a population level (Moessner & Bauer, 2017). Theoretically, of course, the reach of Internet-based prevention programs is huge, but in practice, recruiting participants for such programs can be challenging. The investigation of specific strategies with respect to their effect (i.e., with respect to the number of participants reached), costs, and cost-effectiveness as well as research on differences between subgroups recruited via these strategies may inform future dissemination efforts. The present study contributes to this emerging field of research by analyzing user characteristics and program utilization depending on participants' access path.

The findings indicate that different access paths were associated with differences in both sample composition and program utilization. Compared to participants who had been informed about ProYouth at their high school, access via other paths resulted in users who were at significantly higher risk for eating disorders and on average more symptomatic. In addition, participants who had not been recruited via high schools utilized the program more frequently and more intensively. This finding was consistent across all measures of user activity. As expected, a higher symptom level at baseline was associated with higher utilization of the more intense modules of ProYouth; in other words, participants with greater symptomatology were more likely to post to the forum and to engage in chat counseling sessions. This agrees with the basic concept of the intervention, which seeks to match the level of support to participants' individual needs.

The observed differences between the groups most likely reflect the fact that non-school-based access is strongly affected by self-selection: Participants who decided to access the program based on online information (weblink) or print materials (flyer/poster) and those who followed the recommendation of a friend reported high levels of eating disorder-related risk factors and symptoms and approximately 30 % had already utilized treatment for an eating disorder. We assume that these individuals were actively searching for support and were motivated to take up the intervention because of a manifest impairment. For many of these individuals, prevention obviously comes too late, as they are already affected by subthreshold or full-blown eating disorders. In contrast, school-based recruitment, a more universal approach, resulted in a younger, more healthy subsample and a higher participation rate among males. Based on these findings, it seems that similar to

conventional prevention programs, high schools may be a good setting for the implementation of population-based online screening and prevention programs – even though the intervention itself will then mostly be used by participants outside of the classroom via the Internet.

The results have important implications for future developments and research. Especially in the case of recruitment outside of schools, it is important to connect online programs with conventional healthcare as a subgroup of participants likely are severely impaired. In addition, it is important to note that, depending on the recruitment strategy, the costs for providing the intervention may differ substantially. In the case of ProYouth, more intense utilization is associated with higher costs because more staff time is required (to monitor forum discussions and to provide chat consultation). For the current program version, costs are estimated at EUR 15 per participant per year, which includes provisions for the technological infrastructure and delivery of the actual intervention in Germany (Minarik et al., 2013). Additional costs accrue for the dissemination of the program (Moessner et al., 2016). Based on the findings of the present study, these cost estimates may change depending on future advertisement strategies because of their effect on both sample composition and patterns of program utilization. In general, it is important that the development of online prevention programs is accompanied by a dissemination plan and a respective budget plan considering expenses related to the sustained delivery of the intervention. In addition, such a plan must consider the resources required for the longer-term recruitment and dissemination itself (e.g., school-based activities, print and online advertisement).

Several limitations of the study should be noted. Participant characteristics and access paths were determined solely via self-report and therefore might be prone to bias. In addition, we did not differentiate between different types of schools. Also, we cannot exclude overlap between different access paths: For example, participants might have been informed about the program with flyers in their school, so that in some cases it might not have been clear to them which option to choose (“I learned about ProYouth in my school” versus “I learned about ProYouth via print materials”). In the present study, a substantial proportion of participants stated that they learned about ProYouth via “another source of information.” Since less than 20 % of them provided additional information about their access path, it remains largely unknown how these participants became aware of the program. Furthermore, participation time was not controlled for. Although it may be assumed that participation time is equally distributed between groups, this yields increased variance in program utilization. Finally, we did not analyze acceptability and outcome data, i.e., no con-

clusions may be drawn on user satisfaction and on the effectiveness of ProYouth in the groups that learned about the program via different sources.

Despite these limitations, the present study provides valuable insights related to the implementation and dissemination of Internet-based programs for the prevention and early intervention of eating disorders. Clearly, more research in this area is needed to facilitate the translation of prevention programs into routine healthcare.

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Acknowledgment

The ProYouth initiative received funding from the European Union, in the framework of the Health Programme (PROYOUTH 20101209).

Conflicts of Interests

There are no conflicts of interest.

History

Manuscript submitted: 31.03.2018
Accepted after revision: 18.02.2019
Published online: 03.05.2019

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