Problem Gambling and Its Relation to Delay Discounting: A Randomized Controlled Trial

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Dominic Haag, Andreas Meyer, Nikolaos Boumparis, Andreas Wenger, Christian Baumgartner, Doris Malischnig, Michael P. Schaub

Swiss Research Institute for Public Health and Addiction ISGF

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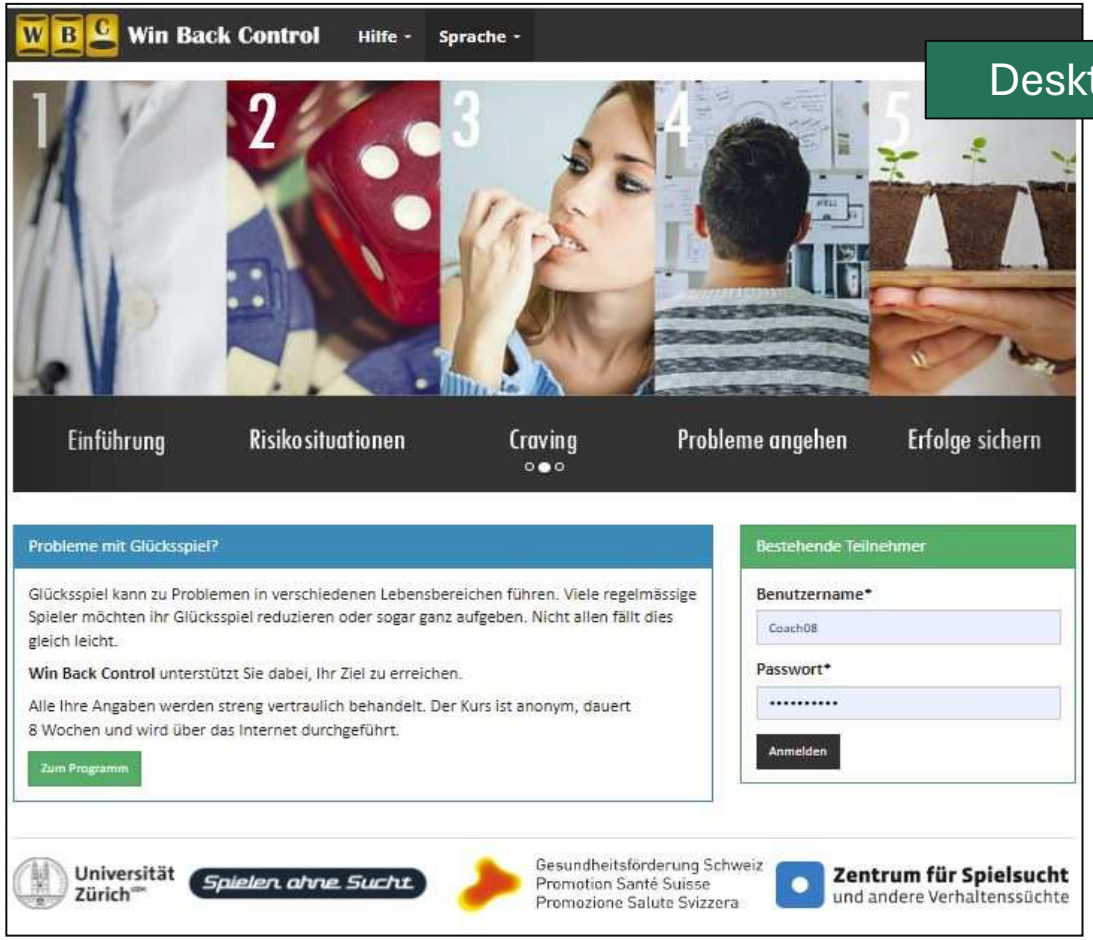
Schweizer Institut für Sucht- und Gesundheitsforschung
Swiss Research Institute for Public Health and Addiction
Institut suisse de recherche sur la santé publique et les addictions

Universität Zürich[UZH]

WBC Win Back Control

What is «Win Back Control» and what does it do?

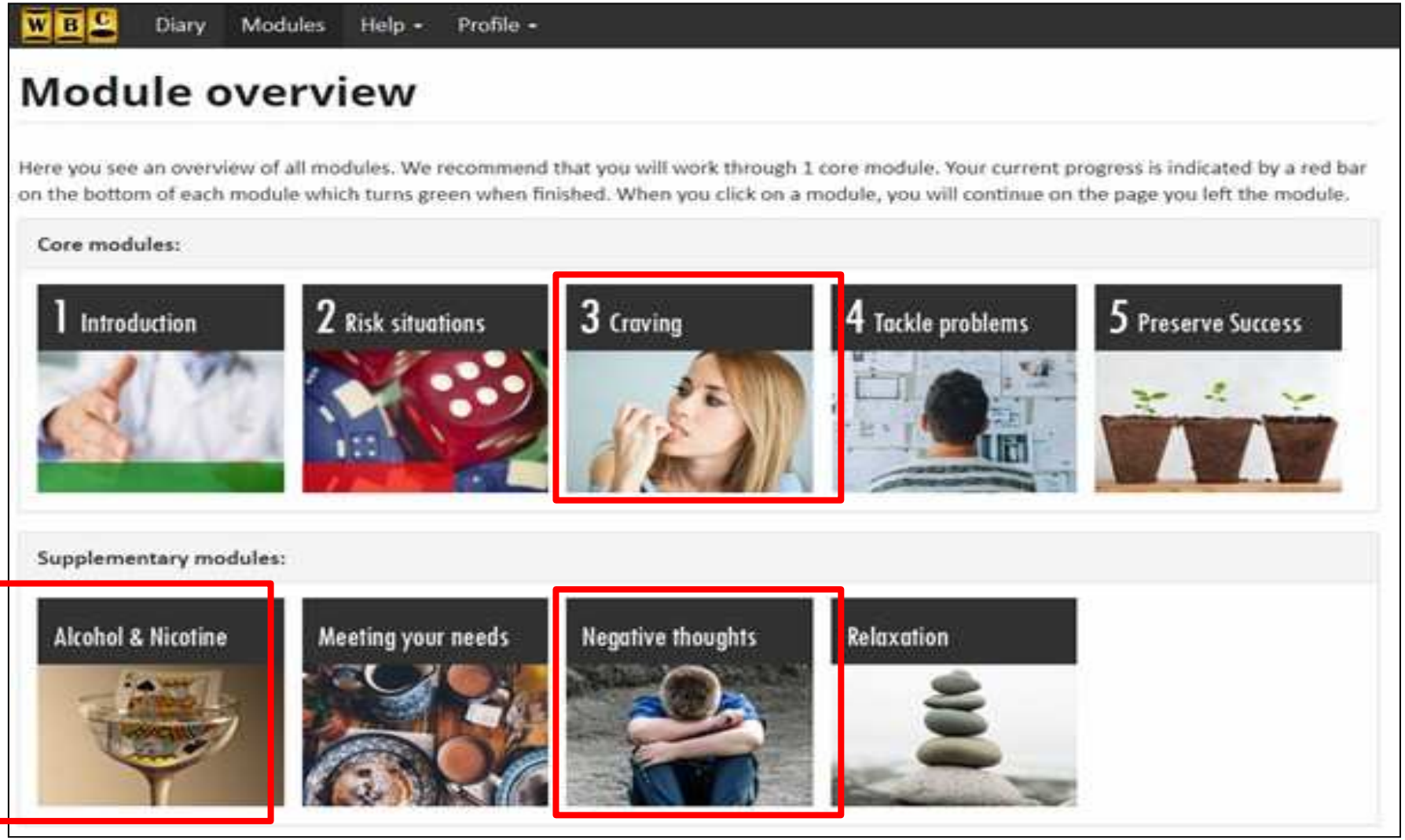
Desktop version



Mobile version

Core Features of WBC

How can WBC help people reduce or overcome their problem gambling?

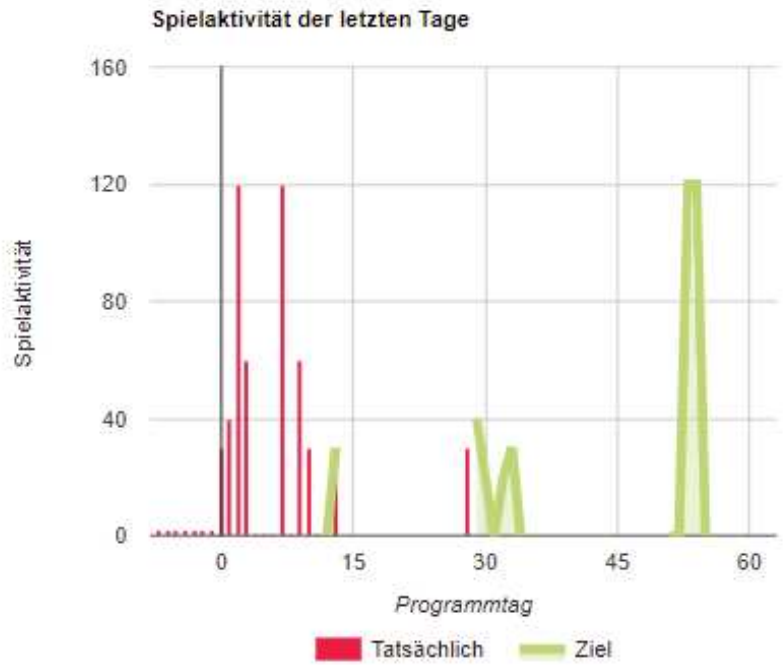

WBC
Diary
Modules
Help
Profile
Module overview
Here you see an overview of all modules. We recommend that you will work through 1 core module. Your current progress is indicated by a red bar on the bottom of each module which turns green when finished. When you click on a module, you will continue on the page you left the module.
Core modules:
1 Introduction
2 Risk situations
3 Craving
4 Tackle problems
5 Preserve Success
Supplementary modules:
Alcohol & Nicotine
Meeting your needs
Negative thoughts
Relaxation

Glücksspiel der letzten Woche

Geben Sie ein, wie viele Minuten Sie in den letzten 7 Tagen gespielt haben. An Tagen an de
Sie auch an wie viel Geld Sie beim Glücksspiel (in Franken) gewonnen oder verloren (mit -

	SA, 11.06	SO, 12.06	MO, 13.06	DI, 14.06
Glücksspieldauer Ziel				
Glücksspieldauer	342	126	89	
Glücksspiel Bilanz (±)	± 3433	± 346	± 128	±
Stimmung	2	7	5	

Fortschrittsgrafik



Ängstlichkeit (GAD-7)

Sie erreichten **12/21** Punkte. Es bestehen Hinweise auf eine mittelschwere Angststörung. Wir empfehlen Ihnen, während des Kurses sich das Modul „An Bedürfnissen arbeiten" anzuschauen.

Stimmung (PHQ-9)

Sie erreichten **9/27** Punkte. Es bestehen Hinweise auf eine leichte Depression. Wir empfehlen Ihnen, während des Kurses sich das Modul „Negative Gedanken" anzuschauen.

Konzentration (ASRS)

Sie erreichten **6/24** Punkte. Es gibt leichte Hinweise für eine ADHS.

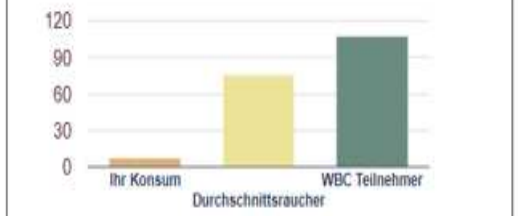
Alkoholabhängigkeit (AUDIT)

Sie erreichten **22/40** Punkte. Es ist wahrscheinlich, dass Ihr Trinken schädlich ist. Sprechen Sie mit Ihrem Arzt oder einem Suchtspezialisten. Fragen Sie nach Medikamenten und Ratschlägen, die Ihnen helfen können, mit dem Trinken aufzuhören. Wenn Sie alkoholabhängig sind, hören Sie nicht ohne die Hilfe eines Arztes auf zu trinken. Wir empfehlen Ihnen, auch während des Kurses sich das Modul „Alkohol & Nikotin" anzuschauen.

Glücksspielsymptome (G-SAS)

Sie erreichten **20/48** Punkte. Sie haben eine leichte Glücksspielsymptomatik.

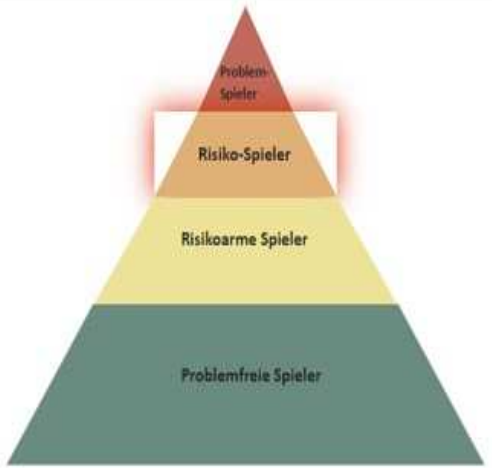
Zigarettenkonsum der letzten Woche



Alkoholkonsum der letzten Woche

Problematisches Glücksspiel (PGSI)

Sie erreichten **4/27** Punkte. Sie haben ein moderates Glücksspielrisiko. Ihr Glücksspiel führt möglicherweise zu negativen Folgen in Ihrem Leben. Vielleicht spielen Sie mit mehr Geld als Sie sich leisten können, verlieren Ihr Zeitgefühl beim Spielen oder fühlen sich schuldig wegen Ihrem Glücksspiel.



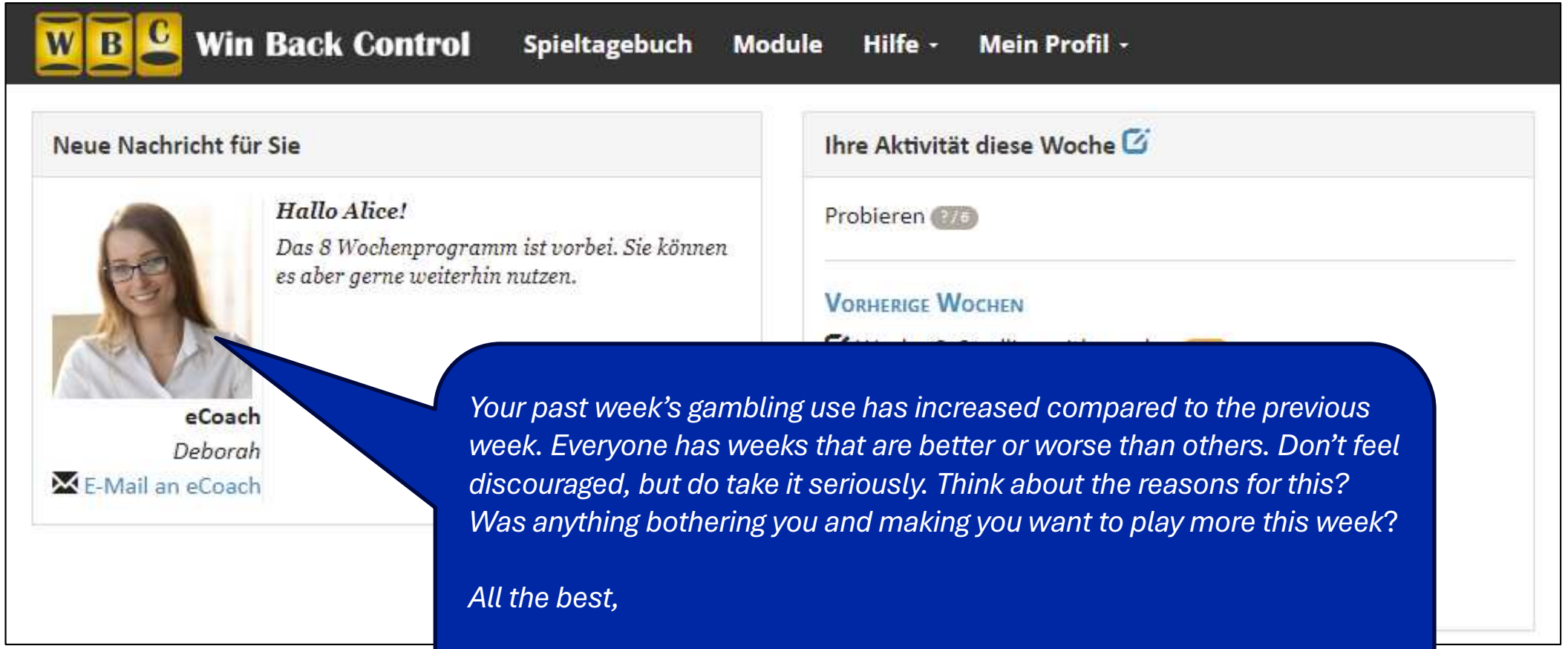
Glücksspielkosten

Sie haben in den letzten 30 Tage **900 Franken** für Glücksspiel ausgegeben. Für dieses Geld hätten Sie sich all diese folgende Dinge leisten können:

Eine neue Kamera

Einen Restaurantbesuch für 2


Win Back Control
Spieltagebuch
Module
Hilfe
Mein Profil
Neue Nachricht für Sie
Personalized eCoach
Hallo Alice!
Das 8 Wochenprogramm ist vorbei. Sie können es aber gerne weiterhin nutzen.
eCoach
Deborah
E-Mail an eCoach
Ihre Aktivität diese Woche
Activity tracker
Probieren 2 / 6
Vorherige Wochen
Woche 6: Strolling with my dog 7 / 5
Woche 5: Blumen für meine Mutter 4 / 4
Woche 4: Fussball spielen 10 / 7
Woche 3: Spazieren 4 / 10
Woche 2: Kaffee trinken 4 / 5
Woche 1: Meine beste Freundin anrufen 8 / 5


Win Back Control
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Hilfe
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Neue Nachricht für Sie
Hallo Alice!
Das 8 Wochenprogramm ist vorbei. Sie können es aber gerne weiterhin nutzen.
eCoach
Deborah
E-Mail an eCoach
Ihre Aktivität diese Woche
Probieren
Vorherige Wochen
Your past week's gambling use has increased compared to the previous week. Everyone has weeks that are better or worse than others. Don't feel discouraged, but do take it seriously. Think about the reasons for this? Was anything bothering you and making you want to play more this week?
All the best,
Your eCoach Deborah


Sonia - Kontrolliert Spielen
Link kopier...
Den vollständigen Film finden Sie unter www.sos-spielsucht.ch


Ismail - Chasing
Link kopier...
Den vollständigen Film finden Sie unter www.sos-spielsucht.ch


Malik
Corinne
Samuel
Marcel
Priska
Almedina
Samuel, 42, arbeitssuchend
Hallo, ich bin Samuel. Aktuell bin ich auf der Suche nach einer neuen Anstellung. Ich gehe gerne ins Casino und spiele am liebsten Blackjack und Roulette. Das Personal dort ist sehr freundlich, und man fühlt sich wertgeschätzt. Das Casino erlaubt mir, aus meinem tristen und langweiligen Alltag auszubrechen und etwas Aufregendes zu erleben. Eigentlich sollte ich nicht spielen, da ich nicht wirklich das Geld dazu habe und schon einige Schulden bei verschiedenen Leuten habe. Aber ich hoffe immer noch auf den grossen Gewinn: Dann könnte ich meine Schulden zurückzahlen und überhaupt aufhören, eine Arbeit zu suchen. Ich könnte mir schöne Reisen leisten und das Leben in vollen Zügen geniessen!

Part II:
Scientific Aspects

Effectiveness of WBC

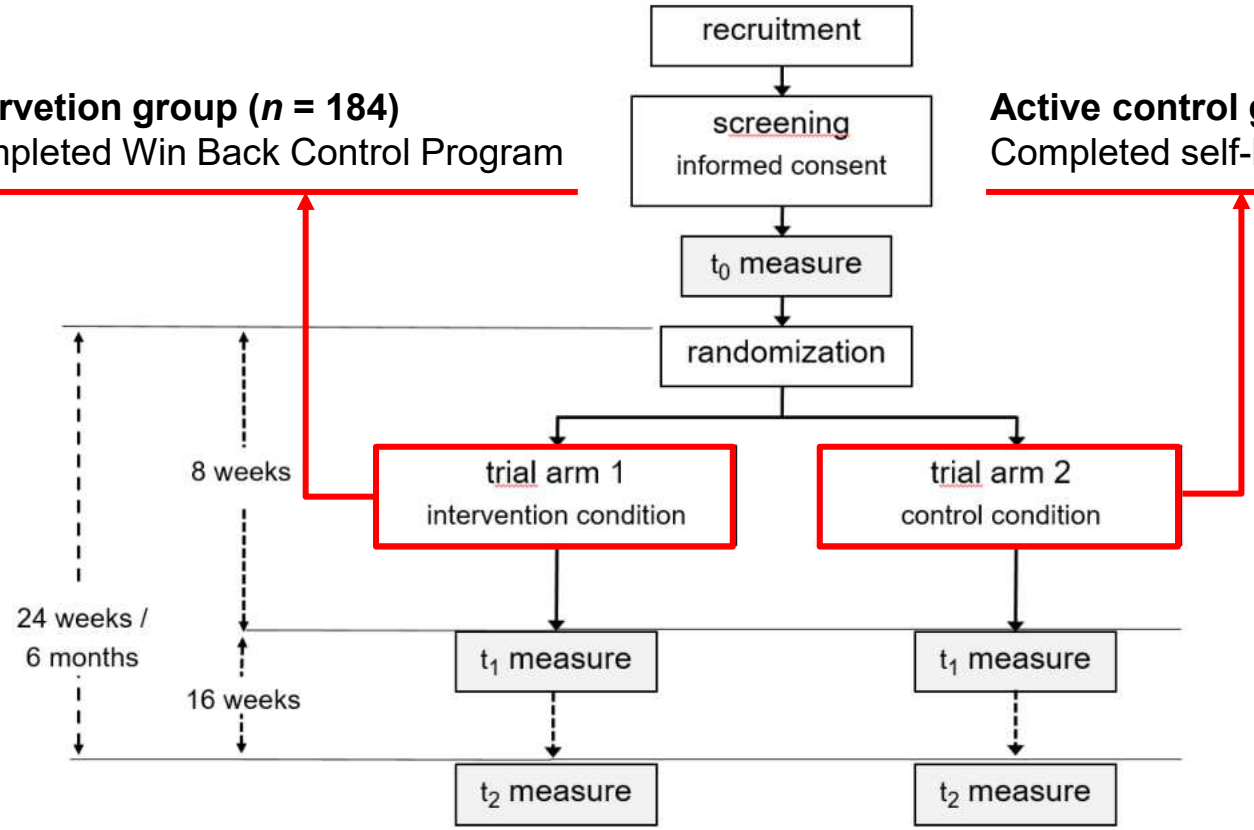
Effectiveness of the programme has been tested in a randomized controlled trial (RCT)

Baumgartner, C., Bilevicius, E., Khazaal, Y., Achab, S., Schaaf, S., Wenger, A., ... & Schaub, M. P. (2019). Efficacy of a web-based self-help tool to reduce problem gambling in Switzerland: Study protocol of a two-armed randomised controlled trial. *BMJ open*, *9*(12), e032110.

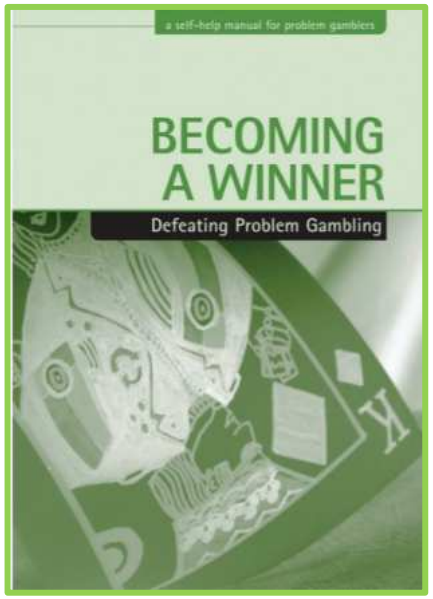
Boumparis, N., Baumgartner, C., Malischnig, D., Wenger, A., Achab, S., Khazaal, Y., ... & Schaub, M. P. (2023). Effectiveness of a web-based self-help tool to reduce problem gambling: A randomized controlled trial. *Journal of behavioral addictions*, *12*(3), 744-757.

Study Design

Intervetion group (*n* = 184)
Completed Win Back Control Program



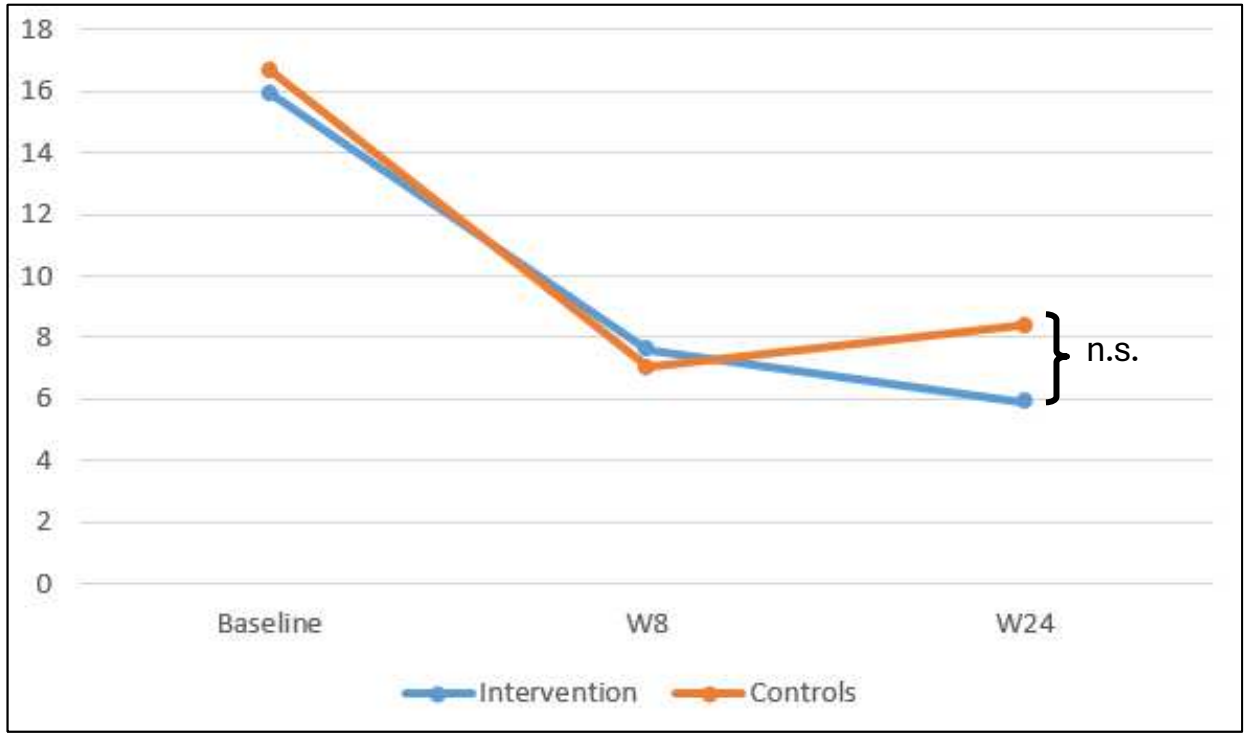
Active control group (*n* = 174)
Completed self-help manual [1]



[1] Hodgins, D. C., & Makarchuk, K. (2002). *Becoming a winner: Defeating problem gambling: A self-help manual for problem gamblers*. Addictive Behaviours Laboratory, University of Calgary.

Results (*n* = 358)

Primary outcome of interest: **Number of gambling days over the last 30 days**

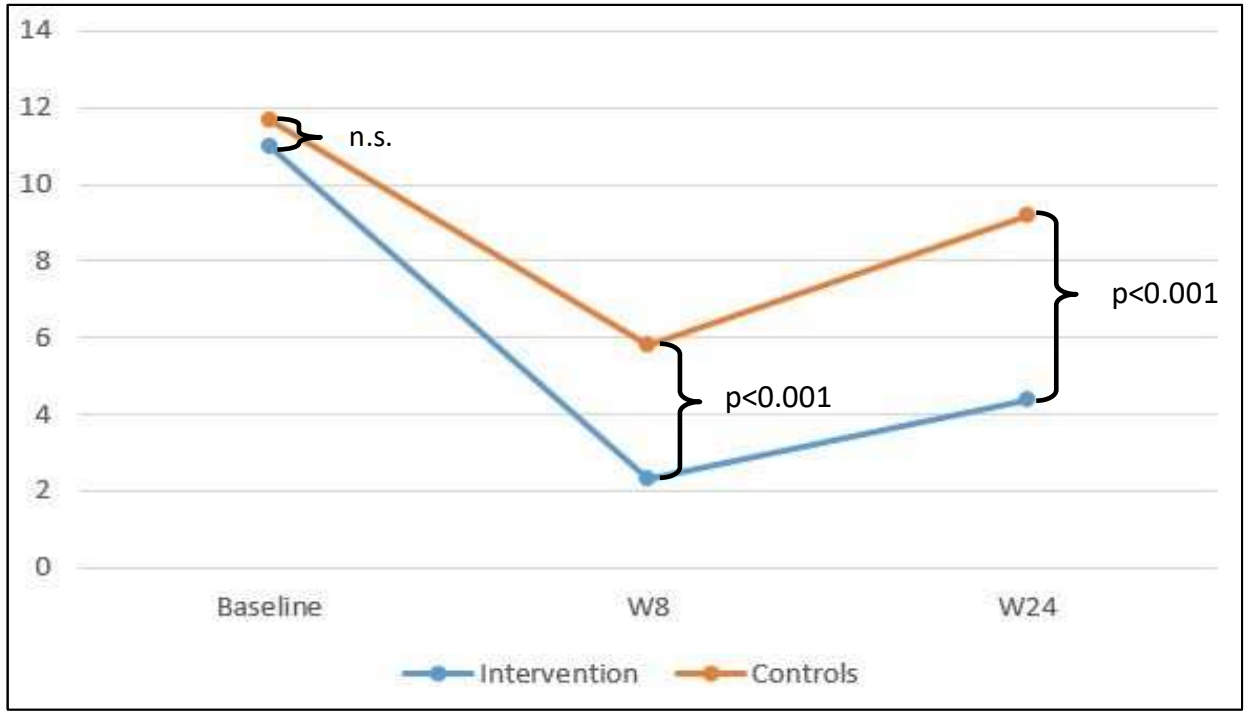


Result:

Number of gambling days over the last 30 days significantly decreased for both groups at post-treatment (8 weeks) and follow-up (24 weeks).

Results (*n* = 358)

Secondary outcome of interest: **Time spent gambling (hours per week)**

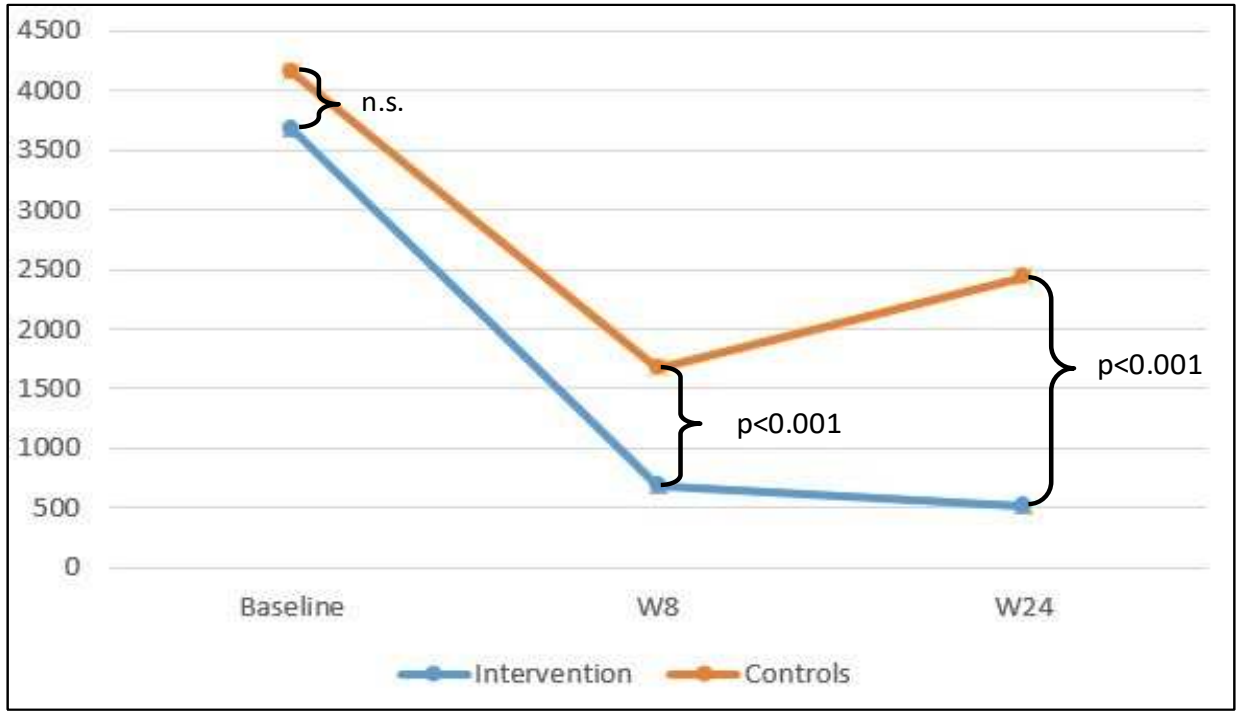


Result:

Time spent gambling (hours per week) was significantly reduced for both groups at post-treatment (week 8) and follow-up (week 24), with larger effects favoring the intervention group.

Results (*n* = 358)

Secondary outcome of interest: **Money spent (Swiss Franks per month)**



Result:

Money spent for gambling (in Swiss Franks per month) was significantly reduced for both groups at post-treatment (week 8) and follow-up (week 24), with larger effects favoring the intervention group.

Secondary outcomes

- Win Back Control was significantly better at reducing other gambling related outcomes, such as **gambling symptom severity (PGSI)**, **cigarette use**, and **client satisfaction**

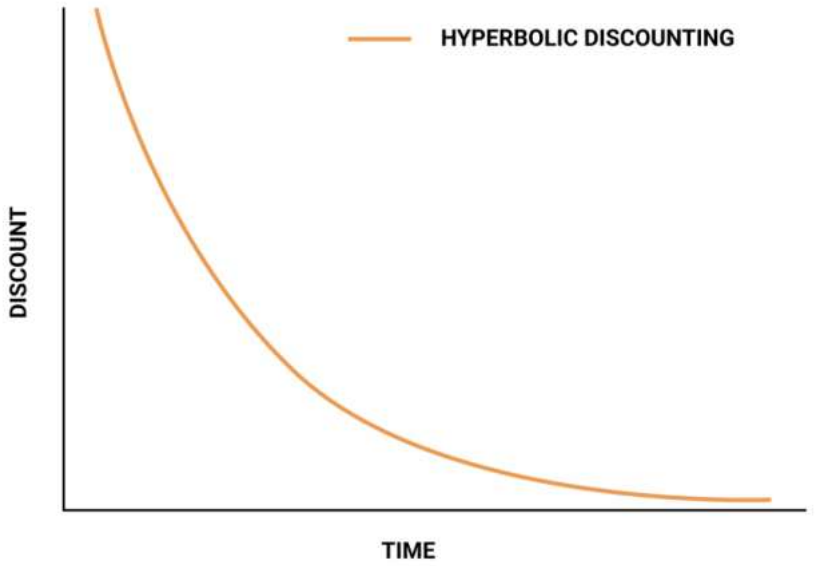
- Main limitations include high dropout rates in both treatment arms

Assessment instruments	Baseline (t_0)	8 weeks (t_1)	24 weeks (t_2)
1. Sociodemographics	X		
2. Timeline Follow back for Gambling, Smoking and Alcohol	X	X	X
3. Patient Health Questionnaire for Depression (PHQ-9)	X		X
4. Generalised Anxiety Disorder Screener (GAD-7)	X		X
5. Adult ADHD Self-Report Scale (ASRS-V1.1)	X		X
6. PTSD-Screening according to the DSM-IV (PTSD-7)	X		X
7. Problem Gambling Severity Index (PGSI)	X	X	X
8. Gambling Symptom Assessment Scale (G-SAS)	X	X	X
9. Monetary Choice Questionnaire (MCQ)	X	X	X
10. Alcohol Use Disorders Identification Test (AUDIT)	X		X
11. National Institute on Drug Abuse *Screening (NIDA ASSIST*)	X		X
12. Drug Abuse Screening Test (DAST-10)	X		X
13. Suicidality Screener (P4-SCR)	X	X	X
14. Client Satisfaction Questionnaire for Interventions (CSQ-I)		X	
15. Negative effects according to Rozental			X

Discounting over time

Monetary Choice Questionnaire (MCQ)

- 27 Decisions
- Example items:
  - *Would you prefer $54 today, or $55 in 117 days?*
  - *Would you prefer $55 today, or $75 in 61 days?*
  - *Would you prefer $31 today, or $85 in 7 days?*



Evaluation of the MCQ

$$V = A / (1 + kD),$$

- *V = Reward today*
- *A = Reward after delay*
- *D= Number of days delay*
- *k = free parameter: Discounting rate*

Example: *$31 today or $85 in 7 days*

V= $31, A= $85, D= 7. Solving for k results in a k-value of .25

0.25 would be the indifference value.

If the delayed reward is selected, it can be concluded from this item that the person's k value is <0.25.

an individual k-value can then be calculated for each participant. The higher this value, the more it is discounted.

Gray et al. (2016),
Kirby et al. (1999)

Correlates of temporal discounting

Table 8.1 (continued)

	Finding	Study population	Study
		College graduates (mostly)	
Bike/motorcycle helmet use		College students	Daugherty and Brase (2010)
Seatbelt use	−	College students	Daugherty and Brase (2010)
Seatbelt use	−	Adults	Bradford et al. (2014)
Condom use with alcohol intoxication	−	Problem drinkers	Celio et al. (2016)
Condom use, general		Problem drinkers	Celio et al. (2016)
		General clinic patients	Chesson et al. (2006)
		Teenage clinic patients	Chesson et al. (2006)
		College students	Chesson et al. (2006)
Prescription compliance	−	Type 2 diabetes patients	Reach et al. (2011)
	−	Type 2 diabetes patients	Lebeau et al. (2016)
	−	College graduates (mostly)	Chabris et al. (2008); Exp. 3
Eating healthy food		College graduates (mostly)	Chabris et al. (2008); Exp. 3
		Overweight and obese females	Appelhans et al. (2012)
Eating breakfast	−	College students	Daugherty and Brase (2010)
Flu shots	−	≥ age 50	Bradford (2010)
	−	Corporate workplace employees	Chapman and Coups (1999)
	−	College faculty/staff	Chapman et al. (2001); Exp. 1
Wearing sunscreen	−	College students	Daugherty and Brase (2010)

Table 8.2 Summary of study findings describing the association between delay discounting an health behavior commissions

	Finding	Study population	Study
Substance abuse			
Opioids[a]	+	Opioid-dependent versus controls	Madden et al. (1997)
Alcohol[a]	+	Problem drinkers versus controls	Vuchinich and Simpson (1998)
Tobacco[a]	+	Smokers versus controls	Mitchell (1999)
Other stimulants[a]	+	Cocaine-dependent versus controls	Coffey et al. (2003)
Marijuana[a]		Marijuana-dependent versus controls	Johnson et al. (2010)
Needle sharing	+	Opioid users	Odum et al. (2000)
Gambling			
Pathological gambling[a]	+	Pathological gamblers versus controls	Petry (2001b)
Problem gambling plus substance abuse[a]	+	Problem gambling substance abusers versus controls	Petry and Casarella (1999)
Diet			
Binge-eating disorder	+	Females, aged 25–45	Davis et al. (2010)
Fast/convenience food consumption	+	College employees	Garza et al. (2016)
		Overweight and obese females	Appelhans et al. (2012)
Snack consumption	+	General sample	Bradford et al. (2014)
Overeating		College graduates (mostly)	Chabris et al. (2008); Exp. 3

(Stevens, 2017)

Research question 1: Hypotheses, method and results

Question 1: Hypothesis

Background:

Subjects with gambling disorder discount more than those without gambling disorder (Petry, 2001)

As shown in the meta-analysis by Amlung et al. (2017), among others, temporal discounting is related to the severity and frequency of addictive behaviors.

Hypothesis: High temporal discounting is associated with stronger symptoms and higher severity of problem gambling.

Question 1a: What is the relationship between time discounting and the ***symptoms*** of problem gambling?

Question 1b: What is the relationship between time discounting and the ***severity*** of problematic gambling behavior?

Question 1: Method

- Independent variables
  - Time discounting: discount value of the **Monetary Choice Questionnaire (MCQ)**
  - Time (numeric 0,8,26)
- Dependent variables
  - Symptoms of problem gambling: **Gambling Symptom Assessment Scale (G-SAS)**
  - Severity of problem gambling: **Problem Gambling Severity Index (PGSI)**

Question 1: Method

- Multi-level analysis
  - For question 1a an ICC of 0.14
  - For question 1b an ICC of 0.00

➔ Random effects only for question 1a (Heck et al. 2013)

- R packages
  - *lme4* (version 1.1-35.4; (Bates et al., 2014))
  - *robustlmm* (Version 3.3-1; (Koller, 2016))

Question 1a: Results

Mixed linear models for the scores on the Gambling Symptom Assessment Scale (G-SAS) with the discount factor and time as predictors

	Criterion variable: Gambling Symptom Assessment Scale (G-SAS)										
	With imputed data				Without imputed data				With imputed data and robust standard estimator		
Predictors	*b*	*SE b*	*95% CI*	*p*	*b*	*SE b*	*95% CI*	*p*	*b*	*SE b*	*p*
Model 1											
Time	-0.46	0.03	-0.51 - -0.40	**<.001**	-0.61	0.04	-0.70 - -0.52	**<.001**	-0.50	0.03	**<.001**
k-value	14.41	4.63	5.35 - 23.47	**.002**	19.65	5.30	9.30 - 30.01	**<.001**	14.96	4.54	**<.001**
Predictors Model 2*											
Time	−0.46	0.03	-0.51 - -0.40	**<.001**					-0.49	0.03	**<.001**
k-value	13.65	4.49	4.85 - 22.45	**.002**					13.90	4.41	**.002**
Predictors Model 3 **											
Time	-0.46	0.65	-0.51 - -0.40	**<.001**					-0.50	0.03	**<.001**
k-value	14.76	0.03	5.36 - 24.25	**.002**					15.02	4.54	**.001**
Predictors Model 4											
Time	-0.46	0.36	-0.53 - -0.39	**<.001**	−0.67	0.06	- 0.79 - - 0.56	**<.001**	- 0.51	0.04	**<.001**
k-value	13.88	5.97	2.19 - 25.56	**.002**	15.18	5.86	3.72 - 26.64	**.01**	13.94	5.85	**.017**
Time: k-value	0.05	0.35	-0.62 - 0.72	.888	0.95	0.54	- 0.10 - 2.01	.08	0.10	0.34	.760

*With time as a random effect
** With the mean k-value as a random effect

Question 1b: Results

Mixed linear models for the characteristics in the Problem Gambling Severity Index (PGSI) with the discount factor and time as predictors

	Criterion variable: Problem Gambling Severity Index (PGSI)										
	With imputed data				Without imputed data				With imputed data and robust standard estimator		
Predictors	*b*	*SE b*	*95% CI*	*p*	*b*	*SE b*	*95% CI*	*p*	*b*	*SE b*	*p*
Model 1											
Time	-0.34	0.02	-0.38- -0.31	**<.001**	-0.36	0.03	-0.41 - -0.31	**<.001**	-0.36	0.02	**<.001**
k-value	8.31	2.37	3.67 - 12.95	**<.001**	11.34	3.26	4.92 - 17.75	**<.001**	9.39	2.55	**<.001**
Predictors Model 2											
Time	-0.31	0.02	-0.36 - -0.27	**<.001**	-0.37	0.03	- 0.44 - - 0.30	**<.001**	- 0.32	0.02	**<.001**
k-value	12.67	3.32	6.16 - 19.18	**<.001**	10.49	3.61	3.43 - 17.55	**<.001**	14.73	3.59	**<.001**
Time: k-value	-0.40	0.21	-0.82 - 0.02	.061	0.19	0.33	- 0.46 - 0.83	.57	-0.49	0.23	**.034**

Summary of the results: Overview

- Hypothesis 1: ✓
  - Greater temporal discounting **is significantly positively** related to the symptoms and severity of problem gambling**.**

Research question 2: Hypotheses, method and results

Question 2: Hypothesis

Background:

High temporal discounting has already been identified as a predictor of non-adherence in diabetics and breast cancer patients (Reach, 2012; Vaughn et al., 2021).

Correlation of temporal discounting to study dropout in younger players (Mena-Moreno et al. 2022)

Hypothesis: Study participants with higher values in temporal discounting at baseline show less adherence.

Question 2

- Is time discounting a predictor of participant ***adherence***?

Question 2: Methods

- Two variables for operationalizing adherence
  - **Completed WBC intervention modules**
    - Poisson regression: *stats* (version 4.4.0; (R Core Team, 2021))
    - Negative binomial model: *MASS* (Version 7.3 - 60.2; (Venables & Ripley, 2002))
  - **Non-participation in the two follow-up examinations (0, 1, 2)**
    - Multi-minal logit model: *VGAM* (Version 1.1 - 11; (Yee, 2015))

Question 2: Results

Negative binomial model

Criterion variable: Number of completed WBC modules				
Predictors	b	SE	95% CI	*p*
(Intercept)	0.97	0.12	0.75 - 1.20	**< .001**
k-value at baseline	-1.16	0.98	-3.06 - 0.76	.236

Note. N = 183, participants in the WBC condition

the data set with imputed data was used

Question 2: Results

Multinomial logit model

Criterion variable: Missing measurement time points				
Predictors	b	SE	95% CI	*p*
(Interzept):1	-1.35	0.22	-1.78 - -0.93	**<.001**
(Intercept):2	-1.62	0.23	-2.06 - -1.18	**<.001**
k-value at baseline:1	-4.05	2.20	-8.35 - 0.25	0.065
k-value at baseline:2	-0.45	1.91	-4.18 - 3.29	0.814

Note. N = 348

the data set was used without imputed data

Summary of the results: Overview

- Hypothesis 2: ✘
  - The correlation between the time discounting and the number of completed WBC modules and the number of missing questionnaires **could not** be confirmed.

Research question 3: Hypotheses, method and results

Question 3: Hypothesis

Background:

Temporal discounting as a trait (Odum, 2011)

Nevertheless changeable (Rung et al., 2019).

- Lower time discounting in former smokers at the follow-up measurement 12 months after treatment than at baseline (Secades-Villa et al., 2014).
- Temporal discounting can be changed by episodic future thinking (Vaughn et al., 2021)

Hypothesis: The temporal discounting decreases over the course of the study.

Question 3:

- How does the temporal discounting change over the course of the study?

Question 3: Method

- Independent variables
  - Time (numeric, 0, 8, 26)
  - Intervention group (binary)
- Dependent variables
  - Time discounting: discount value of the **Monetary Choice Questionnaire (MCQ)**

- Multi-level analysis
  - ICC from 0.57
- R packages
  - *lme4* (version 1.1-35.4; (Bates et al., 2014))
  - *robustlmm* (Version 3.3-1; (Koller, 2016))

Question 3: Results

Mixed linear models for the change in temporal discounting over the various measurement points.

	Criterion variable: k-value of time discounting										
	With imputed data				Without imputed data				With imputed data and robust standard estimator		
Predictors Model 1	*b*	*SE b*	*95% CI*	*p*	*b*	*SE b*	*95% CI*	*p*	*b*	*SE b*	*p*
Time	-7.072e-04	1.474e-04	-9.96e-04 - -4.18e-04	**<.001**	-7.044e-04	3.194e-04	-1.34e-03 - -7.85e-05	**.029**	-6.212e-04	1.071e-04	**<.001**
Predictors Model 2											
Time	-7.072e-04	1.474e-04	-9.96e-04 - -4.18e-04	**<.001**	-6.954e-04	3.200e-04	-1.33e-03 - -6.86e-05	**.031**	-6.216e-04	1.070-04	**<.001**
Researchgroup	-5.315e-03	7.280e-03	-1.95e-02 - 8.95e-03	.466	-7.013e-03	8.279e-03	-2.32e-02 - 9.25e-03	.398	-5.457e-03	5.982e-03	.362

Summary of the results: Overview

- Hypothesis 3: ✓
  - The time discounting **decreases significantly** over the course of the study and the therapy in both the intervention and the active control group.

Research question 4: Hypotheses, method and results

Question 4: Hypothesis

Background:

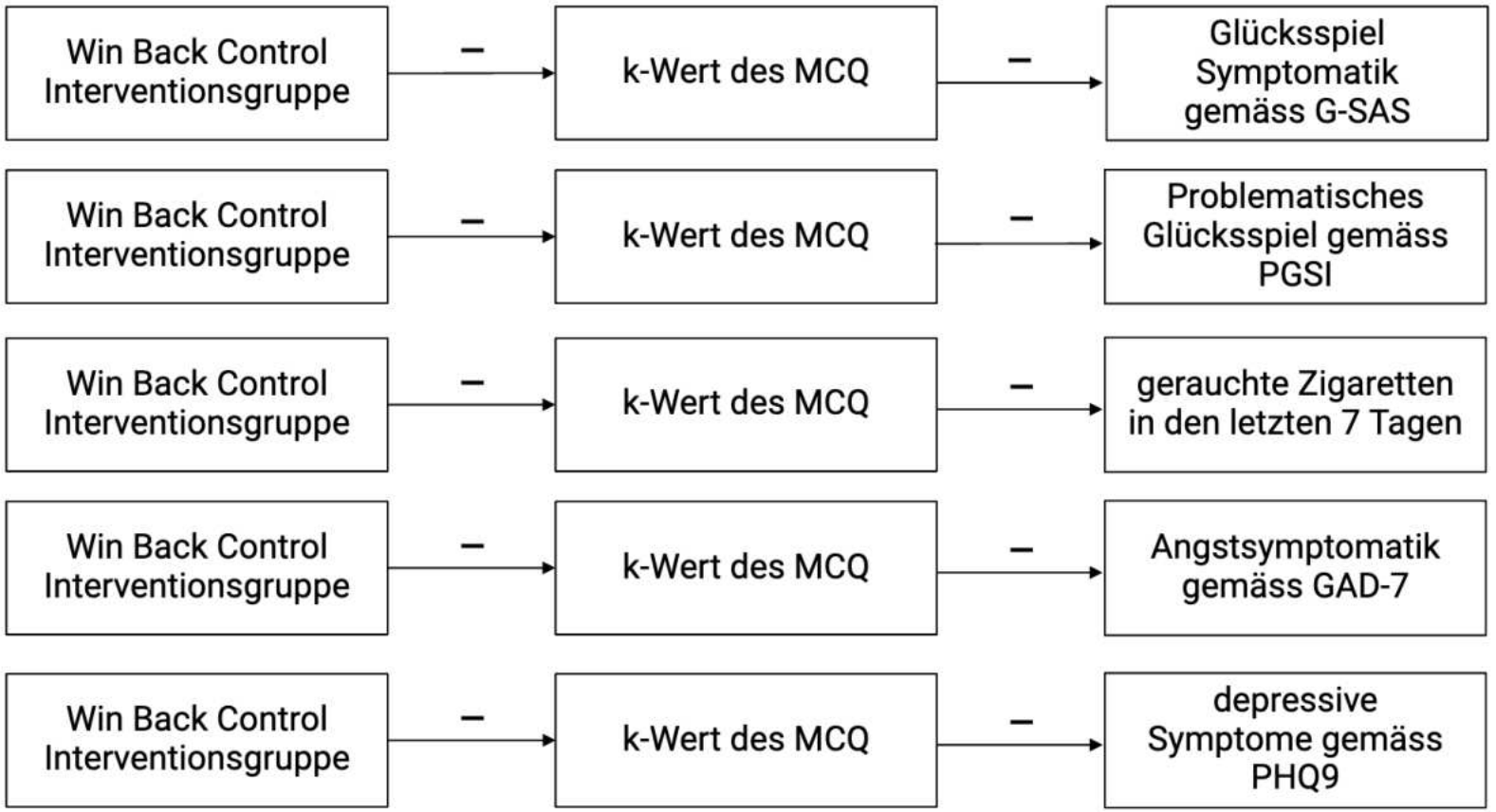
- Lower time discounting in former smokers at the follow-up measurement 12 months after treatment than at baseline (Secades-Villa et al., 2014).
- Temporal discounting as a mediator of the relationship between stress and smoking (Fields et al. 2009)

Hypothesis 4: The effect of CBT on relevant variables is mediated by time discounting.

Question 4:

- Can temporal discounting be identified as a mediator between cognitive behavioral therapy (CBT) and various symptoms?

Question 4: Method



Question 4: Method

- Bootstrap mediation analyses
  - *mediation* (version 4.5.0; (Tingley et al., 2014))
  - Change scores of all AV and the MCQ
    - Between baseline and 1st follow-up (8 weeks)
    - Between baseline and 2nd follow-up (6 months)

Question 4: Results for gambling symptoms and change score

Bootstrap mediation analysis: The effect of the intervention group on changes in the G-SAS mediated by changes in the k-value was investigated

	Change scores between baseline and week 8 follow-up			Change scores between baseline and 6 months follow-up		
	estimate	*95% CI*	*p*	*estimate*	*95% CI*	*P*
ACME	0.01	- 0.15 - 0.20	.93	-0.05	-0.39 - 0.23	.71
ADE	- 0.53	- 2.90 - 1.86	.65	4.19	1.71 - 6.65	**<.001**
Total effect	-0.52	-2.89 - 1.87	.66	4.14	1.68 - 6.60	**.001**
Prop. Mediated	0.00	-0.59 - 0.70	.99	-0.01	-0.13 - 0.06	.71

N = 345

ACME: average indirect effect; ADE: average direct effect.

Question 4: Results for problem gambling severity and change score

Bootstrap mediation analysis: The effect of the intervention group on changes in the PGSI mediated by changes in the k-value was investigated

	Change scores between baseline and week 8 follow-up			Change scores between baseline and 6 months follow-up		
	estimate	*95% CI*	*p*	*estimate*	*95% CI*	*P*
ACME	0.01	- 0.08 - 0.10	.884	-0.02	-0.14 - 0.09	.767
ADE	1.73	0.44 - 3.04	**<.001**	2.16	0.89 - 3.38	**<.001**
Total effect	1.74	0.44 - 3.06	**.011**	2.14	0.87 - 3.38	**<.001**
Prop. Mediated	0.00	-0.07 - 0.08	.882	-0.00	-0.09 - 0.05	.767

N = 345

ACME: average indirect effect; ADE: average direct effect.

Question 4: Results for nicotine use and change score

Bootstrap mediation analysis: The effect of the intervention group on changes in nicotine consumption mediated by changes in the k value was investigated

	Change scores between baseline and week 8 follow-up			Change scores between baseline and 6 months follow-up		
	estimate	*95% CI*	*p*	*estimate*	*95% CI*	*P*
ACME	-0.13	- 1.57 - 1.01	.82	-0.33	-2.57 - 1.59	.72
ADE	-9.74	-25.65 - 5.93	.23	43.19	25.94 - 60.20	**<.001**
Total effect	-9.86	-25.81 - 5.90	.23	42.86	25.80 - 59.89	**<.001**
Prop. Mediated	0.00	-0.32 - 0.39	.85	-0.00	-0.07- 0.04	.72

N = 345

ACME: average indirect effect; ADE: average direct effect.

Question 4: Results for depression, anxiety and change score

Bootstrap mediation analysis: The effect of the intervention group on changes in the PHQ9 and GAD7 mediated by changes in the k value was investigated

	Change score of the PHQ9 between baseline and 6 months follow-up			Change scores of the GAD7 between baseline and 6 months follow-up		
	estimate	*95% CI*	*p*	*estimate*	*95% CI*	*P*
ACME	-0.01	- 0.13 - 0.08	.77	-0.01	-0.09- 0.07	.88
ADE	2.50	1.42 - 3.57	**<.001**	3.86	2.74 - 5.03	**<.001**
Total effect	2.49	1.41 - 3.54	**<.001**	3.86	2.72 - 5.03	**<.001**
Prop. Mediated	-0.00	-0.06 - 0.03	.77	-0.00	-0.03 - 0.02	.88

N = 345

ACME: average indirect effect; ADE: average direct effect.

Summary of the results: Overview

- Hypothesis 4: ✘
  - Time discounting could not be identified as a mediator between the intervention and the symptoms, the severity of gambling behavior, nicotine consumption, depression and anxiety symptoms.

Discussion

Summary of the results: Overview

- Hypothesis 1: ✓
  - Greater temporal discounting **is significantly positively** related to the symptoms and severity of problem gambling**.**
- Hypothesis 2: ✗
  - The correlation between the time discounting and the number of completed WBC modules and the number of missing questionnaires **could not** be confirmed.
- Hypothesis 3: ✓
  - The time discounting **decreases significantly** over the course of the study and the therapy in both the intervention and the active control group.
- Hypothesis 4: ✗
  - Time discounting could not be identified as a mediator between the intervention and the symptoms, the severity of gambling behavior, nicotine consumption, depression and anxiety symptoms.

Conclusion and Discussion

- Positive correlation between time discounting and problem gambling
- Time discounting decreases together with the symptoms and severity
- Causal, moderating or mediating effect? -> RCT with passive control group
- Episodic future thinking to directly influence temporal discounting (in addition to (online-)CBT)?

THANK YOU FOR YOUR ATTENTION

Contact: michael.schaub@isgf.uzh.ch; www.isgf.uzh.ch

Boumparis N, Baumgartner C, Malischnig D, Wenger A, Achab S, Khazaal Y, Keough MT, Hodgins DC, Bilevicius E, Single A, Haug S, Schaub MP. Effectiveness of a web-based self-help tool to reduce problem gambling: A randomized controlled trial. *J Behav Addict.* 2023; 12(3):744-757.

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www.winbackcontrol.ch; www.genuggespielt.at; www.changingtowin.ca

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Limitations

- Secondary analysis
- High dropout rate of 76%.
- Data collection via self-report only
- No formal diagnosis according to ICD-11 or DSM-V criteria
- Inclusion and exclusion criteria from Boumparis et al. (2023)
  - No severe substance use disorder
  - Did not go through a manic phase or psychosis
  - No suicidality higher than "minimal risk"

Evaluation of the MCQ in R

- R syntax (Gray et al. 2016)
  - Based on the premise that there is a finite number of answer combinations
  - The following values are listed in a table for each combination:
    - k-value
    - ICR value (immediate-choice-ratio)
    - Consistency value
  - These values from the table were then transferred to our empirical data.
  - People with a consistency value < 0.7 should be excluded (Gray et al., 2016)
    - Six people were excluded (only three people for question 2)

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Discounting over time

- Behavioral economic measure of the reduction in the present value of an outcome when its receipt is delayed (Mazur, 1987)
- For time discounting tasks, people must choose between small rewards that are available immediately and larger rewards that are only available after a certain period of time.
- With systematically varying rewards and varying time delays, choice preferences can be calculated for each person.
- A facet of impulsivity (Aisle, 1975; Mazur, 1987; Stevens, 2017)

Impulsiveness

– Model of the causes of gambling participation and the etiology of gambling-related disorder (Williams, 2015)