

# The Effectiveness of Low-investment Pachinko/pachislot in Reducing Gambling-related Harms: A Cross Sectional Study

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## Research Article

**Keywords:** gambling disorder, harm-reduction, low-investment pachinko

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1    **Abstract**

2    **Background:** *Pachinko* and *pachislot* are popular types of gambling activities in Japan. Prior studies  
3    in Japan have reported a concerning prevalence of gambling disorder among university students and  
4    adult players. While these studies have identified various gambling-related harms, Japanese research on  
5    harm-minimization strategies is scarce. Therefore, the present study aimed to analyze the effectiveness  
6    of low-investment *pachinko* and *pachislot* as a harm-reduction strategy.

7    **Methods:** We also called gamblers who played for the normal amount as “normal-pachi players,” those  
8    who played *pachinko* and *pachislot* for half of the normal amount were called “half-pachi players,” and  
9    those who played for a quarter of the normal amount were called “quarter-pachi players.” To assess the  
10   effect of harm reduction, a one-way ANCOVA was conducted to compare the impact of the groups  
11   (normal-pachi players [ $n= 101$ ], half-pachi players [ $n= 104$ ], and quarter-pachi players [ $n= 100$ ]) on  
12   dependent variables, namely the number of days players had gambled during the prior month, the total  
13   time and amount of money spent on gambling, debts caused by gambling, gambling severity, cognitive  
14   distortion, depressive symptoms, and disability.

15   **Results:** We demonstrated that the amount of money spent by quarter-pachi players on gambling during  
16   the past month was lower than that of normal-pachi players. However, we did not find significant  
17   differences with respect to any other gambling-related harms among normal-, half-, and quarter-pachi  
18   players.

19   **Conclusion:** Low-investment *pachinko* and *pachislot* can reduce the amount of money spent on  
20   gambling. It can thus partly act as a harm-minimization strategy. Moreover, the results of present study

21 indicate that the level of disability at work affects various outcomes for gamblers. Given that 90% of  
22 the participants in this study were employed, the results of this study may have important implications  
23 for employed gamblers. Interventions should be devised to reduce work-related disabilities among  
24 employed adults with a gambling disorder.

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26 **Keywords:** gambling disorder, harm-reduction, low-investment pachinko

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41 **Background**

42           Reportedly, the lifetime prevalence of gambling disorder in speakers of English and other  
43       European languages is 0.8–1.2% [1]. The estimated proportion of probably disordered gambling among  
44       over 13,000 college students worldwide is 10.23% [2]. In Japan, a nationwide prevalence study revealed  
45       that approximately 1.5% of participants were classified as probably being affected by a gambling  
46       disorder [3]. Moreover, 5.1% of probable gambling disorders have been reported among college and  
47       university students in Japan [4]. One of the essential characteristics of gambling in Japan is the type of  
48       gambling accessible to gamblers. In Yokomitsu et al.'s [4] study, *pachinko* and slot machines (called  
49       *pachislot* in Japan) were the most common types of gambling activities that university students had  
50       engaged in. In addition, Shoun et al. conducted a questionnaire study on 5,060 Japanese adults aged  
51       from 18–79 years through a low-coverage error sampling method and found that 11.5% of them ( $n=$   
52       582) had played *pachinko* or *pachislot* in the past 12 months [5]. Furthermore, the 9,000 slot machines  
53       and *pachinko* gambling venues in Japan make gambling accessible. The bias for *pachislot* and *pachinko*  
54       gambling is unique to Japanese gamblers in Japan, unlike Western gamblers.

55           *Pachislot*, a popular type of gambling in Japan, is similar to slot machines that use cash in  
56       casinos. In Japan, players play *pachislots* using medals, which can be exchanged for cash. An important  
57       difference between *pachislots* in Japan and slot machines in overseas casinos is that the former is a  
58       player-participation type of gambling that requires pulling a lever on the side of the machine, pushing  
59       three buttons to stop a rolling reel, and alignment of various symbols. A set of these processes is a game  
60       (play) in a *pachislot*. Players have the chance to win a large prize (nearly a jackpot) with a fixed

61 probability for each game. Although this probability varies according to the type of *pachislot*, a one-in-  
62 two hundred chance is frequently applied. In each game, an animation with lights, sounds, and images  
63 is generated on a 14-inch (35.6 cm) liquid crystal display on the top of the reel. Big and loud animations  
64 signal a high probability of a big win. These animations include gaming, which can immerse gamblers  
65 in gambling.

66 On the other hand, *pachinko*, which is also popular in Japan, resembles a vertical pinball  
67 machine. A *pachinko* machine uses numerous *pachinko* balls approximately 1 cm in diameter. When a  
68 ball enters a catcher near the bottom center of the playing board, a big win is generated with a fixed  
69 probability. Similar to *pachislot*, the probability varies according to the kind of *pachinko*; however, a  
70 one-in-300 chance is frequently applied. The animation with images, sound, and light production in  
71 *pachinko* is the same as *pachislot* wherein a big and loud production is associated with a high probability  
72 of a big win. However, in both *pachislot* and *pachinko*, gamblers sometimes do not achieve a big win  
73 despite the pompous production. Such an event is called a near-miss event.

74 Disordered gambling can lead to a variety of harms. In Langham et al.'s [6] review, gambling-  
75 related harm has been defined as "any initial or exacerbated adverse consequence due to an engagement  
76 with gambling that leads to decrement to the health or well-being of an individual, family unit,  
77 community or population." This review identified harms that could occur either sequentially or  
78 simultaneously. These types of harm include financial, interpersonal, emotional or psychological,  
79 health-related, professional, educational, and criminal harms. To minimize these harms, international  
80 guidelines recommend implementing evidence-based and best practice policies to minimize gambling,

81 including specific requirements for policies on internet gambling— specifically, a minimum legal age  
82 of 18 years for gambling participation, licensing of gambling venues and activities with responsible  
83 gambling, and mandated consumer protection strategies; additionally, brief interventions should be  
84 available for those susceptible to and facing gambling-related harm. From the perspective of responsible  
85 gambling, several harm-minimization strategies have been devised to prevent pathological gambling  
86 behaviors and facilitate self-control gambling [7]. Harm-minimization strategies include supply-  
87 reduction (reducing opportunities for gambling), demand-reduction (raising awareness on preventing  
88 serious gambling or gambling knowledge for gamblers/non-gamblers), and harm-reduction  
89 interventions (approaches to reduce gambling-related harm) [8]. Specifically, some supply-reduction  
90 interventions reduce operating hours on gambling venues or include shutting down electronic gambling  
91 machines (EGMs) [9]. These interventions reduce accessibility to gambling and force gamblers to take  
92 a break from gambling. Although previous studies could not reach a conclusion regarding effectiveness  
93 of these interventions in reducing gambling-related harms [10, 11], one study [12] showed a reduction  
94 of 3.3% in gambling expenditure across gambling venues that reduced their hours. A demand-reduction  
95 intervention is youth prevention intervention, which has been provided for students from elementary to  
96 high school [13]. For these interventions, multimedia tools (videos and online modules) [14] and  
97 classroom lectures [15] are used to teach students about the unprofitability of gambling (for example,  
98 house edge, odds). This approach is prevention-based and aims to improve knowledge aspects of  
99 gambling for all students, regardless of their engagement in gambling and severity of their symptoms  
100 [13]. Some harm-reduction interventions are personalized feedback interventions, pre-

101 commitment/limit setting, self-exclusion, and machine messages/feedback. For example, in a prior  
102 study on university students, personalized feedback or personalized normative feedback interventions  
103 were used most commonly [16] and provided feedback on the gamblers' own time and money spent  
104 gambling, as well as gambling symptoms in a summarized form based on these assessments. In this  
105 intervention, personalized feedback messages sent to gambler include normative information (For  
106 example, "You spent ¥ X in the past month. This value is ¥ X more than normal gamblers."), possible  
107 risk (For example, "You scored X points on the gambling screening scale. You possibly have a gambling  
108 disorder."), and advice for changing behaviors (For example, "You believe that you can increase your  
109 chances of winning or getting lucky in gambling by your own methods and rules. Unfortunately, there  
110 is no way to increase chances of winning at gambling. Please try it and use your own methods to increase  
111 your chances of winning when you gamble the next time."). Meta-analysis showed that personalized  
112 feedback intervention was effective in improving disordered gambling (Cohen's  $d = 0.20$ , 95%  
113 confidence interval [CI] = 0.12–0.27) [17]. Another harm-reduction intervention, pre-commitment/limit  
114 setting, can be either optional or mandatory. A prior study forced gamblers to set limits on deposits,  
115 session times, or loss limits [18]. Some limit settings included typical limit setting tools and  
116 notifications, other limit settings used a typical tool with an enhanced tool that incorporated user  
117 feedback in the design, content, and implementation. Some studies that examined a typical monetary  
118 limit setting tool found that participants adhered to their pre-set limit more frequently when they  
119 received a pop-up reminder [19].

120 Interventions to minimize gambling-related harm have not been established and research in

121 relation to harm reduction is still budding in Japan. Harm-minimization strategies include pre-  
122 commitment/limit setting on the purchase of online horse race tickets upon application by an individual  
123 or a family member, the removal an ATM from the horse, bicycle, and boat race tracks, setting limits  
124 on ATM withdrawals at the *pachinko* venue (maximum ¥30,000 per day), and self-exclusion on  
125 application by the individual or a family member from *pachinko* venue. However, gambling as an  
126 alternative to disordered gambling such as low-investment *pachinko* and *pachislot* can be an another  
127 harm-minimization strategy. In an earlier study [20], similar to low-investment *pachislot* machines,  
128 machines with a maximum stake of \$1 have been reported to reduce playing time, financial loss, and  
129 consumption of alcohol and cigarettes while gambling, suggesting that this type of low-investment  
130 gambling in Japan may lead to harm reduction. When Japanese gamblers played the low-investment  
131 *pachinko* and *pachislot*, they could play twice or even four times as long as normal *pachinko* and  
132 *pachislot* for the same amount of money. As gamblers bet less in this type of gambling, the money that  
133 they can acquire on winning is half or a quarter of the normal amount.

134 In the present study, we defined low-investment *pachinko* and *pachislot* as “playing *pachinko*  
135 and *pachislot* for half or quarter of the normal amount.” Gamblers who played *pachinko/pachislot* for  
136 half of the normal amount were called “half-pachi players,” and those who played for a quarter of the  
137 normal amount were called “quarter-pachi players.” We also called gamblers who played for the normal  
138 amount as “normal-pachi players.” We aimed to examine the effect of the investment types in  
139 *pachinko/pachislot* that adult gamblers usually engage in on gambling-related harms. Specifically, we  
140 sought to compare gambling-related harms among normal-, half-, and quarter-pachi players. In the

141 present study, we considered debt, the number of days players had gambled during the prior month, the  
142 total time and money spent on gambling, the severity of gambling, gambling cognitive distortion,  
143 depressive symptoms, and degree of disability at work, home and in their social life as gambling-related  
144 harm.

145

## 146 **Method**

### 147 **Participants**

148 In all, 305 Japanese gamblers (males= 261, females= 44, mean age= 51.1, SD= 12.9) aged 20  
149 years and older were recruited from September 11–12, 2019 through the online survey panels of a major  
150 Japanese Internet survey company (Rakuten Research Inc., Tokyo, Japan). None of the data from these  
151 participants had missing values.

### 152 **Procedure**

153 A website was created for this online study. Participants who registered with the internet  
154 survey panels were recruited to participate in an online study presented as “Behavior and cognition  
155 about gambling in daily life.” Before participation, every potential participant was given information  
156 on the study through a separate screen to ensure and obtain informed consent for study participation.

157 This explanation emphasized that participation was entirely voluntary. Completion of the Internet  
158 survey was regarded as consent to participate in the study, as the online survey was anonymous.

### 159 **Measures**

160 *Demographics.* Participants were asked questions on gender, age, education level, annual income,

161 money spent on entertainment and leisure, and marital status.

162 *Gambling behavior, gambling history, and debts caused by gambling.* Participants were asked to report  
163 the types of gambling they engaged in during the prior month, years of *pachinko/pachislot* history with  
164 a normal amount, as well as with half (or quarter) of the normal amount. Participants were also asked  
165 to report the number of days they gambled during the prior month (“How many days did you gamble  
166 for in the previous month?), the total time spent (“How much time did you spend gambling in the  
167 previous month”), and money spent on gambling (“How much money did you spend on gambling  
168 during the previous month? You need not give data about the income or expenditures related to  
169 gambling but only report money that you spent.”). Moreover, participants were asked to report the debts  
170 caused by gambling at present (“How much debt do you have which was caused by gambling at  
171 present?”).

172 *Japanese version of the Problem Gambling Severity Index—PGSI-J [3].* The PGSI [21] is a nine-item  
173 self-rated scale designed to assess gambling severity during the past year. The PGSI had a score of 0–  
174 27. Participants responded using a four-point Likert scale to indicate the extent to which they agreed  
175 with the values expressed in each item (0= never; 1= sometimes; 2= most of the time; and 3= almost  
176 always). Higher scores indicated more severe gambling symptoms and were interpreted as follows: 8 =  
177 non-problematic; 1–2= low risk; 3–7= moderate risk; and 8 or more= problematic gambling  
178 (classification based on [21]). In this study, the total scale demonstrated high internal consistency ( $\alpha=$   
179 0.95).

180 *Japanese version of the Gambling Related Cognitions Scale (GRCS-J [22]).* The GRCS [23] assesses

181 gambling-related cognition. The GRCS-J is a 23-item questionnaire designed to measure gambling-  
182 related cognition. As with the original GRCS, participants responded using a seven-point Likert scale  
183 to indicate the extent to which they agreed with the values expressed in each item (1= does not apply at  
184 all; 7= pretty applicable). Higher scores indicated a higher number of cognitive distortions. The overall  
185 GRCS-J has good internal consistency ( $\alpha= 0.94$ ) and good convergent validity (correlation coefficient  
186 with SOGS-J:  $r= 0.61$  [22]). In this study, the total scale demonstrated high internal consistency ( $\alpha=$   
187 0.97).

188 *Japanese version of the Patient Health Questionnaire-9— PHQ-9-J* [24]. The PHQ-9 [25] is a self-  
189 reported questionnaire for assessing depressive symptoms in the preceding two weeks. The  
190 questionnaire consists of nine items evaluated using a four-point Likert scale to indicate the extent to  
191 which participants agreed with the values expressed in each item (0= not at all, 3= nearly every day).  
192 Higher scores indicate more severe depressive symptoms. In an earlier study, this scale demonstrated  
193 good internal consistency ( $\alpha= 0.93$ ) and good convergent validity (correlation coefficient with the  
194 Kessler Psychological Distress Scale:  $r = 0.81$ ) in a Japanese clinical population. In this study, the total  
195 scale demonstrated high internal consistency ( $\alpha= 0.93$ ).

196 *Japanese version of the Sheehan Disability Scale— SDIIS-J* [26]. The SDIIS [27] assesses disability  
197 across three domains— work, social life, and family life. As with the original SDIIS, participants  
198 responded using an 11-point Likert scale to indicate the extent to which they agreed with the values  
199 expressed in each item (0= no problem at all; 10= quite a disability) on the SDIIS-J. Higher scores  
200 indicated more severe disability.

201

202 **Statistical Analysis**

203 Analyses were conducted using IBM SPSS Statistics version 26. Descriptive statistics were  
204 presented as means and standard deviations (SD) for each variable. To assess the effect of the harm  
205 reduction, a one-way ANCOVA was conducted to compare the effects of groups (normal-, half-, and  
206 quarter-pachi players) on dependent variables; namely, the number of days participants had gambled  
207 during the prior month, the total time and money spent on gambling, debts caused by gambling,  
208 gambling severity, the total score of PGSI-J, cognitive distortion, the total score of GRCS-J, depressive  
209 symptoms (the total score of PHQ-9-J, disability; SDIIS-work, SDIIS-Social life, SDIIS-Family life).  
210 Participants' sex, age, income, history of playing *pachinko* and *pachislot*, allowance, and other outcome  
211 variables were covariates. For all analyses, statistical significance was set at  $p < 0.05$ .

212

213 **Results**

214 **Demographic characteristics**

215 We describe the demographic data of the study samples in Tables 1 and 2. Of the 305  
216 participants, 85.57% ( $n = 261$ ) were male and 14.43% ( $n = 44$ ) were female. The participants' mean age  
217 was 51.11 years ( $SD = 12.87$ ; range = 20–80). Additionally, 33.11% ( $n = 101$ ) participants were normal-  
218 pachi players, 34.10% ( $n = 104$ ) were half-pachi players, and 32.79% ( $n = 100$ ) were quarter-pachi  
219 players. Furthermore, the mean score of the one-month allowance in entire sample was ¥51477.38  
220 ( $SD = 65474.41$ ); the mean one-month allowance for groups was as follows—normal-pachi players:

221 ¥75178.22 (SD= 81350.77), half-pachi players: ¥47467.31 (SD= 67311.31), and quarter-pachi players:  
222 ¥31710.00 (SD= 27936.90). A one-way ANOVA was conducted with groups (normal-, half-, and  
223 quarter-pachi players) as independent variables and allowance as dependent variables. The results  
224 showed a main effect of groups ( $F (2, 302)= 12.21$ ,  $p= 0.000$ ). Bonferroni testing indicated that  
225 allowance for normal-pachi players was significantly higher than that for half-pachi players ( $p= 0.006$ ,  
226 95% CI= 6460.44–48961.38) and quarter-pachi players ( $p= 0.000$ , 95% CI= 22009.37–64927.06).  
227 There was no significant difference between half- and quarter-pachi players ( $p= 0.228$ , 95% CI=  
228 –5547.00–37061.62).

229

230 -----

231 Tables 1 and 2 here

232 -----

233

234 The mean years of the history of playing *pachinko* and *pachislot* in the full sample were 23.09  
235 (SD= 13.72), and were 23.59 (SD= 12.55) for normal-pachi players, 27.88 (SD= 13.79) for half-pachi  
236 players, and 17.62 (SD= 12.91) for quarter-pachi players. A one-way ANOVA was conducted with the  
237 groups (normal-, half-, and quarter-pachi players) as independent variables and history of playing  
238 *pachinko* and *pachislot* as dependent variables. The results showed a main effect of group ( $F (2, 302)=$   
239 15.73,  $p= 0.000$ ). Bonferroni testing indicated that there was no significant difference between normal-  
240 and half-pachi players ( $p= 0.058$ , 95% CI= –8.70–0.11) in terms of history of playing *pachinko* and

241 *pachislot*. The quarter-pachi players had a significantly lower mean than that of the normal-pachi  
242 players ( $p= 0.004$ , 95% CI= 1.51–10.41) and half-pachi-players ( $p= 0.000$ , 95% CI= 5.84–14.68).

243 **Group differences on the dependent variable**

244 The means and SDs for each outcome variable are shown in Table 3.

245 -----

246 Table 3 here

247 -----

248 A one-way ANCOVA was conducted to compare the amount of money spent on gambling  
249 between the three groups, controlling for the effects of sex, age, income, history of playing *pachinko*  
250 and *pachislot*, allowance, and other outcome variables. There was a significant difference in the amount  
251 of money spent on gambling between the groups ( $F (2, 288)= 3.82$ ,  $p= 0.023$ , partial  $\eta^2= 0.03$ ). Post-  
252 hoc tests showed that there was a significant difference between normal- and quarter-pachi players ( $p=$   
253 0.02, 95% CI= 2601.15–40652.19). There was no significant difference in other outcome measures (the  
254 debt caused by gambling between groups:  $F (2, 288)= 0.55$ ,  $p= 0.580$ , partial  $\eta^2= 0.00$ ; the number of  
255 days participants gambled in the prior month between groups:  $F (2, 288)= 0.31$ ,  $p= 0.73$ , partial  $\eta^2=$   
256 0.00; the time spent gambling between groups:  $F (2, 288)= 1.86$ ,  $p= 0.158$ , partial  $\eta^2= 0.01$ ; PGSI-J:  $F$   
257  $(2, 288)= 0.27$ ,  $p= 0.76$ , partial  $\eta^2= 0.00$ ; GRCS-J:  $F (2, 288)= 1.27$ ,  $p= 0.28$ , partial  $\eta^2= 0.01$ ; PHQ-9-  
258 J:  $F (2, 288)= 0.21$ ,  $p= 0.81$ , partial  $\eta^2= 0.00$ ; SDIIS-work:  $F (2, 288)= 2.07$ ,  $p= 0.127$ , partial  $\eta^2= 0.01$ ;  
259 SDIIS-Social life:  $F (2, 288)= 0.96$ ,  $p= 0.384$ , partial  $\eta^2= 0.01$ ; SDIIS-Family life:  $F (2, 288)= 1.22$ ,  
260  $p= 0.295$ , partial  $\eta^2= 0.01$ .

261 -----

262 Figure 1, Table 4, 5 here

263 -----

264

265 **Discussion**

266 This study was designed to examine the effect of investment types in *pachinko/pachislot* by

267 adult gamblers on gambling-related harms. We sought to compare the differences in gambling-related

268 harm between normal-, half-, and quarter-pachi players in terms of debt, the number of days participants

269 had gambled during the prior month, the total time and money they had spent on gambling, severity of

270 gambling, gambling cognitive distortion, depressive symptoms, as well as the degree of disability at

271 work, in their family, and social lives. Our results demonstrated that the amount of money quarter-pachi

272 players spent on gambling during the past month was lower than that spent by normal-pachi players.

273 However, apart from the amount of money gamblers had spent on gambling during the past month, we

274 did not find any significant differences in gambling-related harm among normal-, half-, and quarter-

275 pachi players. These results suggest that low-investment *pachinko/pachislot* could serve to decrease the

276 amount of money gamblers spent on gambling, thus acting as a harm-minimization strategy. In addition,

277 in the analyses of this study, the groups were the independent variable, and other variables (sex, age,

278 income, money spent for entertainment and leisure, *pachinko/pachislot* playing history, and other

279 outcome variables) were used as covariates to examine the effect on outcome measures. As a result,

280 some control variables had a statistically significant influence on outcome measures in each analysis;

281 therefore, we would like to discuss the support for gambling harm reduction comprehensively while  
282 considering these variables.

283 The results of this study showed that among gambling-related harms, the amount of money  
284 gamblers had spent on gambling in the past month was lower among quarter-pachi players than among  
285 normal-pachi players. In other words, the quarter-pachi players engaged in gambling with a reduced  
286 risk to the financial harms of gambling. A previous study [6] demonstrated that gambling does not only  
287 cause financial harms, but also leads to gambling behaviors and symptoms and affects mental health  
288 (for example, depressive symptoms) and interpersonal relationships (for example, social and family  
289 life). In the present study, we assumed that the harms experienced by gamblers who played low-  
290 investment pachinko (quarter- and half-pachi players) would be less severe than those experienced by  
291 normal-pachi players.

292 For gambling behaviors and symptoms, a previous study found that the more severe the  
293 gambling, the more time gamblers had to spend to acquire the fun and stimulation they desired [28] and  
294 the higher was the irrational cognitive distortion [22]. Therefore, we assumed that low-investment  
295 *pachinko/pachislot* gamblers would have a lower level of gambling symptoms as well as lesser number  
296 of days, money, and total time spent on gambling. However, the results of this study found that there  
297 was no significant difference between the groups as per the PGSI-J, which measured the severity of  
298 gambling among groups, the number of days players had gambled in the prior month, the total time they  
299 had spent gambling, and gambling cognitive distortion. In other words, the fact that the participants in  
300 this study played *pachinko/pachislot* at a lower investment rate did not mean that they had a low level

301 of gambling severity. In addition, participants in this study included people with a relatively long  
302 gambling history of 23.09 years; the years of playing *pachinko/pachislot* among all players were over  
303 17 years. With a gambling history of over 17 years, participants' gambling would have had already  
304 become a habit, and they would have to spend more time to acquire the enjoyment and stimulation  
305 obtained from gambling. This could have been the reason why there were no significant differences in  
306 depressive symptoms, degree of disability at work, and in family and social life among the groups.

307 Based on the results of this study, we would like to discuss potential harm reduction  
308 approaches for low-investment *pachinko* players. The results of this study provide important insights,  
309 because some control variables had a statistically significant influence on some outcome measures from  
310 each analysis. For example, when one variable, the amount of money spent on gambling, was included  
311 as a control variable in the analyses (outcome measures: debt of gambling, number of days gambled,  
312 degree of disability at work, and degree of disability in one's social life), it had positive effects on  
313 outcome measures. Although disordered gamblers have been found to gamble to solve financial  
314 difficulties [29], table 4 shows that financial losses on gambling would also affect their work-related  
315 disability ( $F (2, 288) = 4.000$ ,  $p = 0.046$ , partial  $\eta^2 = 0.014$ ). Therefore, while the main analysis in this  
316 study found that low-investment *pachinko/pachislot* could serve to reduce the amount of money  
317 gamblers spent on gambling and thus act as a harm-minimization strategy, reducing the amount of  
318 money gamblers spent on gambling could induce some gambling-related harms.

319 Moreover, these results indicate that the level of disability at work affects various outcomes  
320 for gamblers. Given that 90% of the participants in this study were employed (Table 1), the results of

321 this study may have important implications for employed gamblers. While considering treatment  
322 interventions for those affected by gambling disorders, it is important to focus on helping individuals  
323 reduce their gambling behavior. On the other hand, based on the results of this study, it is also important  
324 to focus on the difficulties in gamblers' lives, especially their professional lives. In addition, depressive  
325 symptoms ( $F (2, 288)= 4.514$ ,  $p= 0.034$ , partial  $\eta^2= 0.015$ ) and gambling severity ( $F (2, 288)= 5.641$ ,  
326  $p= 0.018$ , partial  $\eta^2= 0.019$ ), as well as financial loss were variables influencing gamblers' work-related  
327 disability (Table 4). Although these variables would interact with each other [29], the results of this  
328 study indicate that financial loss and depressive symptoms because of gambling can interfere with work  
329 and in turn, work interference can exacerbate gambling-related harm. There are a number of supportive  
330 interventions that can be used to help alleviate work-related disability and increase work satisfaction,  
331 such as cognitive behavioral psychotherapy [30] and mindfulness [31]. Therefore, conducting these  
332 treatments may improve their prognosis.

333

### 334 **Limitations**

335 A potential limitation of this study is its cross-sectional design. Therefore, we cannot conclude  
336 whether the longitudinal use of low-investment *pachinko/pachislot* could reduce gambling harm. We  
337 have not been able to identify a causal relationship between harms faced by gamblers and low-  
338 investment *pachinko/pachislot*. Future studies must employ a longitudinal design to assess this causal  
339 relationship. Another limitation of the present study is the use of internet sampling. Given that most  
340 gamblers would not receive sufficient treatment and support to alleviate their gambling difficulties, the

341 results of this study would be useful for people who did not receive treatment. However, replication of  
342 the present study's results would lead to generalization of its findings not only in a non-clinical sample,  
343 but also for clinical assessment and treatment of disordered gamblers.

344

### 345 Conclusion

346 While low-investment *pachinko/pachislot* is useful for gamblers who are currently  
347 experiencing financial harm, it has also shown potential of being effective for gamblers facing mental  
348 health and lifestyle-related problems in the long term. For low-investment *pachinko* to be effective as a  
349 harm-reduction strategy in the context of treatment in Japan, it is important to conduct a thorough  
350 assessment of the gamblers' condition and propose low-investment *pachinko/pachislot* as a less harmful  
351 alternative behavior depending on the outcome.

352

### 353 Abbreviations

354 EGM, electronic gambling machines; CI, confidence interval; PGSI-J, Japanese version of the  
355 Problem Gambling Severity Index; GRCS-J, Japanese version of the Gambling Related  
356 Cognitions Scale; PHQ-9-J, Japanese version of the Patient Health Questionnaire-9; SDIIS-J,  
357 Japanese version of the Sheehan Disability Scale; SD, standard deviation; ANOVA, analysis  
358 of variance.

359

### 360 Declarations

361    **Ethics approval and consent to participate**

362    This study was reviewed by the Institutional Review Board of Hokusho University (2019-014) and  
363    completion of internet survey by participants was considered as informed consent. Participants were  
364    informed about study procedures and voluntary participation was emphasized.

365    **Consent for publication**

366    Not applicable.

367    **Availability of data and materials**

368    The datasets used and/or analysed during the current study are available from the corresponding  
369    author on reasonable request.

370    **Competing interests**

371    KY received honorarium from an casino operator.

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375    **Authors' contributions**

376 KY made substantial contributions to the conception; KY and TI designed the study and KY  
377 contributed to the acquisition of data. KI contribute to the analysis of data and KY and KI drafted the  
378 work and substantively revised it. All authors read and approved the final manuscript.

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381

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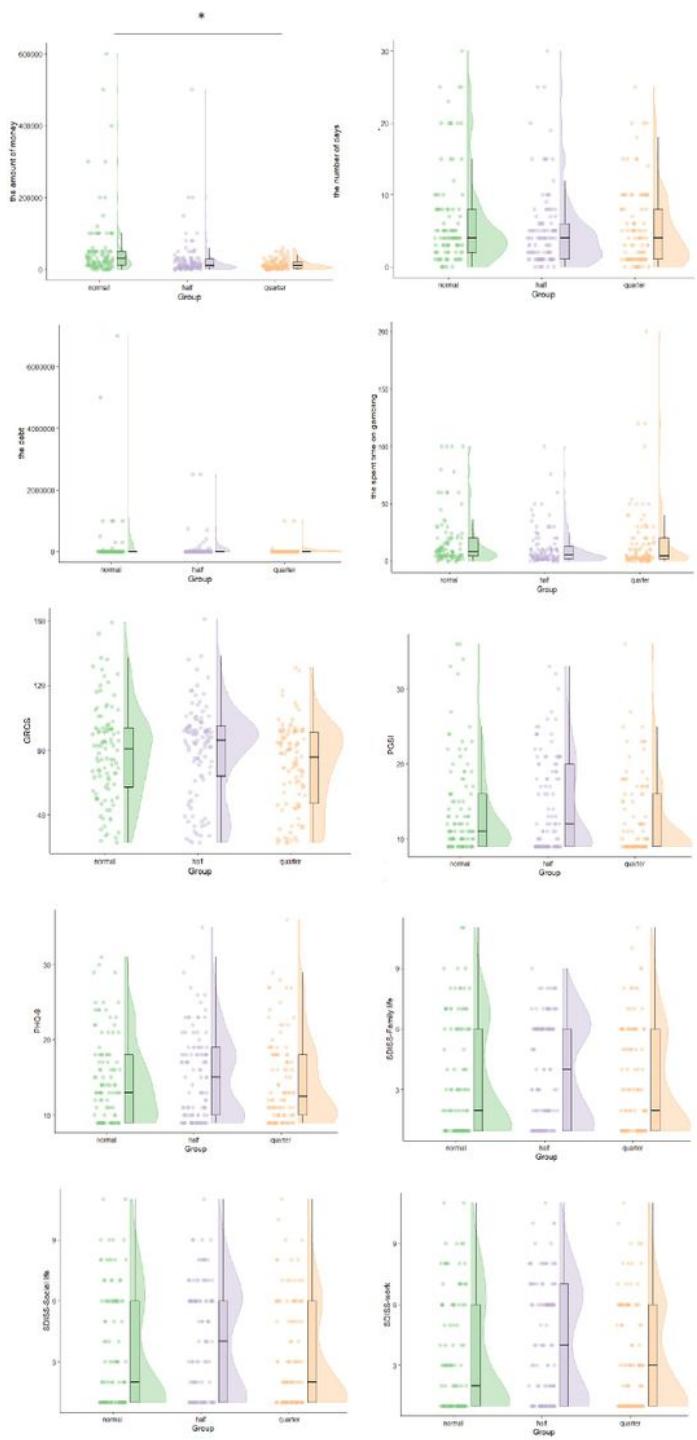
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# Figures



**Figure 1**

The results of outcome variables for each group

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