

**Abstract**

**Objective:** Telescoping refers to the accelerated progression from starting a potentially addictive behavior to reaching a disordered level. For disordered gambling, telescoping has been reported for women compared to men. Most previous studies on telescoping have used clinical samples and retrospective reports, but this study examined a non-clinical population of gamblers using electronically tracked gambling behavior. **Method:** The sample consisted of Norsk Tipping's *Multix* electronic gaming machine (EGM) customers during the period of March 2013 to December 2018 ( $n = 184,113$ , 27.0% women, age range from 18 to 103 years ( $M = 41$ ,  $SD = 16$ )). We hypothesized that women would be older than men when first playing *Multix* and that the time between first playing *Multix* to reaching first loss limit (money one is allowed to lose) would be shorter for women compared to men. **Results:** Welch two-sample  $t$ -tests revealed that women were older than men at *Multix* gambling onset (Women:  $M = 46$ ,  $SD = 17$ ; Men:  $M = 40$ ,  $SD = 15$ ;  $p < .001$ ). Kaplan–Meier revealed a median survival time of 46 months (95% CI [45, 47]) for women and 55 months (95% CI [54, 56]) for men before the first loss limit. Cox regression showed higher risk for meeting the loss limit for women compared to men ( $HR = 1.22$ , 95% CI [1.20, 1.25],  $p < .001$ ) when controlling for age. **Conclusion:** Prevention efforts should consider that adult women playing EGMs appear to be at risk for developing high-risk gambling faster than men.

*Keywords:* gambling progression, risky gambling, player-account data, behavioral tracking, sex differences

**Public Health Significance**

This study found that adult women gambling on electronic gaming machines progress faster than men towards risky gambling, supporting a telescoping phenomenon.

### **Telescoping and Gender Differences in High-Risk Gambling: Loss Limit Behavior in a Population of Electronic Gaming Machine Players**

Disordered gambling refers to gambling involving lack of control and harms experienced by the gambler and others who are affected, and it can be understood as existing on a continuum with more severe forms qualifying for the diagnosis of gambling disorder (Shaffer & Korn, 2002; Shaffer & Martin, 2011). One phenomenon that has been identified regarding development of disordered gambling is “telescoping”, which refers to accelerated progression from starting a potentially addictive behavior to reaching a disordered level of that behavior. In terms of gambling, it has been reported that women tend to start gambling later in life but progress faster from gambling onset to disordered gambling compared to men (González-Ortega et al., 2013; Grant et al., 2012; Ibáñez et al., 2003; Ladd & Petry, 2002; Nelson et al., 2006; Potenza et al., 2001; Ronzitti et al., 2016; Tavares et al., 2001). Such a telescoping effect has also been observed related to other problems, such as alcohol and substance abuse (Hernandez-Avila et al., 2004; Piazza et al., 1989; Randall et al., 1999; Zilberman et al., 2004). A detailed understanding of potential telescoping for women in gambling and under which circumstances it occurs is important for the prevention and treatment of disordered gambling (Zakinaeiz et al., 2017).

Several potential explanations have been suggested for the telescoping effect (Zakinaeiz et al., 2017). For example, women report higher motivation to regulate mood states with gambling compared to men (Sacco et al., 2011), and this motivation could influence women’s tendency for faster progression to disordered gambling because mood-regulating motives for gambling have been associated with disordered gambling (Marchica et al., 2020). Compared to men, women with disordered gambling also display higher rates of comorbid mood and anxiety disorders that also may reinforce gambling for mood regulation and thus overinvolvement in gambling (Blanco et al., 2006; Desai & Potenza, 2008; Tavares

et al., 2003). Still, the telescoping effect has been observed even when controlling for psychiatric comorbidity (Grant et al., 2012). Hence, psychiatric comorbidity cannot fully account for telescoping, although the influence of emotion regulation motivation cannot be ruled out.

Another explanation for telescoping is related to gambling preferences (Zakiniaez et al., 2017). Women gamblers report, for instance, higher preference for high event frequency games (i.e., games with short time interval between stake and outcome) such as electronic gaming machines (EGMs) compared to men (Blanco et al., 2006; LaPlante et al., 2006). EGMs and other high event frequency games have consistently been linked to increased risk of developing disordered gambling compared to low event frequency games (Dowling et al., 2005; Leino et al., 2015). However, telescoping has also been observed while controlling for game type preference (Grant et al., 2012).

It has further been suggested that changes in social norms and gambling opportunities for women might be an explanation for telescoping (Zakiniaez et al., 2017). Historically, gambling has not been considered a suitable activity for women, and such negative perceptions of women gamblers may have reduced women's access to gambling (McCarthy et al., 2019, Potenza et al., 2001). Women who do engage in gambling may thus start later in life due to the reduced social access to gambling opportunities. Further, gambling among women may be more easily considered problematic due to norm violations, and women who have problems related to gambling may experience more stigmatization compared to men, which may further reinforce their gambling problems. Differences in division of labor, notably lower income among women, might also explain the telescoping effect because women have less money to lose and thus more quickly experience the negative consequences of gambling (Brown & Coventry, 1997).

Social norms concerning gender are, however, constantly changing and societies are in general becoming more egalitarian (Khamis & Ayuso, 2021). For example, Richmond-Rakerd, Slutske, and Piasecki (2013) studied gambling onset among different birth cohorts. They found that gambling onset took place earlier in more recent birth cohorts and that the gender gap in gambling onset was diminishing. These findings run counter to one part of telescoping, i.e., that women start gambling later than men. Relatedly, a study by Nelson, LaPlante, LaBrie, and Shaffer (2006) found that men and women's progression to disordered gambling did not differ when controlling for age of gambling onset. Participation in gambling may be increasing among younger women. One study found that younger women are more likely to engage in sports betting and to gamble in casinos compared to older women (McCarthy et al., 2018). Multiple factors appear to be influencing young women's gambling participation, including family traditions of gambling, peer influences, gambling marketing targeting women, and women experiencing that social attitudes towards women gambling is changing (McCarthy et al., 2020).

Most studies on telescoping in gambling have relied on clinical samples (Zakinaeiz et al., 2017). In contrast, Slutske, Piasecki, Deutsch, Statham, and Martin (2015) studied telescoping using a general population sample in Australia and did not find support for this phenomenon. If telescoping is only observable within clinical samples, this may reflect gender differences in help-seeking behavior rather than reflecting the nature of development of disordered gambling itself. Notably, women with disordered gambling show lower rates of treatment seeking compared to men (Braun et al., 2014). This underscores the importance of studying telescoping effects across different types of populations of gamblers.

Another limitation to previous studies on telescoping in gambling is that they typically have relied on self-report data, which are subject to both recall and social desirability bias. Studies on gambling are now increasingly making use of behavioral tracking data that

circumvents these limitations (Chagas & Gomes, 2017; Deng et al., 2019). Such data often involve large sample sizes with detailed information on gambling behavior and are collected without being invasive to the player, thus increasing the ecological validity of the data (Griffiths, 2014). However, a potential limitation of behavioral tracking data is a lack of clinical information about disordered gambling in addition to contextual factors. Still, limited clinical information may be mitigated by using proxy measures based on behavioral tracking data that have been found to be associated with disordered gambling (Deng et al., 2019).

Reaching pre-set loss limits, assumed to reflect lack of control, is one proxy for disordered gambling because people with disordered gambling are far more likely to reach their loss limit threshold for gambling compared to those without disordered gambling (Hing et al., 2015; Lalande & Ladouceur, 2011).

Loss limits are intended as tools to minimize negative consequences from gambling (i.e., as a responsible gambling tool) and refer to the maximum amount of money a player is allowed to lose before play is temporarily stopped, typically for a day, week, or month depending on the timeframe of the loss limit (Delfabbro & King, 2021). Use of loss limits can be voluntary or mandatory. One study on voluntary loss limits found that voluntary loss limits were viewed more favorably by people with risky/problem gambling, young people, and women (Engebø et al., 2019). Mandatory loss limits are less frequently offered/demanded by gambling operators, and information about their use is mostly based on data from Norway (Delfabbro & King, 2021). Most gamblers who reach mandatory loss limits report that they stop gambling altogether while the restriction is in effect, although those with high-risk gambling appear more likely to report continuing play at another gambling provider where there is no restriction (Auer et al., 2020).

### **Gambling in Norway and the current study**

The current study was conducted in Norway and is based on data from customers of Norsk Tipping's *Multix* EGMs. In Norway gambling is regulated, with Norsk Tipping as the monopoly provider of online and land-based lotteries, sports betting games, and EGMs (Rossow & Hansen, 2016). The most recent nationally representative survey of gambling in Norway was conducted in 2019 and found that 67.1% of Norwegian men and 60.2% of Norwegian women aged 16–74 years had gambled at least once during the last year (Pallesen et al., 2020). Men tend to participate in more game types compared to women. Further, younger people are more likely to participate in online games (e.g., online casino games, online poker) while older people are more likely to participate in lottery games and horse race betting. It was found that 1.4% of the Norwegian adult population (men: 1.9% vs. women: 0.8%) could be classified as problem gamblers, which represents a statistically significant increase from the 0.9% estimate found in 2015. This places Norway around the middle compared to problem gambling rates in other European countries, which ranges between 0.12% and 3.4%, although methodological variations across studies preclude direct comparisons (Calado & Griffiths, 2016).

Norsk Tipping introduced *Multix* in 2008. *Multix* is a multigame terminal that offers a collection of different games within its interface, including casino games, card games, and other games of chance and skill. *Multix* is situated at different public locations such as kiosks, hotels, pubs, bingo halls, and racing tracks. There were 31 different games available in 2013 and 44 different games available in 2018. One example of a chance game is *Wolf Run*, which is a 5-wheel slot game where one hopes to match symbols. Casino games include electronic versions of traditional table games such as *Roulette*, *Street Holdem* (poker), and *Blackjack*. The latter two are also examples of *Multix* games with skill elements, of which there were 5 in total between 2013 and 2018. The age limit is 18 years, and *Multix* has built-in responsible gambling tools such as mandatory monthly loss limits, which were set to 2,500 Norwegian

kroner ( $\approx 250$  €) in 2013 and were adjusted to 2,700 NOK ( $\approx 270$  €) in November 2016.

Players may alternatively set voluntary limits below mandatory thresholds (see Leino et al. (2015) for more details about *Multix*).

The current study aims to account for previous limitations in study designs on telescoping by examining a non-clinical population of gamblers and by using behavioral tracking data. To the authors' knowledge, the present study is the first to use actual gambling data to study telescoping in gambling and the first to include a whole population of gamblers.

We posit the following hypotheses in line with a telescoping phenomenon for women gamblers:

1. Women will be older than men when they first gamble on *Multix* during the study period.
2. The time between the first gambling on *Multix* to when the first loss limit threshold is reached will be shorter for women compared to men.
3. Women will be more likely to reach their first loss limit compared to men at any point during the study period when controlling for age when first gambling on *Multix*.

Hypothesis 3 reflects the expectation that this telescoping effect of high-risk gambling will not be fully explained by age of gambling onset, as suggested by Nelson et al. (2006).

## Methods

### Transparency and openness

In the following we report how we determined our sample size, all data exclusions, all manipulations, and all measures in the study. Data were analyzed with R version 4.1.1. The study was not preregistered. The analysis code, information about specific R package versions, and supplemental material referenced in the text are available at

<https://osf.io/wa6gq/>. Data are only available upon application due to a data provider agreement.

### **Participants and procedure**

The sample consisted of the whole population of Norsk Tipping's *Multix* EGM customers. Data were collected between March 2013 and December 2018 ( $N = 195,318$  [26.5% women]) and were organized into 70 monthly time points. The data were provided and anonymized by Norsk Tipping. The data included detailed information about gambling behavior on *Multix*, such as number of active days gambling, time played, losses, mandatory and voluntary loss limits in NOK, and sessions played (see supplemental material for the full list). We excluded participants who would have been younger than 18 years at study start (March 2013) so that measures of gambling behavior would be complete and thus more comparable between age groups. The final analytic sample ( $n = 184,113$ ) comprised 27.0% women, and the age at the first month of gambling on *Multix* (in the period between March 2013 and December 2018) ranged from 18 to 103 years ( $M = 41$ ,  $SD = 16$ ).

### **Measures**

#### ***Demographic information***

Demographic information included age and gender based on Norsk Tipping's access to customers' personal identification numbers. Age refers to a participants' age at first active gambling month on *Multix* in the study period and was handled both continuously and categorically (18–29, 30–39, 40–49, 50–59, 60–69, and 70+ years). Information on ethnicity was not available.

#### ***Gambling behavior***

Gambling behaviors on *Multix* included gambling participation (active gambling months and sessions played in a month, number of different *Multix* games played across the study period, and preference for chance versus skill-based games based on the proportion of



sessions played), gambling involvement (amount staked in NOK and time spent), and responsible gambling measures (setting a monthly loss limit below the mandatory threshold, reaching a monthly loss limit). In addition, the data included the amount staked in NOK across all of Norsk Tipping's gambling products during months with active *Multix* gambling.

Some participants had reached their loss limits without this being registered by Norsk Tipping (for mandatory limit:  $n = 873$ , for voluntary limit:  $n = 7674$ ), which was corrected for in the analysis. Registration errors may happen due to communication failure between the gambling machine and the responsible gambling software used by Norsk Tipping (Norsk Tipping, personal communication, March 14th, 2022). In most cases only the status of registration was affected, and play was stopped even if this was not registered, although a small minority of cases showed losses exceeding the limit amount (for mandatory limit:  $n = 239$ , for voluntary limit:  $n = 444$ ). The exceeding loss amount among those affected ranged from 1 NOK to 1,558 NOK for mandatory limits (median = 120; IQR = 19, 324) and from 1 NOK to 2,500 NOK for voluntary limits (median = 197; IQR = 33, 498).

### **Statistical analysis**

Descriptive statistics were calculated to obtain an overview of gender differences related to the key study variables, namely the age at *Multix* gambling onset and age at reaching loss limits. This included mean/median/distribution of age at *Multix* onset, frequencies of reaching one's loss limit, and the number of active gambling months until the first loss limit was reached or study end stratified by gender for the whole population. Additional descriptives were calculated for those who had reached the loss-limit threshold. This included minutes spent gambling on *Multix*, number of sessions on *Multix*, and total bets on *Multix* and on all of Norsk Tipping's products stratified by gender. Reaching a monthly loss limit was defined as reaching either the monthly mandatory set loss limit or the voluntary set loss limit because some customers set the voluntary loss limit lower than the mandatory

loss limit. For time spent gambling on *Multix*, number of bets total, and number of sessions, we divided all of a participant's monthly totals by active months gambled to calculate an average for each participant. Only age at *Multix* onset satisfied the normality assumption (see supplemental material). Welch two-sample *t*-tests were used to test the first hypothesis that women would be older than men when first gambling on *Multix*. Wilcoxon rank sum tests were used for analyses of all other continuous variables. Pearson's chi-squared tests were calculated where differences in frequencies were tested for age categories and for having reached the loss limit. Effect sizes were calculated using Cohen's *d* for *t*-tests, correlation-coefficient *r* for Wilcoxon rank sum tests, and Cramer's *V* for Pearson's chi-squared tests. A Cohen's *d* of 0.2 is regarded as a small effect, 0.5 is regarded as a medium effect, and 0.8 is regarded as a large effect. An *r* and Cramer's *V* of 0.1 constitute a small effect, 0.3 constitutes a medium effect, and 0.5 constitutes a large effect (Cohen, 1992; Tomczak & Tomczak, 2014).

Survival analysis with the Kaplan–Meier estimate of survival function was performed to test the second hypothesis that the time between first playing *Multix* to reaching the first loss limit would be shorter for women compared to men. Time-to-event was operationalized as the number of months between the first active *Multix* gambling month to the month when the loss limit threshold on *Multix* was reached or the last active gambling month for those who did not reach the monthly loss limit threshold (right-censored gamblers). The Kaplan–Meier estimates of survival function was used to analyze the probability of not having met the monthly loss limit at a specific time point given that it had not occurred during previous time points. It was expected that women would have lower survival probabilities compared to men, and this was investigated by a log-rank test.

Cox proportional hazards regression was used to test the third hypothesis by investigating gender differences regarding the probability of meeting a monthly loss limit at

any time period while controlling for age categories. Finally, we also examined whether the gender effect differed across age categories by including its interaction in the model. Gender effects across age categories were reported contingent on the statistical significance of the interaction effect. Cox regression involves analyzing *hazard ratios (HRs)*. In the current context, hazard refers to the probability of meeting a monthly loss limit for the first time within a specific time point (1 to 70, reflecting the number of months in the current dataset) provided that it has not occurred during preceding time points. *HR* refers to differences in hazards between men and women. An *HR* greater than 1 would indicate that women have a greater risk of reaching the loss limit threshold compared to men, whereas an *HR* less than 1 would indicate that men have a greater risk of reaching the loss limit threshold compared to women. It was hypothesized that the *HR* would be higher for women compared to men. Statistical assumptions were checked (see supplemental material). Visual inspection of the Schoenfeld residuals against time indicated that the proportional hazards assumption was met for both gender and age. Visual inspection of deviance residuals revealed the presence of influential outliers, which were handled by using a robust method of Cox regression that modifies the partial likelihood estimator to account for this (Bednarski, 1993; Minder & Bednarski, 1996).

Some participants could have gambled on *Multix* before study start, thus having earlier *Multix* gambling onset. If there were any systematic differences between men and women in this unobserved period then this could conceivably also affect hypothesized gender differences about gambling onset and meeting first loss limit, for example, if men met their first loss limit earlier than women but this pattern emerged during the unobserved period. Therefore, we conducted sensitivity analyses on a sub-sample that had their first gambling after month 12 or later in the study period ( $n = 76,182$  (28.9% women)) because this was assumed to increase the proportion that truly had their *Multix* gambling onset during the

analysis period. The sensitivity analysis included the distribution of age at *Multix* gambling onset, the Kaplan–Meier estimate, and Cox regression, as accounted for above.

### **Ethics**

Because no personally identifiable information was collected by the authors, the study was exempt from ethical approval in accordance with the guidelines of the Norwegian Centre for Research Data. To ensure participant anonymity, Norsk Tipping aggregated the data at the monthly level, and each participant received a constructed identification number.

### **Results**

Within the entire sample, 30% of participants had met at least one monthly loss limit during the study period. The median number of active months on *Multix* during the study period was 6, with an interquartile range from 2 to 27 months. Participant characteristics are presented broken down by gender in Table 1. In relation to the first hypothesis, the results showed that women playing *Multix* were older than men by a mean age difference of 6 years when they gambled at *Multix* for the first time (during the study period). Examination by age category showed that the largest differences in percentages between men and women were in the 18–29 years category. Table 2 presents gambling behavior among those who had met at least one monthly loss limit broken down by gender. The results showed small effect size differences in gambling behavior between men and women who had reached a monthly loss limit in gambling behavior. This also included time to when the loss limit was met. However, this measure was not taken as a test of the second hypothesis because median or mean measures do not consider rates of people who stop gambling before study end and/or reaching loss limit.

In relation to the second hypothesis, the time to first monthly loss limit reached was examined with the Kaplan–Meier survival estimate (Figure 1). The results showed that the probability of having exceeded at least one loss limit increased with participants' time in the

study. The median survival time was 55 months (95% CI [54, 56]) for men compared to 46 months (95% CI [45, 47]) for women. The Cox regression results with main effects for gender and age category are presented in Table 3 and inform the third hypothesis. They showed that women had 22% higher probability to reach the monthly loss-limit threshold at any time point compared to men after controlling for age categories. Inclusion of the interaction effect between gender and age category indicated that the effect of gender differed across age categories (Wald test = 3156, 11 df,  $p < .001$ ). Cox regressions stratified by gender (also reported in Table 3) showed increasing *HRs* for older age groups up to the oldest bracket of 70+ years for men and up to 60–69 years for women. Men showed higher within-gender differences for age compared to women. The highest age-related *HR* was 2.52 for men (age group 60–69 years) and 1.15 for women (age group 40–49 years).

Sensitivity analyses mirrored the results of the main analyses. The difference in age at start between men and women was almost identical (Women:  $M = 44$ ,  $SD = 17$ ; Men:  $M = 39$ ,  $SD = 15$ ;  $p < .001$ , Cohen's  $d = -0.355$ ). Kaplan–Meier estimates showed a median survival time of 36 months (95% CI [35, 38]) for women and 47 months (95% CI [46, 48]) for men before the first loss limit was reached. Thus, the median survival time difference was in the same direction and stronger (11 months vs. 9 months in the main analysis). Cox regression showed higher risk for meeting the loss limit for women compared to men ( $HR = 1.28$ , 95% CI [1.23, 1.33],  $p < .001$ ) when controlling for age categories. See the supplemental material for full results on Cox regressions for the main analyses and sensitivity analyses.

### Discussion

In the current study we examined the telescoping effect in gambling using a non-clinical sample and actual gambling data. The results support the first hypothesis as women were older than men when they played *Multix* for the first time during the study period, as shown by a mean age difference of 6 years. The results also support the second hypothesis as

women met their first monthly loss limit earlier than men, with a median difference of 9 months. Finally, the Cox regression supported the third hypothesis as it showed that women had 22% higher probability than men of meeting their first loss limit at any time in the study period when controlling for age at *Multix* onset.

Previous studies have found support for the telescoping effect while using various operationalizations of time to event, i.e., time from non-problematic to problematic gambling (Grant et al., 2012; Ibáñez et al., 2003; Ladd & Petry, 2002; Potenza et al., 2001; Tavares et al., 2001). Start time has typically included age when first gambling, age when starting gambling regularly, and age at first symptom of disordered gambling. Event has typically been operationalized as symptoms of disordered gambling, diagnosis of disordered gambling, entering treatment, or attempts to stop gambling. The current study provides further support for the telescoping effect by showing that it is observable within a whole population of EGM customers with reaching loss limits as a marker of high-risk gambling. Differences in time to loss limit could not be explained by women setting lower loss limits because the median of self-set loss limit was the same for both genders. Further, frequencies of setting a less-than-mandatory amount for the loss limit occurred at a 2% higher frequency among men, hence potential lower self-set loss limits in women could not explain the findings.

The 6-year mean age difference between men and women for age at *Multix* gambling onset constituted a small effect, although it appears comparable to gambling onset age differences reported by several previous studies ranging from 1 year to 16 years (Grant et al., 2012; Ibáñez et al., 2003; Ladd & Petry, 2002; Nelson et al., 2006; Potenza et al., 2001; Slutske et al., 2015; Tavares et al., 2001). The current study results are comparable to the lower end of these studies (Nelson et al., 2006; Potenza et al., 2001; Slutske et al., 2015). However, direct comparison is limited by the fact that the current study examined age when starting gambling on *Multix* during the study period rather than starting any gambling. The

mean age of *Multix* gambling onset is likely higher than the mean age of lifetime gambling onset.

Reasons for the telescoping effect remain largely unknown, as indicated by the different proposed explanations in the introduction. The current study results both support and contradict previously suggested explanations. Because the telescoping effect was observed in the population of *Multix* gamblers, the results run counter to the notion that telescoping is exclusive to treatment-seeking gamblers (Slutske et al., 2015). Further, the results run counter to the idea that telescoping is due to increased preference for non-strategic games among women because telescoping was observed within a population of EGM customers exclusively (Grant et al., 2012). Men were more likely to prefer *Multix* games with a skill element compared to women, although the difference was very small among those who met a monthly loss limit. Some proposed explanations are hard to evaluate based on the current study design. The notion that women develop disordered gambling faster due to less income (Brown & Coventry, 1997) was not possible to evaluate in the current study because data on income or diagnosis of disordered gambling were not available. Still, it was notable that women and men did not differ considerably in frequency of setting loss limits lower than the mandatory amount. In addition, in Norway the gender wage gap difference is lower compared to other countries (e.g., the US), which suggests that differences in disordered gambling progression would be less influenced by gender differences in financial ability in Norway compared to other countries (Reisel et al., 2018).

The Cox regression analyses showed that the *HR* for meeting a monthly loss limit increased for older age groups up to the oldest bracket of 70+ years for men and 60–69 years for women. Relatedly, a previous study found that middle-aged women EGM players were at heightened risk for disordered gambling (Hing et al., 2016). However, the effect of age was stronger within men compared to within women. Taken together, the age-related effects for

men and women are in line with the findings by Nelson et al. (2006) who showed that older age at gambling onset predicted shorter duration to disordered gambling, which was greater than the effect of gender. The results from the current study still support a unique contribution of gender, hence supporting the notion of the telescoping effect for women gamblers.

### **Strengths and limitations**

Some strengths of the current study deserve mention. The data reflected actual gambling behavior for the whole population of EGM customers for nearly 6 years, with the participant age range covering the whole lifespan. There might be some limitations in terms of the generalizability of the current findings to other gambling operators, game types not available on *Multix* (e.g., sports betting and bingo), and gambling in other formats (e.g., physical table games and online games). However, it should still be noted that men and women who reached their monthly loss limit on *Multix* showed similar gambling expenditure across Norsk Tipping's products. Because Norsk Tipping is by far the largest gambling provider monopolist in Norway, data on gambling expenditure at Norsk Tipping likely cover the vast majority of most participants' overall gambling expenditures. Hence, the inherent limitation of behavioral tracking data normally stemming from using only one specific gambling operator/site is to some extent mitigated by the nature of the Norwegian gambling market (Griffiths, 2014). Behavioral tracking data can also be limited by tracking errors and technology abuse. In the present study there were participants with losses indicating that their voluntary or mandatory loss limits were met despite not being registered as such. Fortunately, most cases only affected registration with a small minority being able to continue play. *Multix* requires player-specific game cards, and it has been reported by Norsk Tipping that some players use other people's cards to circumvent responsible gambling measures, although it is unknown to what extent this happens (Norsk Tipping, 2020). This could affect hypothesized gender differences if men are more likely to borrow women's player cards, for example.



Interpretation of the results should take into account the operationalization of landmark events of the telescoping effect, including what constituted the start time and what event represented disordered/high-risk gambling. Time-to-event was calculated with start time equalling *Multix* gambling onset during the study period. The data were left censored in that participants may have played and met a monthly loss limit at *Multix* before the study period. However, results from the sensitivity analyses that were performed to account for this mirrored the main analysis results. More caution should be used when interpreting the main effect of age when first playing *Multix* on the *HR* for reaching loss limit (Table 3). The effect of age when starting gambling is influenced by many participants likely having their first gambling experience before playing *Multix*, more so for older participants. In addition, we did not measure disordered gambling directly, but used reaching the monthly loss limit as a proxy. Reaching loss limits may be understood as indicative of high-risk gambling because those with disordered gambling are more likely to reach loss limits (Hing et al., 2015; Lalande & Ladouceur, 2011). Telescoping has previously been examined in relation to multiple landmark events in the progression of disordered gambling and substance abuse, such as time to first symptom of a condition or initiating treatment (Hernandez-Avila et al., 2004; Ladd & Petry, 2002; Slutske et al., 2015). Because the present study used a novel operationalization of gambling problems, was based on behavioral tracking data, and included the whole population of EMG gamblers, it significantly extends our understanding of the telescoping effect and provides further support for this effect. Another asset of the current study is its prospective design, which stands in stark contrast to previous studies relying on retrospective reports and cross-sectional designs.

Participants' ethnicity was not measured, although general population surveys of Norwegian gamblers in 2019 provide some indication about the distribution of participants' country of birth where approximately 89% reported Norway as country of birth, 7.5%

reported a country in Europe outside Norway/North America/Oceania, and 3.4% reported Africa/Asia/South and Central America (Pallesen et al., 2021). Country of birth was unrelated to participation in online versus land-based gambling in that study, which suggests that the distribution of country of birth may be similar among *Multix* customers.

### **Implications and conclusions**

It is suggested that future studies should combine behavioral tracking data with other forms of data to examine questions that remain unanswered. In addition to using actual gambling data, individual reports on gambling motivation, problem involvement, personality traits, and other risky behaviors (e.g., smoking and alcohol use) can be included. For example, one could investigate the proposed explanation that women progress faster to disordered gambling due to higher emotion regulation motivation by controlling for self-reported gambling motivation. One could also combine information from different registries, such as behavioral tracking data, with information on disordered gambling diagnosis from patient health registries.

Women EGM players were found to progress faster towards high-risk gambling compared to men, and gambling operators should consider incorporating this knowledge into responsible gambling strategies. For example, responsible gambling pop-up messages have been shown to be effective in reducing excessive gambling, and gambling operators may thus consider increasing the use of such messages among gamblers who show early signs of escalating gambling behavior (Bjørseth et al., 2021). Broader information campaigns that seek to spread knowledge about help offers and responsible gambling should also incorporate what is known about the telescoping effect.

Overall, the current study provides additional support for a telescoping phenomenon among women gamblers and suggests that the effect is not restricted to treatment-seeking individuals with more severe forms of disordered gambling. This finding underlines the

importance of incorporating what is known about telescoping not only into treatment strategies, but also to include its implications in wider prevention efforts in the general population.

### References

- Bednarski, T. (1993). Robust estimation in Cox's regression model. *Scandinavian Journal of Statistics*, 213-225.
- Bjørseth, B., Simensen, J. O., Bjørnethun, A., Griffiths, M. D., Erevik, E. K., Leino, T., & Pallesen, S. (2021). The effects of responsible gambling pop-up messages on gambling behaviors and cognitions: A systematic review and meta-analysis. *Frontiers in Psychiatry*, 11(1670). <https://doi.org/10.3389/fpsy.2020.601800>
- Blanco, C., Hasin, D. S., Petry, N., Stinson, F. S., & Grant, B. F. (2006). Sex differences in subclinical and DSM-IV pathological gambling: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Psychological medicine*, 36(7), 943. <https://doi.org/10.1017/S0033291706007410>
- Braun, B., Ludwig, M., Slecza, P., Bühringer, G., & Kraus, L. (2014). Gamblers seeking treatment: Who does and who doesn't? *Journal of Behavioral Addictions*, 3(3), 189–198. <https://doi.org/10.1556/JBA.3.2014.3.7>
- Brown, S., & Coventry, L. (1997). *Queen of hearts: The needs of women with gambling problems*: Financial & Consumer Rights Council.
- Calado, F., & Griffiths, M. D. (2016). Problem gambling worldwide: An update and systematic review of empirical research (2000–2015). *Journal of Behavioral Addictions*, 5(4), 592–613. <https://doi.org/10.1556/2006.5.2016.073>
- Chagas, B. T., & Gomes, J. F. S. (2017). Internet gambling: A critical review of behavioural tracking research. *Journal of Gambling Issues* (36). <https://doi.org/10.4309/jgi.2017.36.1>

- Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*(1), 155. <https://doi.org/10.1037/0033-2909.112.1.155>
- Deng, X., Lesch, T., & Clark, L. (2019). Applying data science to behavioral analysis of online gambling. *Current Addiction Reports*, *6*(3), 159-164. <https://doi.org/10.1007/s40429-019-00269-9>
- Desai, R. A., & Potenza, M. N. (2008). Gender differences in the associations between past-year gambling problems and psychiatric disorders. *Social psychiatry and psychiatric epidemiology*, *43*(3), 173-183. <https://doi.org/10.1007/s00127-007-0283-z>
- Dowling, N., Smith, D., & Thomas, T. (2005). Electronic gaming machines: Are they the 'crack-cocaine' of gambling? *Addiction*, *100*(1), 33-45. <https://doi.org/10.1111/j.1360-0443.2005.00962.x>
- González-Ortega, I., Echeburúa, E., Corral, P., Polo-López, R., & Alberich, S. (2013). Predictors of pathological gambling severity taking gender differences into account. *European Addicition Research*, *19*(3), 146-154. <https://doi.org/10.1159/000342311>
- Grant, J. E., Odlaug, B. L., & Mooney, M. E. (2012). Telescoping phenomenon in pathological gambling: Association with gender and comorbidities. *The Journal of nervous and mental disease*, *200*(11), 996. <https://doi.org/10.1097/NMD.0b013e3182718a4d>
- Griffiths, M. (2014). The use of behavioural tracking methodologies in the study of online gambling. *SAGE Research Methods Cases*.
- Hernandez-Avila, C. A., Rounsaville, B. J., & Kranzler, H. R. (2004). Opioid-, cannabis-and alcohol-dependent women show more rapid progression to substance abuse treatment. *Drug and Alcohol Dependence*, *74*(3), 265-272. <https://doi.org/10.1016/j.drugalcdep.2004.02.001>

- Hing, N., Russell, A., Tolchard, B., & Nower, L. (2016). Risk factors for gambling problems: An analysis by gender. *Journal of Gambling Studies*, 32(2), 511–534.  
<https://doi.org/10.1007/s10899-015-9548-8>
- Ibáñez, A., Blanco, C., Moreryra, P., & Sáiz-Ruiz, J. (2003). Gender differences in pathological gambling. *The Journal of Clinical Psychiatry*, 64(3), 295-301.  
<https://doi.org/10.4088/jcp.v64n0311>
- Khamis, N., & Ayuso, L. (2021). Female breadwinner: more egalitarian couples? An international comparison. *Journal of Family and Economic Issues*, 1-12.  
<https://doi.org/10.1007/s10834-021-09784-2>
- Ladd, G. T., & Petry, N. M. (2002). Gender differences among pathological gamblers seeking treatment. *Experimental and Clinical Psychopharmacology*, 10(3), 302.  
<https://doi.org/10.1037/1064-1297.10.3.302>
- Lalande, D. R., & Ladouceur, R. (2011). Can cybernetics inspire gambling research? A limit-based conceptualization of self-control. *International Gambling Studies*, 11(2), 237-252. <https://doi.org/10.1080/14459795.2011.598540>
- LaPlante, D. A., Nelson, S. E., LaBrie, R. A., & Shaffer, H. J. (2006). Men & women playing games: Gender and the gambling preferences of Iowa gambling treatment program participants. *Journal of Gambling Studies*, 22(1), 65. <https://doi.org/10.1007/s10899-005-9003-3>
- Leino, T., Torsheim, T., Blaszczynski, A., Griffiths, M., Mentzoni, R., Pallesen, S., & Molde, H. (2015). The relationship between structural game characteristics and gambling behavior: A population-level study. *Journal of Gambling Studies*, 31, 1297-1315.  
<https://doi.org/10.1007/s10899-014-9477-y>
- Leino, T., Torsheim, T., Pallesen, S., Blaszczynski, A., Sagoe, D., & Molde, H. (2016). An empirical real-world study of losses disguised as wins in electronic gaming machines.

*International Gambling Studies*, 16(3), 470–480.

<https://doi.org/10.1080/14459795.2016.1232433>

Marchica, L. A., Keough, M. T., Montreuil, T. C., & Derevensky, J. L. (2020). Emotion regulation interacts with gambling motives to predict problem gambling among emerging adults. *Addictive Behaviors*, 106, 106378.

<https://doi.org/10.1016/j.addbeh.2020.106378>

McCarthy, S., Thomas, S. L., Bellringer, M. E., & Cassidy, R. (2019). Women and gambling-related harm: A narrative literature review and implications for research, policy, and practice. *Harm reduction journal*, 16(1), 1-11. <https://doi.org/10.1186/s12954-019-0284-8>

McCarthy, S., Thomas, S. L., Randle, M., Bestman, A., Pitt, H., Cowlshaw, S., & Daube, M. (2018). Women's gambling behaviour, product preferences, and perceptions of product harm: Differences by age and gambling risk status. *Harm Reduction Journal*, 15(1), 22. <https://doi.org/10.1186/s12954-018-0227-9>

McCarthy, S., Thomas, S., Pitt, H., Daube, M., & Cassidy, R. (2020). 'It's a tradition to go down to the pokies on your 18th birthday' – the normalisation of gambling for young women in Australia. *Australian and New Zealand Journal of Public Health*, 44(5), 376–381. <https://doi.org/10.1111/1753-6405.13024>

Minder, C. E., & Bednarski, T. (1996). A robust method for proportional hazards regression. *Statistics in Medicine*, 15(10), 1033-1047. [https://doi.org/10.1002/\(SICI\)1097-0258\(19960530\)15:10<1033::AID-SIM215>3.0.CO;2-Y](https://doi.org/10.1002/(SICI)1097-0258(19960530)15:10<1033::AID-SIM215>3.0.CO;2-Y)

Nelson, S. E., LaPlante, D. A., LaBrie, R. A., & Shaffer, H. J. (2006). The proxy effect: Gender and gambling problem trajectories of Iowa gambling treatment program participants. *Journal of Gambling Studies*, 22(2), 221-240.

<https://doi.org/10.1007/s10899-006-9012-x>

Norsk Tipping (2020) *Dreams and responsibility - Norsk Tipping Annual and Social Report for 2019*. Retrieved from <https://2019.norsk-tipping.no/en/>

Pallesen, S., Mentzoni, R. A., Morken, A. M., Engebø, J., Kaur, P., & Erevik, E. K. (2021). Changes over time and predictors of online gambling in three norwegian population studies 2013–2019. *Frontiers in Psychiatry, 12*, 390.  
<https://doi.org/10.3389/fpsy.2021.597615>

Pallesen, S., Mentzoni, R. A., Torsheim, T., Erevik, E. K., Molde, H., Morken, A. M. (2020) Omfang av penge- og dataspillproblemer i Norge 2019 [Extent of gambling and video game problems in Norway 2019]. Retrieved from  
[https://lottstift.no/content/uploads/2021/05/Omfang\\_av\\_penge-og\\_dataspillproblemer\\_i\\_Norge\\_2019-1.pdf](https://lottstift.no/content/uploads/2021/05/Omfang_av_penge-og_dataspillproblemer_i_Norge_2019-1.pdf)

Piazza, N. J., Vrbka, J. L., & Yeager, R. D. (1989). Telescoping of alcoholism in women alcoholics. *International Journal of the Addictions, 24*(1), 19-28.  
<https://doi.org/10.3109/10826088909047272>

Potenza, M. N., Steinberg, M. A., McLaughlin, S. D., Wu, R., Rounsaville, B. J., & O'Malley, S. S. (2001). Gender-related differences in the characteristics of problem gamblers using a gambling helpline. *American Journal of Psychiatry, 158*(9), 1500-1505. <https://doi.org/10.1176/appi.ajp.158.9.1500>

Randall, C. L., Roberts, J. S., Del Boca, F. K., Carroll, K. M., Connors, G. J., & Mattson, M. E. (1999). Telescoping of landmark events associated with drinking: A gender comparison. *Journal of Studies on Alcohol, 60*(2), 252-260.  
<https://doi.org/10.15288/jsa.1999.60.252>

Reisel, L., Østbakken, K. M., & Attewell, P. (2018). Dynamics of claims making and gender wage gaps in the United States and Norway. *Social Politics: International Studies in Gender, State & Society, 26*(1), 87-115. <https://doi.org/10.1093/sp/jxy019>

- Richmond-Rakerd, L. S., Slutske, W. S., & Piasecki, T. M. (2013). Birth cohort and sex differences in the age of gambling initiation in the United States: Evidence from the National Comorbidity Survey Replication. *International Gambling Studies, 13*(3), 417-429. <https://doi.org/10.1080/14459795.2013.836554>
- Ronzitti, S., Lutri, V., Smith, N., Clerici, M., & Bowden-Jones, H. (2016). Gender differences in treatment-seeking British pathological gamblers. *Journal of Behavioral Addictions, 5*(2), 231-238. <https://doi.org/10.1556/2006.5.2016.032>
- Rossow, I., & Hansen, M. B. (2016). Gambling and gambling policy in Norway—an exceptional case. *Addiction, 111*(4), 593-598. <https://doi.org/10.1111/add.13172>
- Sacco, P., Torres, L. R., Cunningham-Williams, R. M., Woods, C., & Unick, G. J. (2011). Differential item functioning of pathological gambling criteria: An examination of gender, race/ethnicity, and age. *Journal of Gambling Studies, 27*(2), 317-330. <https://doi.org/10.1007/s10899-010-9209-x>
- Sagoe, D., Pallesen, S., Griffiths, M. D., Mentzoni, R. A., & Leino, T. (2018). Does individual gambling behavior vary across gambling venues with differing numbers of terminals? An empirical real-world study using player account data. *Frontiers in Psychology, 9*, 158. <https://doi.org/10.3389/fpsyg.2018.00158>
- Shaffer, H. J., & Korn, D. A. (2002). Gambling and related mental disorders: a public health analysis. *Annual Review of Public Health, 23*(1), 171-212. <https://doi.org/10.1146/annurev.publhealth.23.100901.140532>
- Shaffer, H. J., & Martin, R. (2011). Disordered gambling: Etiology, trajectory, and clinical considerations. *Annual Review of Clinical Psychology, 7*(1), 483-510. <https://doi.org/10.1146/annurev-clinpsy-040510-143928>



Slutske, W. S., Piasecki, T. M., Deutsch, A. R., Statham, D. J., & Martin, N. G. (2015).

Telescoping and gender differences in the time course of disordered gambling:

Evidence from a general population sample. *Addiction, 110*(1), 144-151.

Tavares, H., Martins, S. S., Lobo, D. S., Silveira, C. M., Gentil, V., & Hodgins, D. C. (2003).

Factors at play in faster progression for female pathological gamblers: An exploratory analysis. *The Journal of Clinical Psychiatry, 64*(4), 433–438.

<https://doi.org/10.4088/JCP.v64n0413>

Tavares, H., Zilberman, M. L., Beites, F. J., & Gentil, V. (2001). Brief communications:

Gender differences in gambling progression. *Journal of Gambling Studies, 17*(2), 151-159. <https://doi.org/10.1023/A:1016620513381>

Tomczak, M., & Tomczak, E. (2014). The need to report effect size estimates revisited. An

overview of some recommended measures of effect size. *Trends in sport sciences,*

*1*(21), 19-25. Wood, W., & Eagly, A. H. (2012). Biosocial construction of sex

differences and similarities in behavior. *Advances in Experimental Social Psychology,*

*46*, 55-123) <https://doi.org/10.1016/B978-0-12-394281-4.00002-7>

Xuan, Y.-H., Li, S., Tao, R., Chen, J., Rao, L.-L., Wang, X. T., & Zheng, R. (2017). Genetic

and environmental influences on gambling: A meta-analysis of twin studies. *Frontiers*

*in Psychology, 8*(2121). <https://doi.org/10.3389/fpsyg.2017.02121>

Zakiniaez, Y., Cosgrove, K. P., Mazure, C. M., & Potenza, M. N. (2017). Does telescoping

exist in male and female gamblers? Does it matter? *Frontiers in Psychology, 8*, 1510.

<https://doi.org/10.3389/fpsyg.2017.01510>

Zilberman, M., Tavares, H., & El-Guebaly, N. (2004). Gender similarities and differences:

The prevalence and course of alcohol and other substance-related disorders. *Journal of*

*Addictive Diseases, 22*(4), 61-74. [https://doi.org/10.1300/J069v22n04\\_06](https://doi.org/10.1300/J069v22n04_06)

**Table 1***Participant Characteristics by Gender*

Gender	Men, <i>n</i> = 134 359	Women, <i>n</i> = 49 754	<i>p</i> -value	Effect size <sup>4</sup>
Met a monthly loss limit <sup>1</sup>	38 690 (29%)	16 845 (34%)	<0.001	0.049
Preference for games with a skill element <sup>1, 5</sup>	6 377 (4.7%)	673 (1.4%)	<0.001	0.079
Age at start <sup>1</sup>			<0.001	0.161
18 – 29 years	43 372 (32%)	11 011 (22%)		
30 – 39 years	29 777 (22%)	8 788 (18%)		
40 – 49 years	25 723 (19%)	9 899 (20%)		
50 – 59 years	18 925 (14%)	8 806 (18%)		
60 – 69 years	11 122 (8.3%)	6 553 (13%)		
70 + years	5 440 (4.0%)	4 697 (9.4%)		
Age at start <sup>2</sup>				
Median (IQR)	37 (27, 50)	45 (31, 58)		
Mean (SD)	40 (15)	46 (17)	<0.001	-0.358
Active gambling months <sup>3</sup>				
Median (IQR)	6 (2, 27)	7 (2, 28)	<0.001	0.021
Mean (SD)	17 (22)	18 (21)		
<i>Multix</i> games played <sup>3</sup>				
Median (IQR)	7 (2, 19)	9 (3, 21)	<0.001	0.038
Mean (SD)	13 (15)	14 (15)		

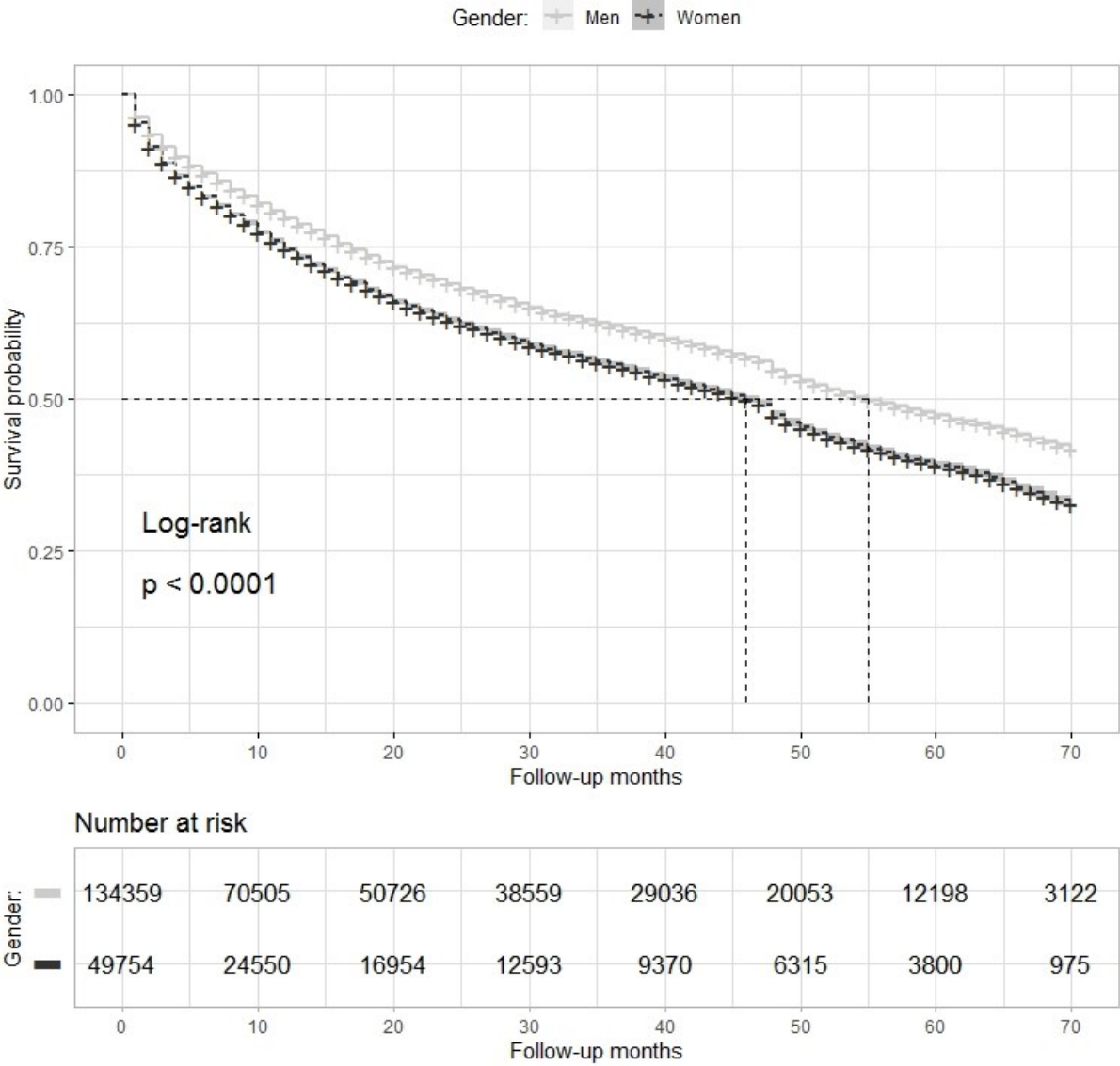
*Note.* <sup>1</sup>Pearson's chi-squared test; <sup>2</sup>Welch two-sample *t*-test; <sup>3</sup>Wilcoxon rank sum test; <sup>4</sup>Cramer's *V* for chi-square, Cohen's *d* for *t*-test, *r* for Wilcoxon rank sum test; <sup>5</sup>Defined as having >50% of game sessions on skill element game type.

**Table 2***Gender Differences Within the Loss Limit Group*

Gender	Men, <i>n</i> = 38 690	Women, <i>n</i> = 16 845	<i>p</i> -value	Effect size <sup>4</sup>
Personal limit set below mandatory <sup>1</sup>	7 806 (20%)	3 044 (18%)	<0.001	0.068
Preference for games with a skill element <sup>1, 5</sup>	174 (0.4%)	31 (0.2%)	<0.001	0.020
Age at start in categories <sup>1</sup>			<0.001	0.089
18 – 29 years	7 262 (19%)	2 780 (17%)		
30 – 39 years	7 156 (18%)	2 748 (16%)		
40 – 49 years	8 812 (23%)	3 544 (21%)		
50 – 59 years	7 972 (21%)	3 369 (20%)		
60 – 69 years	5 194 (13%)	2 679 (16%)		
70 + years	2 294 (5.9%)	1 725 (10%)		
Age at start <sup>2</sup>				
Median (IQR)	45 (33, 56)	48 (35, 60)		
Mean (SD)	45 (15)	48 (17)	<0.001	-0.163
Average bet total Norsk Tipping <sup>3</sup>				
Median (IQR)	18 335 (9 889, 29 398)	18 854 (10 632, 29 511)	<0.001	0.016
Mean (SD)	22 790 (20 686)	22 941 (19 594)		
Average bet total <i>Multix</i> <sup>3</sup>				
Median (IQR)	13 181 (6 849, 21 068)	14 051 (7 700, 21 667)	<0.001	0.033
Mean (SD)	15 155 (11 588)	15 825 (11 629)		
Active gambling months <i>Multix</i> <sup>3</sup>				
Median (IQR)	7 (3, 16)	7 (3, 15)	<0.001	0.027
Mean (SD)	11 (12)	11 (12)		
Time to loss limit <sup>3</sup>				
Median (IQR)	13 (4, 29)	11 (4, 27)	<0.001	0.038
Mean (SD)	19 (18)	18 (18)		
Average minutes spent <i>Multix</i> <sup>3</sup>				
Median (IQR)	159 (78, 277)	168 (86, 279)	<0.001	0.024
Mean (SD)	206 (188)	209 (179)		
Average sessions <i>Multix</i> <sup>3</sup>				
Median (IQR)	15 (8, 25)	15 (9, 25)	<0.001	0.020
Mean (SD)	20 (24)	21 (24)		
Personal amount for loss limit <sup>3</sup>				
Median (IQR)	2 500 (2 500, 2 500)	2 500 (2 500 2 500)	<0.001	0.031
Mean (SD)	2 134 (842)	2 172 (813)		

*Note.* <sup>1</sup>Pearson's chi-squared test, <sup>2</sup>Welch two-sample *t*-test; <sup>3</sup>Wilcoxon rank sum test; <sup>4</sup>Cramer's V for chi-square, Cohen's *d* for *t*-test, *r* for Wilcoxon rank sum test; bet totals are in Norwegian Kroner (NOK); <sup>5</sup>Defined as having >50% of game sessions on skill element game type.

Figure 1.



Caption: Survival curves for first monthly loss limit on *Multix* by gender. Dotted lines equal median survival times.

**Table 3***Cox Regressions for First Monthly Loss Limit*

Characteristic	<i>HR</i>	95% <i>CI</i>	<i>p</i> -value
Men (reference)	1	-	-
Women	1.22	[1.20, 1.25]	<0.001
18 – 29 (reference)	1	-	-
30 – 39	1.40	[1.35, 1.44]	<0.001
40 – 49	1.67	[1.62, 1.72]	<0.001
50 – 49	1.89	[1.83, 1.95]	<0.001
60 – 69	1.93	[1.86, 2.00]	<0.001
70+	1.80	[1.72, 1.88]	<0.001
Men 18 – 29 (reference)	1	-	-
Men 30 – 39	1.49	[1.44, 1.55]	<0.001
Men 40 – 49	1.88	[1.81, 1.95]	<0.001
Men 50 – 59	2.27	[2.18, 2.36]	<0.001
Men 60 – 69	2.52	[2.41, 2.63]	<0.001
Men 70+	2.31	[2.18, 2.45]	<0.001
Women 18 – 29 (reference)	1	-	-
Women 30 – 39	1.11	[1.05, 1.18]	<0.001
Women 40 – 49	1.15	[1.09, 1.22]	<0.001
Women 50 – 59	1.12	[1.06, 1.19]	<0.001
Women 60 – 69	1.03	[0.97, 1.09]	0.34
Women 70+	1.06	[0.99, 1.13]	0.11

*Note.* *HR* = Hazard ratio. *CI* = Confidence Interval