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Understanding the Influence of Gambling Opportunities: Expanding Exposure Models to Include Adaptation

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Many regions are considering expanding the various forms of gambling that are available to residents. The expansion of legalized gambling frequently is the topic of heated debate because of possible harmful ramifications on individuals' mental and physical health as well as the public's health in general. Conventional wisdom holds that the expansion of gambling relates to increases in gambling-related problems among the population (i.e., the exposure effect). A review of empirical evidence provides an opportunity to verify the accuracy of this wisdom. An evaluation of available research studies provides some support for the exposure effect, but also raises questions about the durability of that phenomenon across settings and time points. Some exposure studies indicate specific patterns of gambling activity and consequences that are inconsistent with the exposure effect. These studies suggest that some people and some places might have adapted to the risks and hazards of gambling (i.e., the adaptation effect). This evaluation suggests that social context is an important moderator of exposure processes.

Keywords: gambling, exposure, adaptation, public health, policy

Since 1980, the American Psychiatric Association has classified pathological gambling as an impulse disorder (American Psychiatric Association, 1994). Hallmark features of pathological gambling include, but are not limited to, financial distress, emotional and physical deterioration, and damaged interpersonal relationships (Shaffer & Korn, 2002). Few discussions of gambling generate as much emotional debate as the effect of legalized gambling expansion on public health. Opponents of the expansion of gambling argue that increased opportunities for gambling create a corresponding increase in gambling-related problems, including pathological gambling. Proponents of the expansion of gambling argue that increased opportunities for gambling create jobs and revenue and stimulate the economy. Although a cost–benefit analysis of the expansion of gambling is outside the scope of this article, such analyses serve as important reminders to strive toward a balanced perspective in any research initiative. Fortunately, there is evidence available to inform the impact of gambling exposure on the public health. This article applies a public health exposure perspective to examine empirical evidence related to gambling exposure and its related but less well-known counterpart, adaptation, yielding a conceptually balanced review of this area. In developing this perspective, we consider the importance of social context to processes related to exposure and adaptation.

Exposure to Toxins: Mapping the Course of Infection

Public health exposure research frequently focuses on physical toxins, such as lead, mercury, airborne pollutants, and viruses (e.g., Abelsohn, Gibson, Sanborn, & Weir, 2002; Abelsohn, Stieb, Sanborn, & Weir, 2002; Kennedy, Le Moual, Choudat, & Kauffmann, 2000; Sanborn, Abelsohn, Campbell, & Weir, 2002). Exposure research also might extend to chemicals, such as psychoactive drugs, but less typically extends beyond physical factors. Nevertheless, public health exposure research yields a wealth of information that might facilitate the development of hypotheses that apply to both physical and behavioral environmental factors. Remarkably, many types of infection related to a continuous common source follow a prototypical course in the general population (Centers for Disease Control & Prevention, 2007; Gordis, 2000; Figure 1). Individuals in a population vary in their susceptibility to infection or insult from physical toxins (e.g., viruses). Consequently, in the typical course of infection, as exposure to a virus spreads, the most vulnerable individuals are the first to become infected. This results in a rapid initial increase in rates of infection. As the number of uninfected vulnerable individuals in the population diminishes, the rate of new infection slows, reflecting the fact that the individuals yet to be infected are more resistant. Finally, there may be a flattening or decline in rates of infection as people recover with new immunity, the incidence rate slows, and the public responds and develops prevention and intervention measures.

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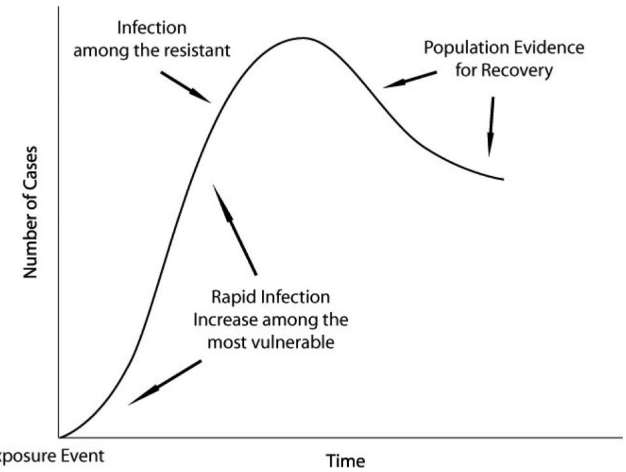

Figure 1. Prototypical epidemiology curve.

Socially Toxic Phenomena

Until recently, researchers have not formally considered the toxic effects of activities like gambling. Shaffer, LaBrie, and LaPlante (2004) first raised the idea that the presence of gambling specifically could be a social toxin. They argued that certain social events, such as gambling and advertising, are the social equivalents of germs. This argument has its roots in McGuire's (1964) social inoculation theory. McGuire's theory suggests that exposure to social phenomena, like exposure to toxins, can stimulate a shift in attitudes and behavior; in turn, these changes can influence many things, including health. The extent of those shifts depends on individuals' "social immunity," or resistance to the social phenomena that they have developed over time through exposure to the toxin. Small amounts of exposure can stimulate the development of resistance (i.e., inoculation); large amounts of toxic exposure can overwhelm resistance and lead to adverse consequences. According to this theory, more exposure translates into a greater likelihood of infection for an increasingly larger segment of the population.

Exposure to Gambling: Three Predictions

If gambling is indeed a socially toxic phenomenon, we would expect a variety of types of exposure to have predictable effects on gambling and gambling-related problems. For example, one type of exposure, one's occupation, often places individuals at risk for specific hazards. During the 19th century, when epidemiology was emerging as a legitimate field of study, John Snow argued that if a trade truly causes adverse health consequences, then it should "be extremely so to the workmen engaged in those trades" (Lillienfield, 2000, p. 5). Hence, even though many societies have developed extensive employee protections (e.g., regulations enforced by the Occupational Health and Safety Administration with regard to auditory, chemical, and radiation exposure), in cases where some exposure is unavoidable, we expect to see elevated rates of specific problems among people who work in specific jobs (e.g., hearing loss among construction workers; lung disease among miners). It follows that gaming employees might be at elevated risk for gambling-related problems.

There are also temporal and spatial types of exposure. Many researchers have observed that the 20th and early 21st centuries experienced a rapid expansion of legal gambling availability around the world (e.g., Braidfoot, 1988; Eadington, 2003; Goodman, 1995; Korn & Skinner, 2000; Volberg, 2000; Wynne & Shaffer, 2003). Over time, these opportunities have increased the likelihood that individuals will gamble and that they will gain exposure to new gambling and gambling-related information at specific times during their life. The expansion of gambling also has changed the physical proximity of gambling opportunities for many people. With state lotteries, new casinos, the transformation of race tracks into racinos (i.e., racetracks that include casino-type games, e.g., slot machines), and Internet gambling, gambling availability is a lot closer to home for a lot more people. A consequence of changes in both temporal and geographic proximity is that we might expect to see increases in gambling participation and observe a clustering of gambling-related problems near temporal and geographic epicenters of gambling.

Finally, if gambling indeed does have properties that are similar to other public health toxins, such as the ability to infect people by its mere presence, we would expect to see gambling-related problems follow the temporal course of well-established infection curves. More specifically, we should see gambling-related problems, or indicators of problems, show a sharp increase following exposure to an epicenter, temporal or geographic, followed by a leveling and a gradual reduction in these problems. We refer to this reduction as adaptation.

Conceptual Approach to the Exposure and Adaptation Domain

In this study, we consider evidence related to the three previously mentioned research predictions: occupational exposure; temporal and geographic epicenters; and infection and adaptation. The goal of this report is not to provide merely an annotated and exhaustive review of the available literature related to gambling exposure but to also examine central questions related to exposure that will illustrate conventional and unconventional exposure effects as well as the importance of considering the complement to exposure: adaptation.

A primary purpose of the study is to highlight important issues related to exposure (e.g., social context), thereby advancing a conceptual frame for environmental influences on gambling-related behavior. This framework rests on an integrated and interactive exposure and adaptation process. That is, the social context and the individuals who behave within this setting serve as an important interactive influence on the interplay between exposure and adaptation.

Occupational Exposure

For gaming employees, the available research supports predictions about exposure to gambling. For example, evidence suggests that casino employees have higher rates of gambling problems as well as alcohol and mental health problems compared with the general population (Shaffer & Hall, 2002; Shaffer, Vander Bilt, & Hall, 1999). Specifically, a study of more than 3,000 casino employees from four geographic sites found that, relative to the general population, casino employees had a higher rate of Level 3 (i.e., pathological; confirmation of five or more symptoms on the South Oaks Gambling Screen [SOGS]; Lesieur & Blume, 1987) gambling behavior (Shaffer, Vander Bilt, & Hall, 1999). Participants in this study did not show higher rates of Level 2 (i.e., problem; confirmation of three or four symptoms on the SOGS) gambling behavior, however.

This study also showed that, compared with the general population, casino employees had higher rates of alcohol problems and reported depression and were more likely to be smokers than individuals in the general population; however, the study did not control for variables, such as age, race, and so forth A second sample of casino employees confirmed pathological gambling-related findings from the first sample and found higher rates of both Level 3 and Level 2 gambling behavior among casino employees (Shaffer & Hall, 2002).

Exposure to Temporal and Geographic Epicenters

Temporal exposure. Research related to temporal epicenters of gambling expansion is mixed, and several examples follow. A meta-analysis of 119 studies of disordered gambling prevalence rates in North American during the 20th century found a strong positive relationship between the time at which a study was completed and the size of the reported prevalence rates (Shaffer, Hall, & Vander Bilt, 1999). Given the expansion of gambling during this time, this relationship might have indicated that as exposure increased, so too did infection. Although anecdotally many people have commented on the seasonality of gambling around annual events, such as the winter holidays, the Super Bowl, and March Madness (e.g., Lipsyte, 2002; Swartz & Kessler, 2005; Torres, 2006), there have been no published peer-reviewed longitudinal studies of gambling that have specifically addressed the question of seasonality and annual events.

Research that examines gambling rates before and after a specific instance of gambling expansion in time varies. For example, there are a number of available studies from Canada, but they do not all indicate that the addition of a gambling venue is associated with increases in gambling-related problems over time. One study indicates an increase in gambling-related problems after the opening of a casino, but more recent follow-ups indicate no ongoing elevation in rates (Jacques & Ladouceur, 2006; Jacques, Ladouceur, & Ferland, 2000). Another study reported increases in gambling-related problems, and a fourth indicated no increase in self-reported problems but an increase in knowing someone else who had gambling-related problems (Govoni, Frisch, Rupcich, & Getty, 1998; Room, Turner, & Ialomiteanu, 1999). In Great Britain, the only study to address this issue indicated an increase in subclinical levels of gambling-related problems following the expansion of gambling (i.e., the implementation of a national lottery) but no increase in clinical levels of gambling-related problems (Grun & McKeigue, 2000). The authors of this study noted that the greatest increases in the proportions of income spent on gambling were among low socioeconomic status groups.

Studies in the United States have examined changes that followed the addition of a new gambling opportunity. Following the opening of the Texas state lottery, researchers found an increase in the number of people who played the lottery but not in gambling generally (Wallisch, 1996). A second study found that regions of Missouri evidenced increased enrollment in the state's gambling self-exclusion program[1] following the opening of new gaming venues in the area (LaBrie, Nelson, et al., 2007). Other researchers noted that increased expansion of legalized gambling in Minnesota did not relate to increases in heavy gambling but might have increased gambling-related problems (Winters, Stinchfield, Botzet, & Anderson, 2002). Finally, some research even illustrates potential societal benefits that might relate to gambling expansion. For example, researchers observed mental health improvements following the opening of a reservation casino in the Great Smoky Mountains: Relative to children in the area who were "never poor," children who were "ex-poor" demonstrated significant mental health improvements (Costello, Compton, Keeler, & Angold, 2003). Children who were "persistently poor" did not evidence such improvements.

Geographic exposure. Research on the geographic exposure to gambling opportunities is more consistent and suggests that when gambling opportunities are close at hand, gambling-related problems are evident as well. The only nationally representative study of college student gambling indicated that students who attended schools that had two or more legal gambling venues in the same state were more likely to gamble (LaBrie, Shaffer, LaPlante, & Wechsler, 2003). Legalized gambling is also associated with higher rates of help seeking. For example, legalized gambling is related to the availability of Gambler's Anonymous chapters (Lester, 1994), and research from Missouri indicates that rates of self-exclusion from casinos are associated with the location of casinos (LaBrie, Nelson et al., 2007); that is, areas in Missouri that have more casinos have higher rates of self-exclusion among residents.

One of the most common ways to study geographic exposure is to examine variability in the rates of gambling and gambling-related problems with respect to predetermined distances from gambling venues. For example, the National Gambling Impact Study Commission found that a casino within 50 miles (vs. 50–250 miles) of a person's home is associated with nearly doubled levels of gambling-related problems and pathological gambling (Gerstein et al., 1999). Similarly, a study of Iowa's Gambling Treatment Program helpline callers found that counties within 50 miles of at least one gambling venue received the highest number of gambling crisis calls (Shaffer, LaBrie, LaPlante, & Kidman, 2002). More recently, Welte, Wieczorek, Barnes, Tidwell, and Hoffman (2004) found that, among a range of distances, a 10-mile limit provided the best predictive power for the prototypical exposure effect; that is, more so than individuals who lived at greater distances, individuals who reported a casino within 10 miles of their home were more like to have gambling-related problems. Welte et al. (2004) also noted, however, that their models accounted for only a small amount of the total variance. Therefore, a number of unmeasured factors, in addition to geographic proximity, play a role in the development of gambling-related problems.

Limitations to research on geographic exposure. The extant research focusing on geographic exposure is not definitive. This body of research fails to include investigative designs that actually can detect causal relationships between proximity and problems.

[1] Self-exclusion programs provide gamblers the opportunity to self-ban from gambling venues at risk of criminal prosecution.

We do not know from this research, for example, whether casinos (a) create problems, (b) attract people who already have problems, (c) develop in areas where people already have problems, or (d) are correlated with other factors, such as urban development and isolation, that create problems.

These research analyses also do not consider variations in infrastructure. What effect, if any, does accessibility to venues, number of employees, and amount of advertising have on the proximity–problem relationship? Similarly, how do regional vulnerability characteristics change the nature of the relationship between proximity and rates of gambling-related problems?

Preliminary research indicates that regional factors could be important. For example, in Missouri, regional vulnerability to risky behavior related to the development of gambling problems, even after controlling for gambling venue proximity (LaBrie, Nelson, et al., 2007).

Finally, investigators arbitrarily selected the distances (e.g., 50 miles, 10 miles, 100 miles) that this research evaluated. This means that any identified effects are specific to those arbitrarily selected distances. What is the size of a particular effect at 49 miles as opposed to 50 miles? Crude cutoffs, instead of continuous measures, preclude more fine-grained analyses and exclude regions in which virtually no variability in gambling venue exposure is possible (e.g., Nevada). To compensate for such limitations, the Harvard Medical School's Division on Addictions developed a new public health tool called the regional exposure model (REM; Shaffer et al., 2004). The REM is designed to allow researchers to compare geographic exposure to potential social toxins, such as gambling, using a standardized scale. The REM operates by determining regions' Dose, Potency, and Duration scores for a particular social toxin. To develop this model, Shaffer et al. (2004) operationalized dose as the extent of exposure in a particular region (e.g., the amount of beverage alcohol consumed or the number of gambling venues–gambling industry employees in a region); potency as the source strength of a particular social toxin (e.g., the proof of a particular type of beverage alcohol or the number of different types of gambling available in a region); and duration as the amount of time a social toxin has been available to the public (e.g., elapsed years of legal drinking or gambling).

Dose, Potency, and Duration scores combine to create a standardized scale for the Regional Impact of Gambling Exposure (RIGE). The formula for creating this scale is available in the Appendix as well as in Shaffer et al. (2004). Gambling venues and opportunities are changing continuously and can yield differential influence; this dynamic process creates a need to assess gambling exposure frequently.

A continuous measure such as the RIGE allows researchers to assess regional variation in exposure in areas of the world that are precluded by analyses that use crude distance cutoffs, such as Nevada. For example, using values from the most recent prevalence survey of gambling-related problems in Nevada (Volberg, 2002), it is apparent that the counties in Nevada with the four highest RIGE standardized scores (i.e., those that were most exposed) had significantly higher rates of gambling-related problems than the lowest four counties (Table 1).

Considering Exposure Infection and Adaptation

Using the RIGE allows for an ordering of states with legal gambling on a standardized scale of gambling exposure (Table 2).

Table 1.
Regional Index of Gambling Exposure Scores and South Oaks Gambling Screen Prevalence Estimates for Nevada Counties

Sample	RIGE score	Pathological	Problem	*n*
Nevada county				
Clark	4.43	4.8	3.6	525
Douglas	2.10	15.4	7.7	13
Washoe	2.00	2.0	3.0	101
Elko	0.69	14.3	7.1	14
Nye	−1.74	0	0	8
Humboldt	−2.13	0	0	5
Carson City (IC)	−2.18	0	0	19
Churchill	−3.18	0	0	9
Total		3.4	1.7	694
Volberg (2002)		3.5	2.9	734

Note. Because we could not assign every case to a county, the prevalence estimates associated with this sample are based on 40 fewer cases than Volberg's (2002) statewide estimates. RIGE = Regional Index of Gambling Exposure; IC[A] =; Pathological = proportion of individuals who gamble pathologically; Problem = proportion of individuals who gamble and experience problems; however, these problems are insufficient to qualify as pathological gambling.
Adapted from "Laying the Foundation for Quantifying Regional Exposure to Social Phenomena: Considering the Case of Legalized Gambling as a Public Health Toxin," by H. J. Shaffer, R. A. LaBrie, and D. A. LaPlante, 2004, *Psychology of Addictive Behaviors, 18,* p. 44.[B]

Because the RIGE scale is standardized, it tells us just how much more prevalent problems should be in specific states compared with others if exposure is the driving force for such problems. As conventional wisdom might have predicted, Nevada is the most exposed state. If there was a linear relationship between exposure and gambling problems (i.e., if gambling-related problems correlated directly with exposure), these standardized scores suggest that the prevalence of problems in Nevada should be at least eight times more than any other state. However, a review of the most recent prevalence estimates of past-year gambling shows that Nevada is not eight times higher than other states. Depending on which measure of gambling problems is used, the NORC Screen for gambling problems (Gerstein et al., 1999) or SOGS, Nevada actually is better off (Volberg, 2002). One past-year estimate indicated that only 0.3% of the adult population had clinical-level problems during the past year, whereas national estimates indicate that closer to 1% of the adult population had past-year clinical-level problems. Even comparisons using the higher of the two estimates, the SOGS, indicate that the gambling problem rates in Nevada are not eight times larger than in other states. These findings reveal that the exposure–infection relationship for gambling is not linear.

One reason for a curvilinear exposure–infection relationship might be adaptation. That is, residents of Nevada have been so exposed for so long that the events and the proximity of gambling no longer have the impact they once had, or have, over people in other places. Although the epidemiology of infection informs us that adaptation is a primary component of the prototypical natural history of infection exposure in a population, empirical research illustrating this phenomenon for addiction generally, and gambling specifically, is scant.

Considering adaptation is a new frontier for gambling-related research; however, some preliminary evidence supports the exis-

Table 2.
Regional Index of Gambling Exposure Scores for States With Casino Gambling

		Dose				
Rank	State	Establishments score	Employees	Potency (venues)	Duration (years; casinos)	RIGE
1	Nevada[a]	330	193,988	6	70	8.28
2	New Jersey	12	45,955	6	25	0.21
3	South Dakota[a]	76	2,671	6	12	−0.55
4	Colorado[a]	65	6,723	6	11	−0.65
5	Mississippi	33	31,531	6	9	−1.04
6	Louisiana[a]	20	15,026	6	8	−1.08
7	Illinois	10	9,963	6	11	−1.15
8	Iowa[a]	10	5,500	6	12	−1.23
9	Missouri	12	15,000	6	9	−1.32
10	Indiana	8	9,250	6	8	−1.46

Note. RIGE = Regional Index of Gambling Exposure.
[a]These states also have tribal gaming; however, tribal gaming is not included in these calculations.
Adapted from "Laying the Foundation for Quantifying Regional Exposure to Social Phenomena: Considering the Case of Legalized Gambling as a Public Health Toxin," by H. J. Shaffer, R. A. LaBrie, and D. A. LaPlante, 2004, *Psychology of Addictive Behaviors, 18,* p. 44.[D]

tence of this process. For example, the 2002 Nevada study found that recent residents of Nevada had more current gambling-related problems than long-term residents (Volberg, 2002). Recent residents are more likely to be newly exposed to the widespread availability of legal gambling. Similarly, our casino study showed that newer employees had more gambling-related problems in the past year than more experienced employees (i.e., employed for more than 4 years; Shaffer, Vander Bilt, & Hall, 1999).

Although no study has been designed specifically to illustrate social adaptation, preliminary evidence from our Missouri self-exclusion study provides additional support for adaptation. The pattern of self-exclusion enrollment between 1997 (the start of the program) and 2003 (the most recent year of available data) followed the prototypical epidemic curve we reviewed earlier (Figure 2; LaBrie, Nelson, et al., 2007). Most recently, the only long-term follow-up study of changes in gambling and gambling-related problems following the development of a new casino indicated that early increases in problems were not maintained over time (Jacques & Ladouceur, 2006). Although this study suffered from poor participant retention rates, like the Missouri self-exclusion findings, the changes in the measured variables follow the prototypical epidemic curve (Figure 3).

Exposure and Adaptation: People, Places, Points, and Problems

Exposure is essential to the development of gambling-related problems and relates to the development of those problems in predictable ways. However, the available scientific literature indicates that exposure is not the same for all people, all time points, and all places and is not linearly related to the prevalence of gambling-related problems in society. Social context can influence processes related to exposure. Further, researchers and others have directed very little attention to the adaptation component of the exposure process. Although it is premature to say definitively how exposure and adaptation processes operate and influence one another, the extant literature indicates the need for more attention to both phenomena.

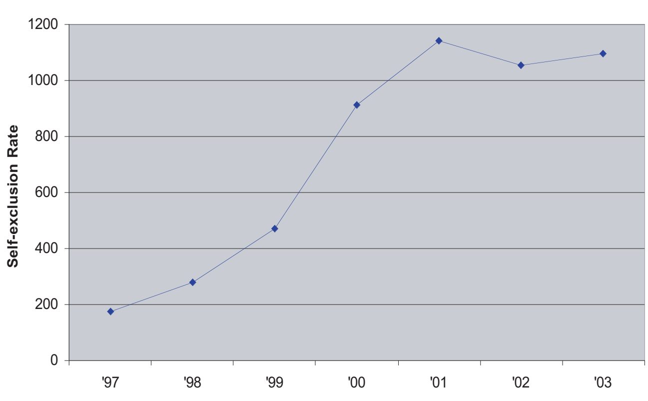

Figure 2. Missouri self-exclusion rates over time. (Adapted from "Missouri Casino Self-Excluders: Distributions Across Time and Space," by R. A. LaBrie et al., 2007, *Journal of Gambling Studies, 23,* p. 236.

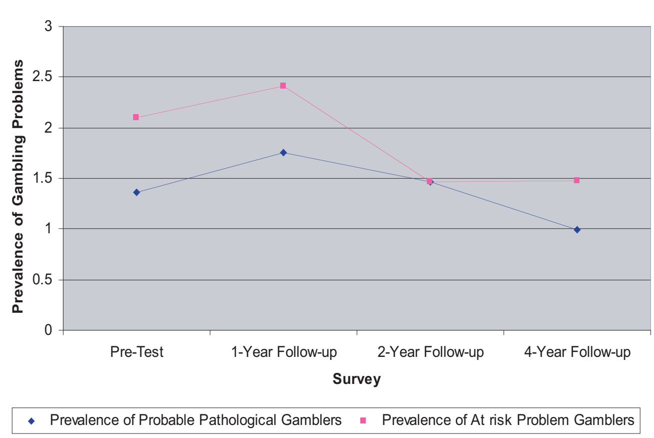

Figure 3. Gambling-related problems over time following a casino opening. (Adapted from "A Prospective Study of the Impact of Opening a Casino on Gambling Behaviours: 2- and 4-year follow-ups," by C. Jacques and R. Ladouceur, 2006, *Canadian Journal of Psychiatry, 51,* p. 770.

The Importance of Social Context

We have reviewed studies that identify a variety of social contexts that can alter processes related to gambling exposure. These alterations result in experiences for which traditional models of exposure cannot account. For example, research indicates that socioeconomic status, regional vulnerability characteristics, personal exposure levels, and regional saturation characteristics all moderate the exposure phenomenon. Undoubtedly, a review of additional studies will identify additional moderators; however, the important point to emphasize is that exposure does not seem to create uniform consequences. Hence, the experience of one person or community might not generalize to other people or communities.

What Is Adaptation?

In brief, the adaptation effect suggests that following initial increases in number and type of adverse reactions to new environmental events, individuals will adapt and become resistant to those events and the number of associated adverse reactions in society will decline (Shaffer et al., 2004; Zinberg, 1981, 1984). Social adaptation can result from a number of influences, including, but not limited to, social learning, waning of novelty effects, increases in harmful consequences, developed interventions, and new interests that preclude engaging in the initially harmful activity. In clinical practice, particularly cognitive and cognitive–behavioral treatments, practitioners attempt to facilitate adaptations to various treatment-induced stressors (i.e., inoculations) that precipitate adaptation. It is important to consider various ways to accomplish a similar process at the societal level.

Complicating the Process of Adaptation

Researchers have suggested that changes in technology can change society by redefining the social world and the choices that are available to individuals, choices that have greater and lesser leeway (Kipnis, 1997). Because technology is a guiding force in the structure of the social world, its impact reverberates through any assessment of the public's health. Furthermore, because technology is constantly changing, this means that adaptation processes, at the individual and societal levels, must rely on a moving target. This is particularly apparent in the field of gambling, which faces an ongoing evolution (e.g., the Internet, electronic gaming). Emerging research on actual Internet gambling will shed light on this issue (e.g., LaBrie, LaPlante, Nelson, Schumann, & Shaffer, 2007; LaPlante, Schumann, LaBrie, Nelson, & Shaffer, 2007). It is important to consider how exposure and adaptation operate in new and changing technological contexts.

Implications for Public Health Policy

In isolation, the exposure and adaptation effects have the power to misdirect public policy (Shaffer et al., 2004). Focusing too heavily on the adaptation effect could cause policymakers to underestimate the influence and importance of early increases in gambling-related problems. Alternatively, focusing only on exposure could cause a public policy overreaction to the availability of new opportunities. The need for finding the right balance (Skinner, 1999) between exposure and adaptation is complicated by the fact that evidence about gambling-related harms resulting from exposure is nascent and is open to multiple interpretations. Consequently, observers can have difficulty distinguishing scientific evidence from conventional wisdom. This makes it difficult to determine when, where, and how much the government should get involved to minimize the risks and maximize the benefits of gambling. The questions that we need to answer to encourage effective and informed public policy decision-making include the following: How long does it take to adapt? Can we afford to wait that long after a group is newly exposed? Until we know the answers, we need to continue to be concerned about gambling-related problems, because these difficulties can compromise the public health and welfare.

Implications for Individuals

For some people, a utopian world would be absent temptation. However, the world in which we live often permits individuals access to objects of temptation. In the short term, temptation can stimulate social adversities. That is, for a period of time, individuals will be at greater risk for personal and interpersonal harms. However, some amount of temptation has worth, particularly if we can effectively and expeditiously deal with the short-term harms. The value of tempting activities (e.g., gambling, investing, engaging in random sex) is that enticements can provide the opportunity for individuals to learn self-control and build character. Such self-regulation emerges from the gentle interplay with temptation; absent such access, it is more difficult, if not impossible, for people to learn how to regulate themselves. People, who engage in such character building and learn self-control can generalize that knowledge to other situations that might pose similar but new temptations that develop over time.

Caveats

First, the trends reported here are population trends. Consequently, the average pattern for a population might not reflect any one individual's experience. Some individuals, undoubtedly, do not adapt as quickly as others, and some adapt almost immediately. Our challenge is to identify and assist those individuals who demonstrate both the inability to adapt quickly and the individuals who do not seem to adapt at all. Second, the relationship between exposure and adaptation is dose related. For example, some gambling exposure might have hormesis-like effects. Hormesis occurs when low doses of a potentially toxic agent, such as radiation, have health benefits (Kaiser, 2003a, 2003b; Stebbing, 2003). Low-dose exposure to toxic agents can provide the opportunity for adaptation, whereas high-dose exposure can overwhelm even a strong immune system.

This report does not provide a comprehensive literature review of all gambling exposure effects. Consequently, readers who want such information might seek out more basic annotations of the extant literature. It is our hope that this article will encourage readers to consider exposure effects in a new way and become open to exploring the possibility of adaptation. We also used examples derived from empirical studies to illustrate the importance of social context for understanding exposure and adaptation effects; citing additional studies would only identify additional social contexts that yield more moderations. Although some observers might disagree with this strategy, we believe that creating discussion about this central idea is sufficiently novel and that providing more examples risks clouding the central message.

Conclusions

Until we find the definitive right balance, the effect of expanded legalized gambling on the public's health will continue to be the source of emotional debate. Occasionally, such debate attempts to masquerade as science; it is thus important to keep an open mind and scrutinize research related to this topic. To date, the available evidence suggests that exposure does play a role in the development of gambling behavior and gambling-related problems. However, available research also indicates that exposure does not necessarily provide a direct path to addiction or even to gambling-related problems. Exposure seems to interact dynamically with other important factors, such as adaptation. Failing to consider exposure effects with respect to processes of adaptation will yield an incomplete understanding of gambling opportunities and their impact. The social context within which people live and develop influences the process of exposure and perhaps the likelihood of adaptation. The probability of a modern-day prohibition against legalized gambling is low, and over time new vehicles by which people gamble will continue to emerge (e.g., the Internet). In light of this reality and to minimize any harm that might accrue as a result of gambling exposure, researchers, gambling industry representatives, and public health officials need to work together to facilitate the process of early and positive adaptation.

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Appendix

Regional Index of Gambling Exposure

The quantitative application of the REM is the Regional Impact of Gambling Exposure (RIGE). Using the following formula, the RIGE standardizes regions' Dose, Potency, and Duration scores and combines those scores, yielding a standardized scale of regional exposure.

$$\mathrm{RE} = a + b_1(f)\mathrm{D}_1 + b_2(f)\mathrm{P}_2 + b_3(f)\mathrm{T}_3 + \ldots b_i(f)X_i + \text{error},$$

where RE represents regional exposure, a is constant, D is standardized dose, P is standardized potency (i.e., strength of exposure), T is standardized duration (i.e., elapsed exposure), and X_i represents additional standardized environmental public health factors. Error can result from a number of sources, such as regional contiguity. Weights (b) for each component are variable and include the possibility that the component should be transposed (f) because the relationship between increasing exposure and gambling problems might be nonlinear (e.g., quadratic or gradually increasing sine curve).

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