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How do electronic Gambling Machines do what they do?

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GROUP OF EIGHT AUSTRALIA

Disclosure

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This presentation

- What are the principles that support Electronic Gambling Machines (EGMs)
- How do these make the devices attractive and addictive?
- What accoutrements have increased the harmful effects of EGMs?
- What can be done to reduce harm associated with EGMs?

Randomness

- EGMs are highly articulated random number generators - computers
  - 'dice on speed'
- They convert a series of randomly generated numbers into a pattern on a screen
- This appears as though it were the result of a series of reels spinning
- EGMs are like a big barrel of marbles …

Random, but predictable

- Random numbers are converted to a set of symbols
- But the number and type of symbols are predetermined and consistent
  - For example – ‘Dolphin Treasure’ has four ‘reels’ of 30 symbols and one ‘reel’ of 44 symbols
  - This means there are 30^4 x 44 = 35,640,000 possible outcomes

Table 1. Paytable and number of occurrences of each symbol on each reel for Dolphin Treasure.

Symbol		# Winning symbols Prizes 2	3	4	5	Reels Symbols per reel 1	2	3	4	5
9	9	2	5	25	100	2	4	1	4	2
10	10	0	2	25	100	2	1	6	2	4
Jack	J	0	5	25	100	4	7	1	2	4
Queen	Q	0	5	25	100	4	1	7	1	4
King	K	0	5	50	100	1	2	4	5	3
Ace	A	0	10	50	125	2	2	2	3	4
Octopus	O	0	10	75	250	2	4	1	2	4
Fish school	FS	0	10	50	250	5	2	1	3	4
Starfish	SF	0	15	100	400	2	2	1	2	4
Treasure Chest	S	2	5	50	400	1	1	1	1	1
Turtle	T	2	25	100	750	2	1	3	2	4
Seahorse	SH	2	25	100	750	2	2	1	2	5
Sunrise	W	10	200	2000	9000	1	1	1	1	1
TOTAL						30	30	30	30	44

Paytables and reels

- Reels (in Australia) must remain consistent
  - The order in which symbols appear stays the same
  - But because there are different numbers of symbols on each reel, the odds of a specific symbol appearing may vary from reel to reel
  - Which affects the odds of winning a prize
- So – the outcome is predictable in the long run, but unknowable in the short term
  - And the long run is 35.64 million spins (e.g.)

Return to player ratio

- In Australia, the minimum RTP is 85%
  - This varies between states and venue types
- That means the average loss per bet is 15%
- It does not mean you will get 85% of your stake back, even over a long period of use
  - RTP is a function of the relationship between pay tables, and the reelstrip configuration

How is RTP measured?

- In Victoria, by the performance of every EGM in a venue over a period of the calendar year
- In other jurisdictions, by the theoretical performance of the game over its game cycle
  - Which can be many years
  - Dolphin Treasure's game cycle requires a *minimum* period of 5.6 years played 24 hours/day at 5 sec intervals on a single line.

Unfortunately,

- Evidence is clear that users have little conception of price
  - demand is highly inelastic
- Many users think EGMs are guaranteed to return 85%
- But that also includes the amount re-staked
  - So even if you get in front, the machine will inexorably eat away until your stake is almost invariably gone

Which means?

- **A user operating an EGM with a price of 15% will, on average, lose 15% of their wager at each spin**.
  - The effect is cumulative. So, if a user inserts $10 and wagers $1 each spin, even if the game performs exactly as predicted (and this is extremely unlikely), the user would exhaust their funds in a little more than five minutes (at the rate of one wager every five seconds). With $5 bets, this process would occupy a little over one minute.

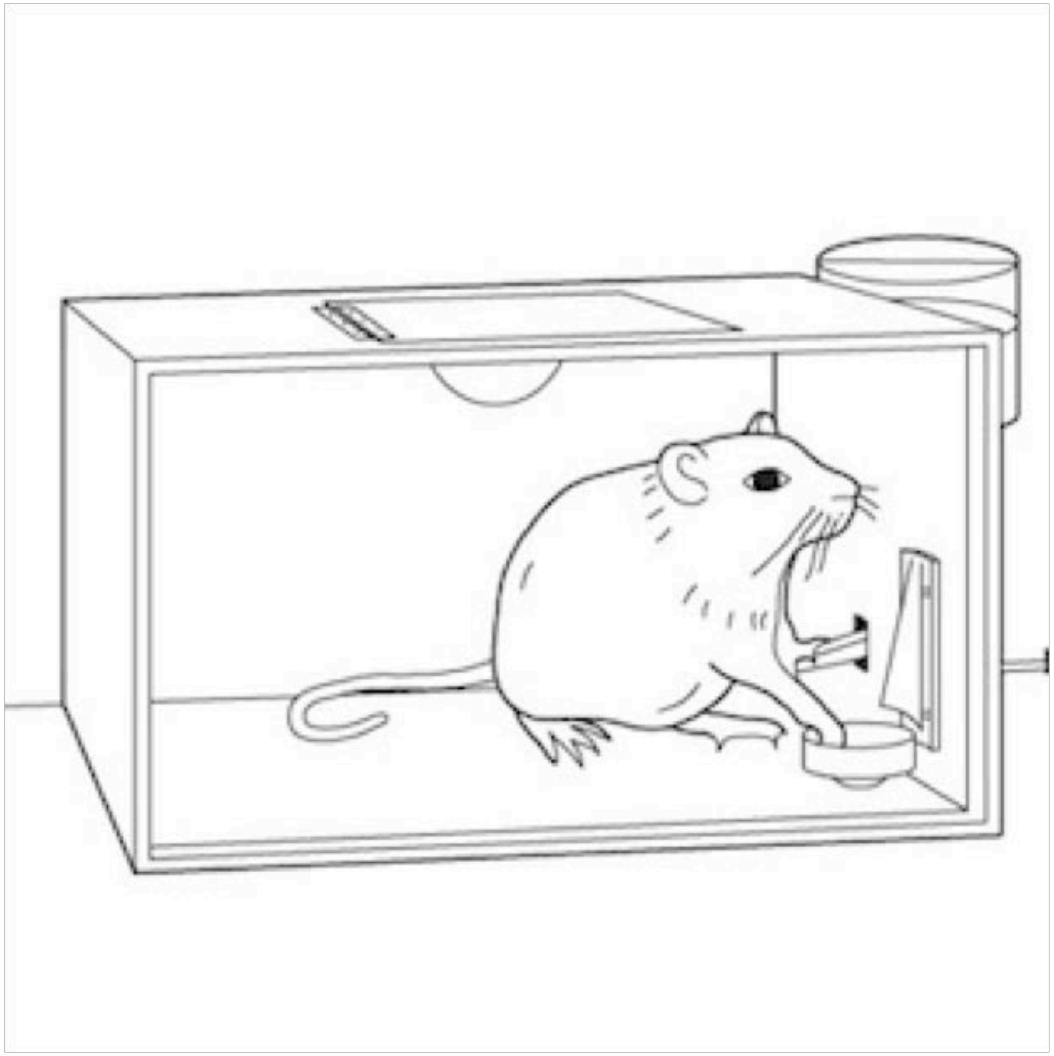
So, why do people use EGMs?

- Two well known psychological principles apply:
  - Operant conditioning
  - Classical conditioning
- Both are core elements of all gambling machines, including early mechanical devices
  - But have been heavily developed via EGMs

Operant conditioning

- B. F. Skinner demonstrated (via animal experiments) that:
- Animals (including humans) will respond to unpredictable stimuli (rewards) by developing patterns of behaviour that are hard to extinguish
- A random schedule of rewards creates habitual behaviour
  - Much more than predictable rewards can

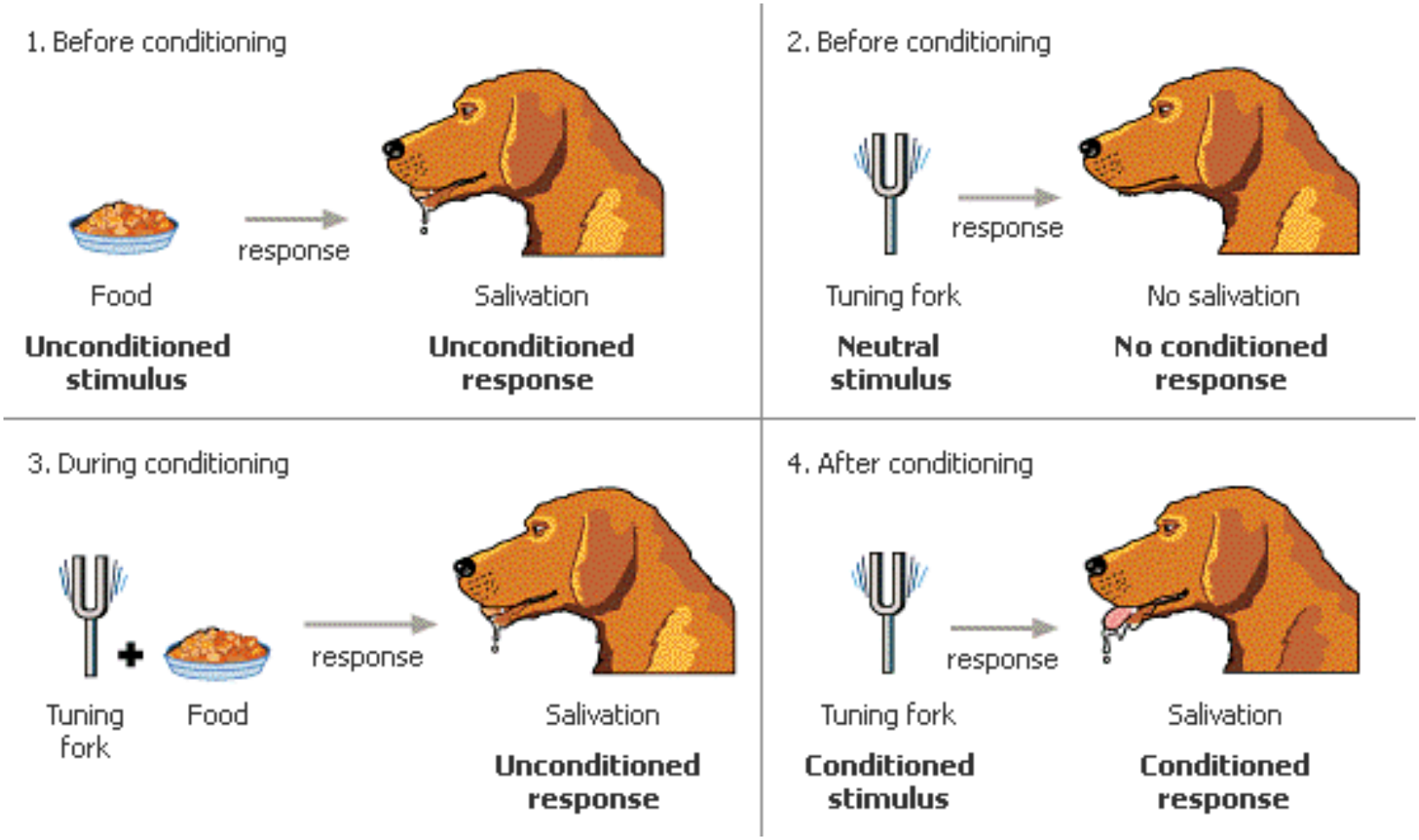
Skinner box



Classical conditioning

- Pavlov demonstrated that animals (including humans) respond to stimuli associated with a reward
  - If you play a metronome when you feed your dog, the dog will salivate when it hears the metronome – regardless of whether it's fed or not
  - If you hear a specific sound when you get a reward, you will rapidly associate that sound with a reward

Pavlov's dog


1. Before conditioning
response
Food
Salivation
Unconditioned stimulus
Unconditioned response
2. Before conditioning
response
Tuning fork
No salivation
Neutral stimulus
No conditioned response
3. During conditioning
response
Tuning fork
Food
Salivation
Unconditioned response
4. After conditioning
response
Tuning fork
Salivation
Conditioned stimulus
Conditioned response

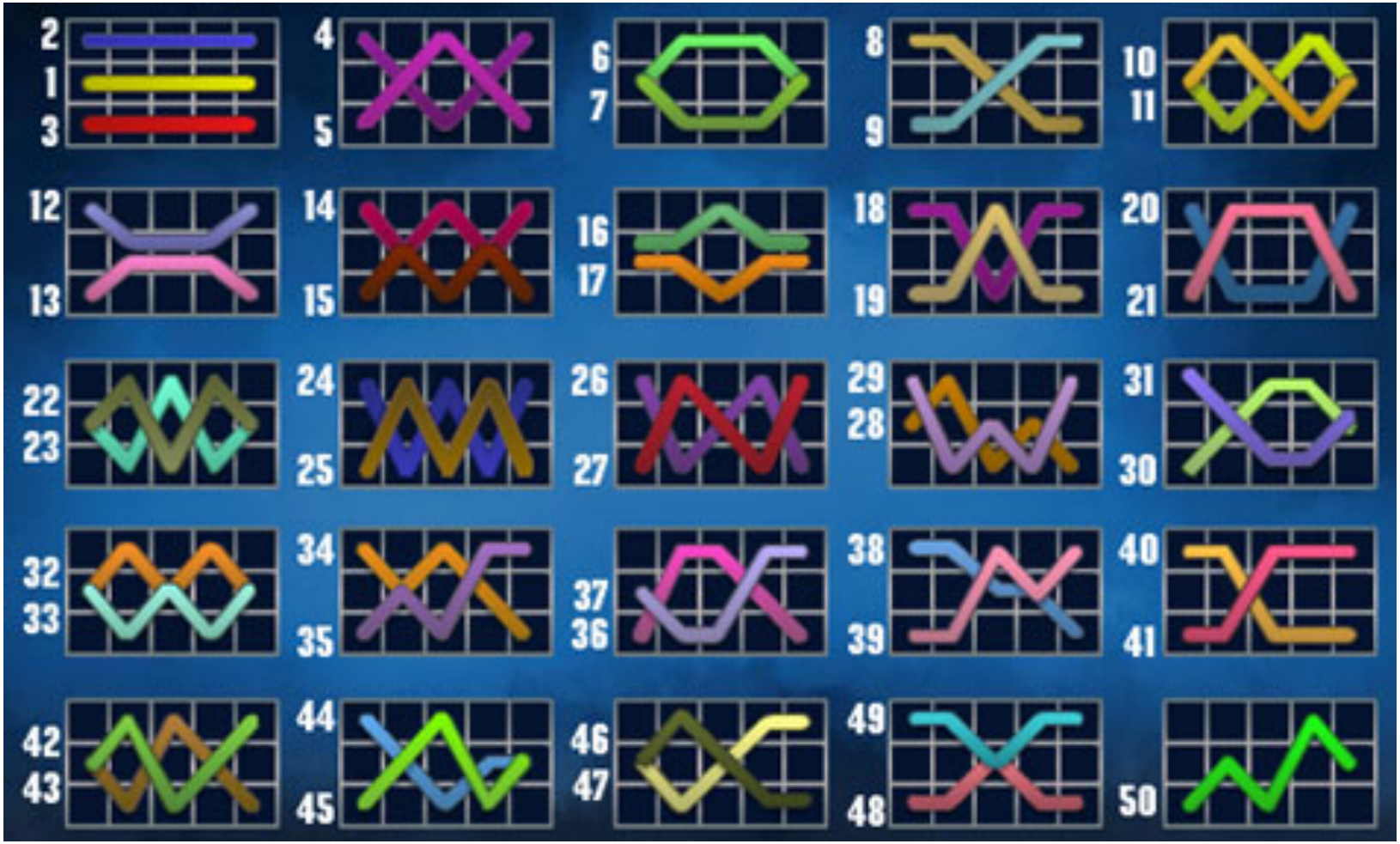
So, what's going on?

- Our brains (and animal brains) recognise and anticipate rewards
- This is done through our brains' systems, esp. the brain's dopamine system
- When a reward is received or anticipated, dopamine is released, causing a pleasurable, euphoric experience
  - Both classical and operant conditioned responses derive from this

Why are EGMs so good at this?

- EGMs can be programmed for multiple ‘tricks’, which increase the reward rate
  - ‘near misses’, losses disguised as wins, jackpots, game features, along with the lights and sounds, maximise reinforcement
  - And many do it without costing the operator anything

Losses disguised as wins



LDWs need multiple lines

- The illustration shows how machines can offer multiple lines for betting
  - Most serious users select as many lines as possible – the mini-max strategy is common
  - This means a ‘win’ is possible on a specific line
  - However, the net result will be a net loss
  - Bet $1, ‘win’ $0.10, result net loss of $0.90
  - But this produces reinforcement and can double the reinforcement rate

Near misses

- Some machines have differing numbers of winning symbols on some reels
- This allows for ‘near misses’ to occur more frequently than if symbols were equally distributed across reels, esp. where uneven reels are used
- As with Dolphin Treasure

Near misses

- The odds of obtaining five King symbols are 1/30 x 2/30 x 4/30 x 5/30 x 3/44 = 120/35,640,000 or **1 in 297,000**.
- Given that there are multiple King symbols on later reels, however, it is not particularly unusual to see a grouping of multiple King symbols on the screen i.e., the odds of seeing a King *on the last three reels* are **1/660**, and on both the third and fourth reels they are **1/45**.
- Such combinations will therefore occur relatively frequently. However, the game pays rewards from *left to right*, and the odds of achieving three kings *on the first three reels* (and achieving the most modest reward for King symbols, a prize of five credits) is 1/30 x 2/30 X 4/30, or **1 in 3,375**.

Features

- Game features are very popular with serious users
  - They offer ‘free spins’, when a combination of symbols appear on the screen, often with increased prizes
  - They’re not free, however: the probability is factored into the RTP
  - Nonetheless, they provide another reinforcement, at no net cost to the operator

Jackpots

- Jackpots (distinct from max prizes) are funded by a contribution from each spin
  - Often this will be around 2% or more of the wager
  - On a machine with 87% RTP this means the actual RTP is reduced to 85%
  - Often machines fund multiple jackpots – e.g., ‘local’ and ‘linked’
  - Both reduce RTP for those who don’t win a jackpot – i.e., almost everyone

So, are there policy implications?

- EGMs can be modified readily
  - All EGM parameters are open to change
  - The ANZ Gaming Machine Standards offer a vehicle
    - Which is underutilised from a consumer protection perspective
  - In some jurisdictions, harm protection standards have been implemented

Current examples

- Maximum bet – NSW $10; Vic, Tas $5
- Load up – NSW $7,500; Vic $1,000; Qld $100
- Bank notes – NSW all notes; Vic $50 max; SA coin only
- LDWs – Qld no sounds permitted

What could be changed?

- Load up limits
- Max bet
- LDWs
- Starved and uneven reels
- Communication of RTP and its meaning
- Accessibility (the major predictor of harm)
- Venue size
- Precommitment

Useful links

- Our report: https://aifs.gov.au/agrc/publications/how-electronic-gambling-machines-work/export
- University of Waterloo slots tutorials https://www.youtube.com/channel/UCYcS_rbZoNvtBZNKfQI0bcw
- Tas Govt pokies loss calculator http://knowyourodds.net.au/
- KaChing! Pokie Nation film http://kachingfilm.com/
- Ontario 'play smart' info https://www.playsmart.ca/?page_id=27#PlaySmartTools
- VRGF research page http://www.responsiblegambling.vic.gov.au/information-and-resources/research

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- Note – references available in the Discussion Paper