

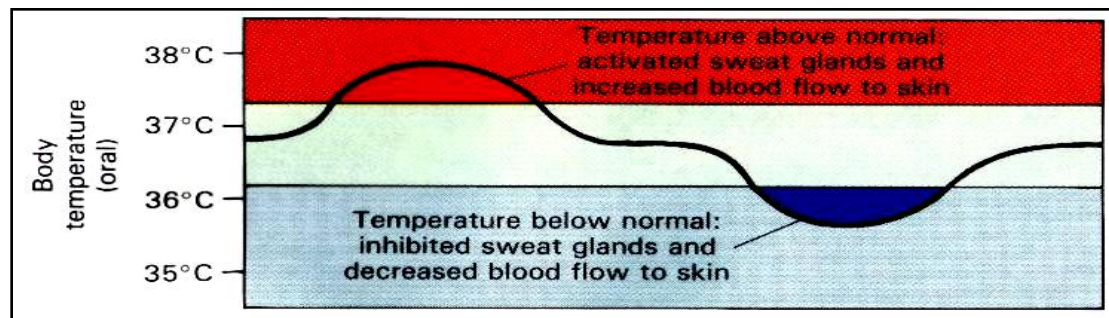
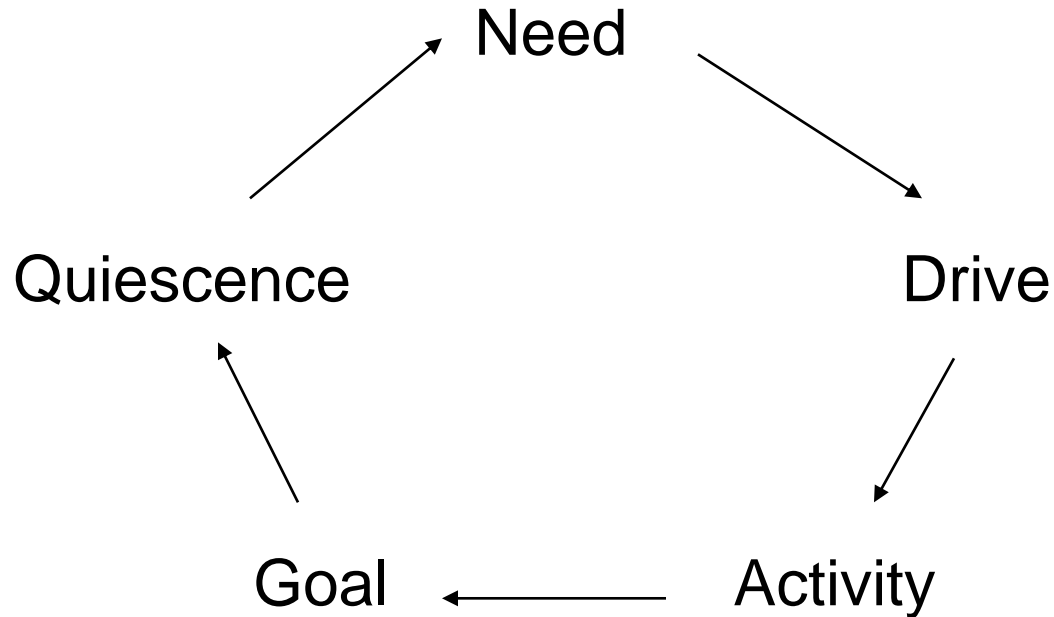
Drive

Arousal

Reinforcement

Intrinsic vs. extrinsic motivation

Regulatory approach: The organism responds to disruptive internal states by restoring the internal equilibrium.



Hull's theory of generalized drive

Hull (1943) proposed a general theory of learning that incorporated the notion of generalized drive

Hull's basic equation for behavior (which he called "excitatory potential") was:

$$\text{Behavior} = \text{Habit strength} \times \text{Drive}$$

Thus, for a behavior to occur the organism must both ***know*** what to do ("habit strength") and must be ***motivated*** to do it ("drive").

Operationally:

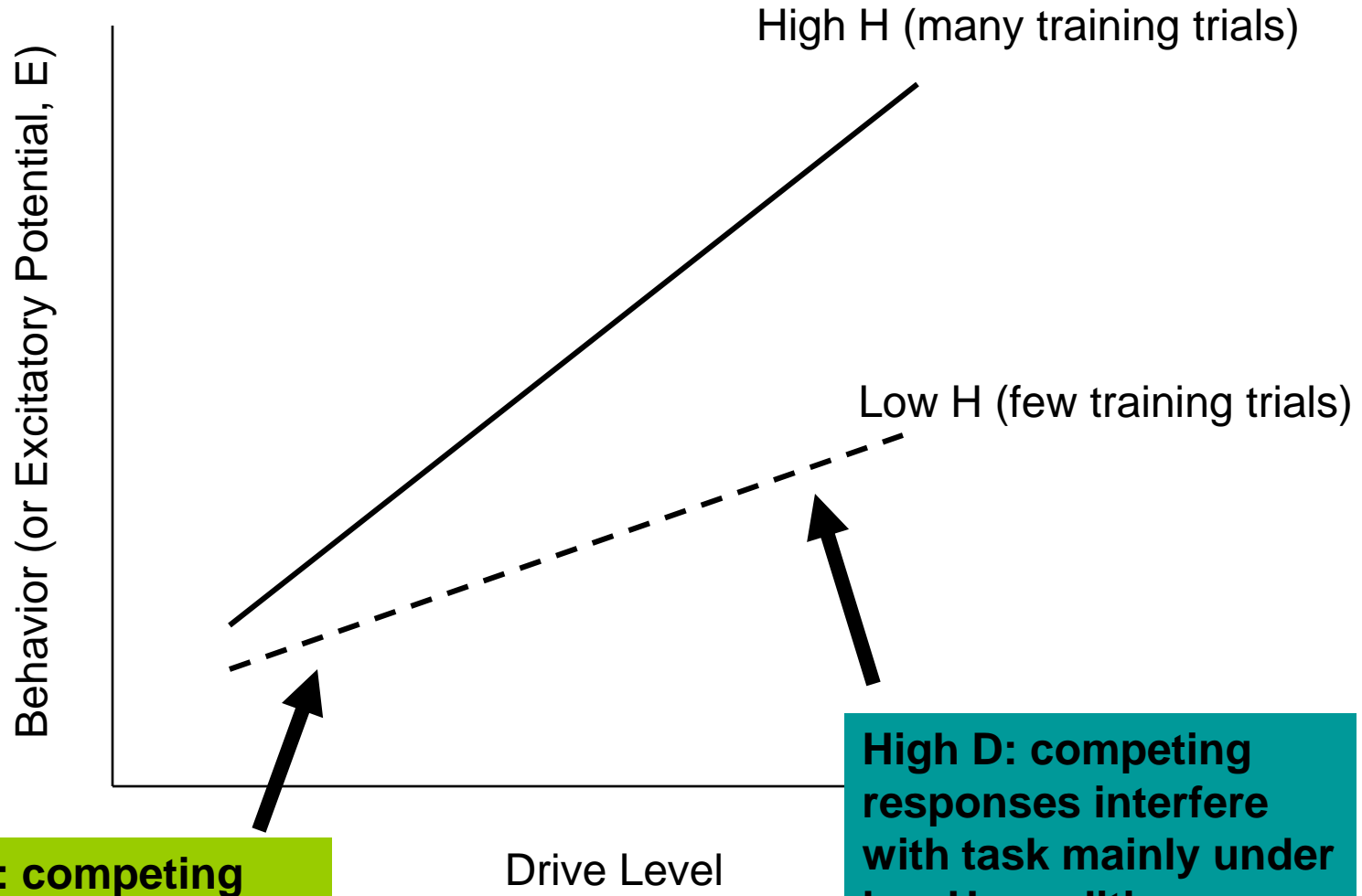
H = number of training trials

D = hours of food deprivation

Why HxD rather than, say, H+D?

Since these are intervening variables, Hull had to define how they would relate to behavior.

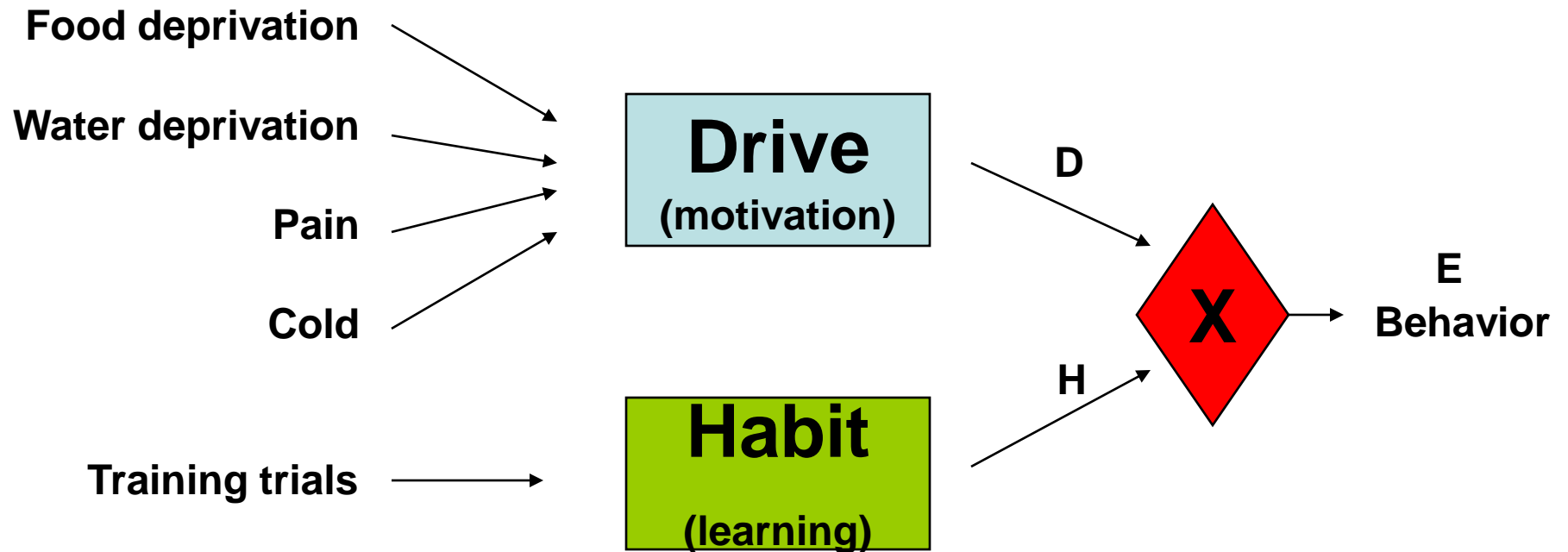
Multiplicative relationship between H and D



Low D: competing responses interfere with task under both low or high H.

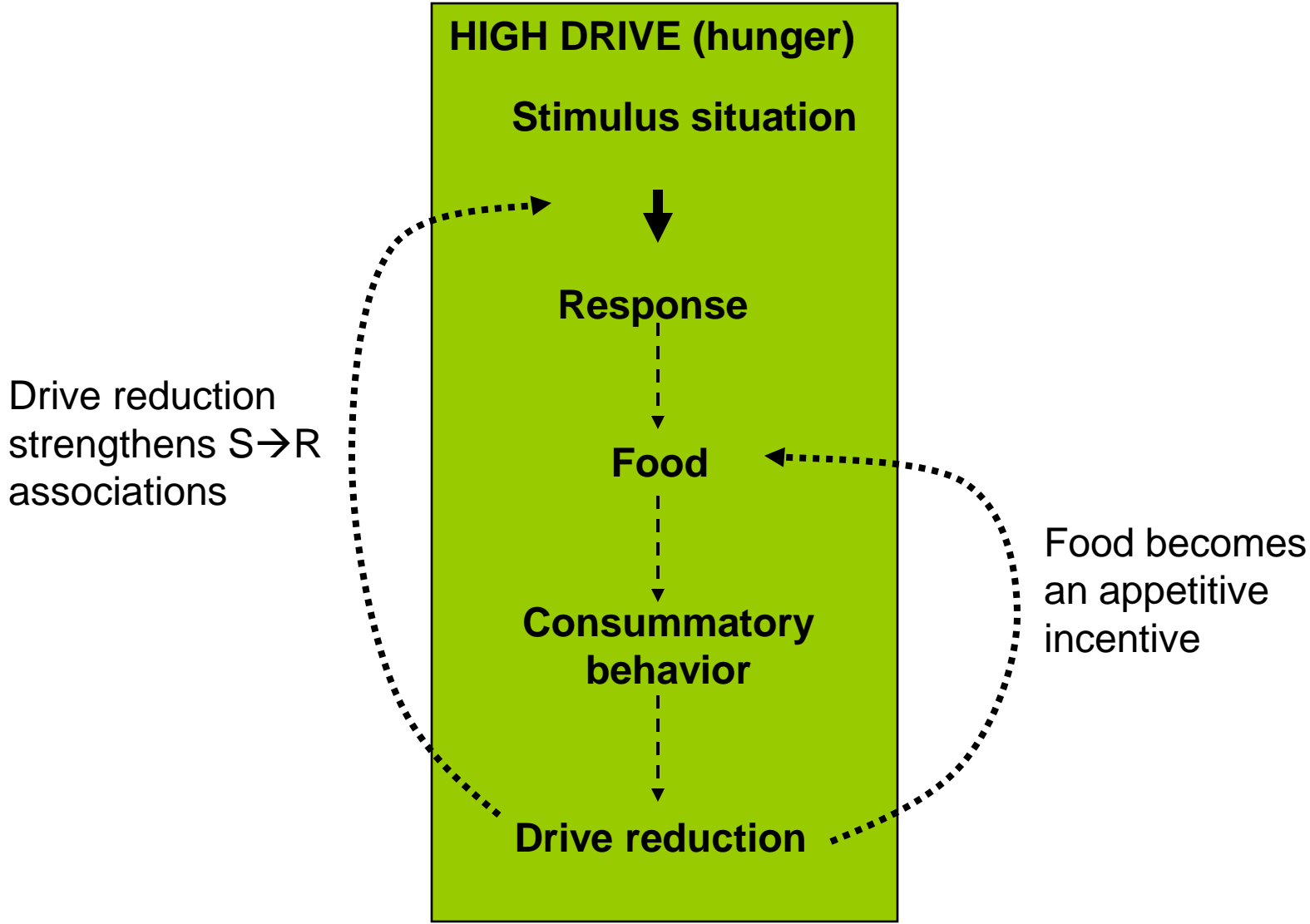
High D: competing responses interfere with task mainly under low H conditions.

Generalized D



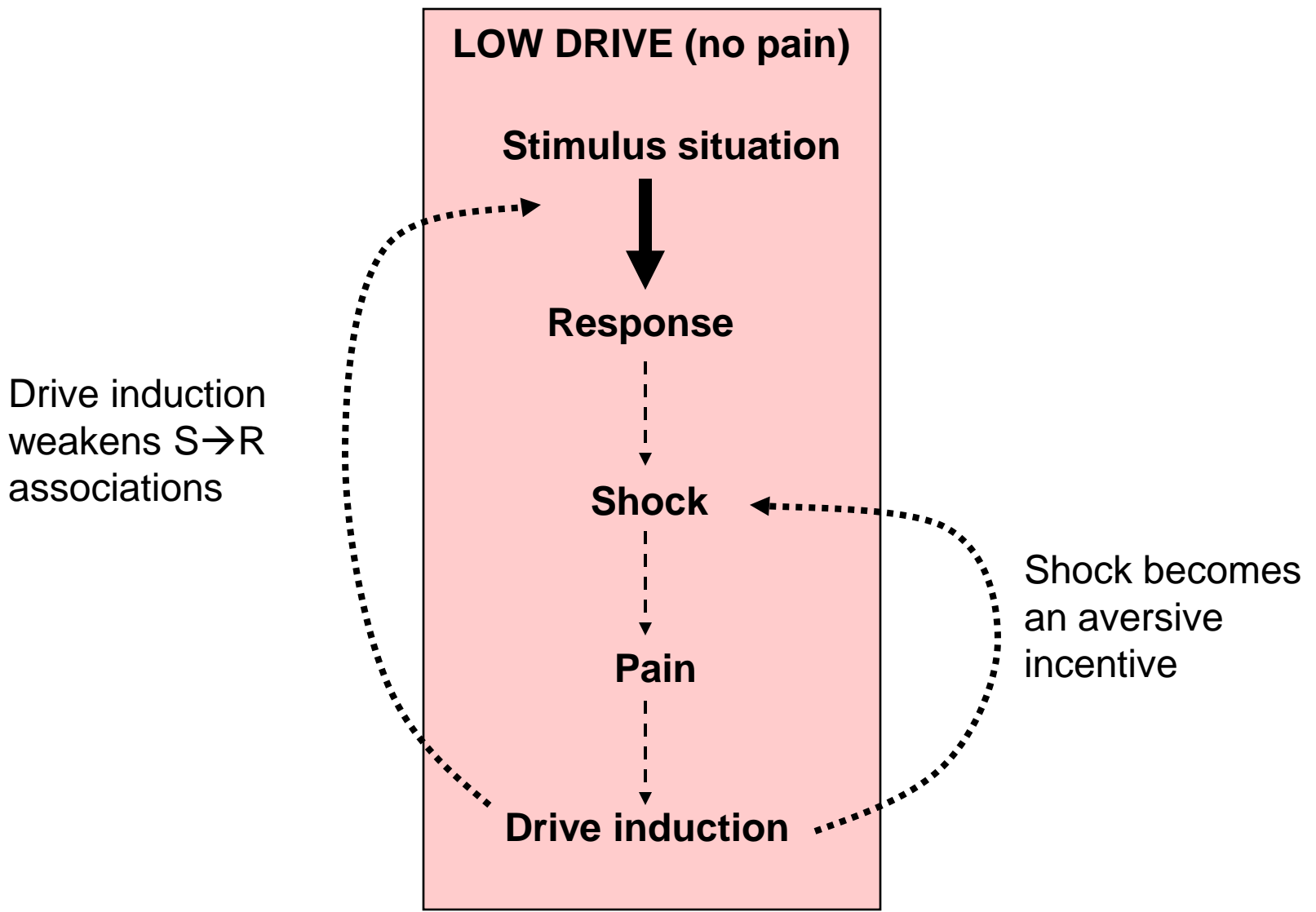
Prediction: organisms should be FASTER at learning a shock avoidance task motivated by pain when under food deprivation than when satiated.

Drive reduction theory



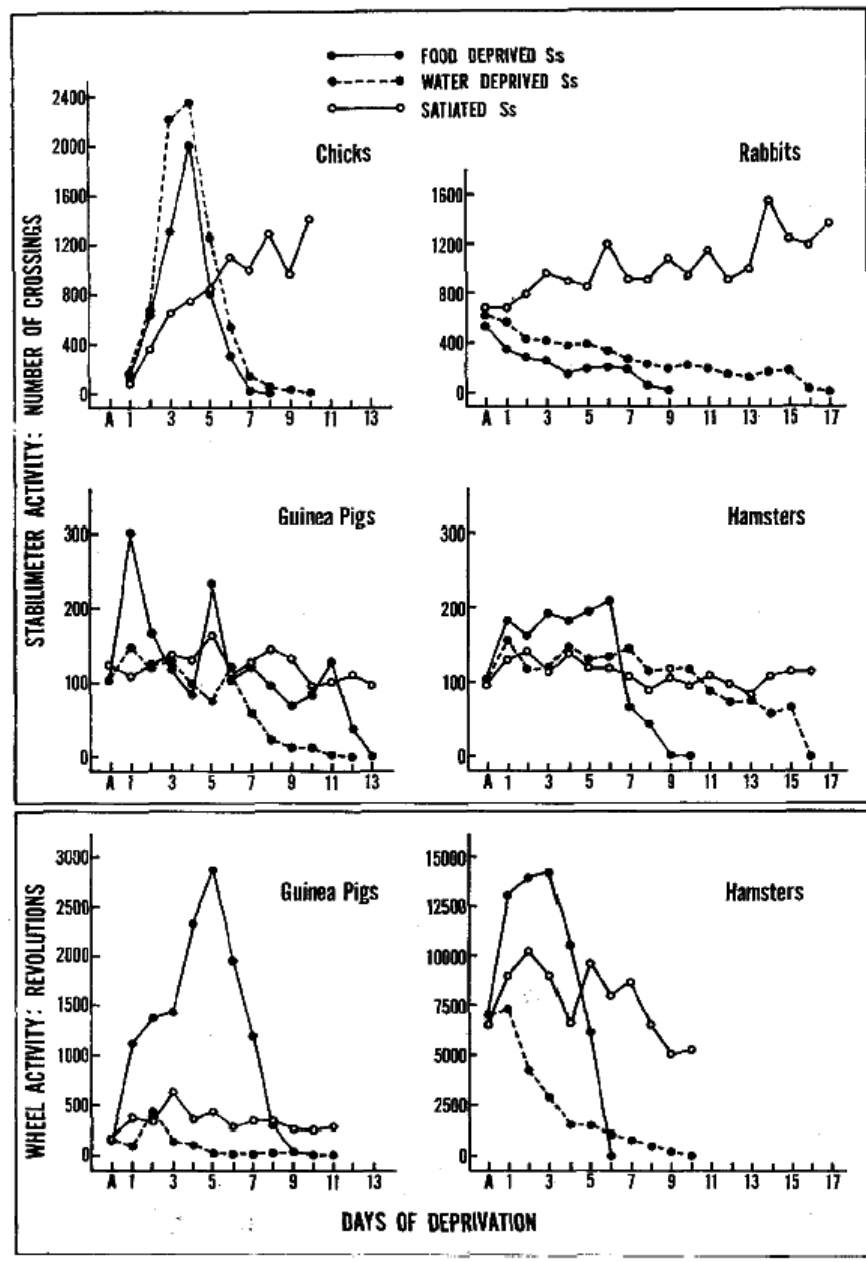
Any stimulus that reduces a drive has appetitive incentive value.

Drive induction theory



Any stimulus that induces a drive has aversive incentive value.

Drive induction data: Disconfirming evidence



(1) Changes in activity as a function of:

- Food deprivation
- Water deprivation
- No deprivation

(2) Activity changes depend on the species:

- Deprived chicks exhibit increases in activity followed by a sharp decline, relative to satiated chicks.
- Deprived rabbits exhibit decreases in activity.

(3) Activity changes depend on the type of deprivation:

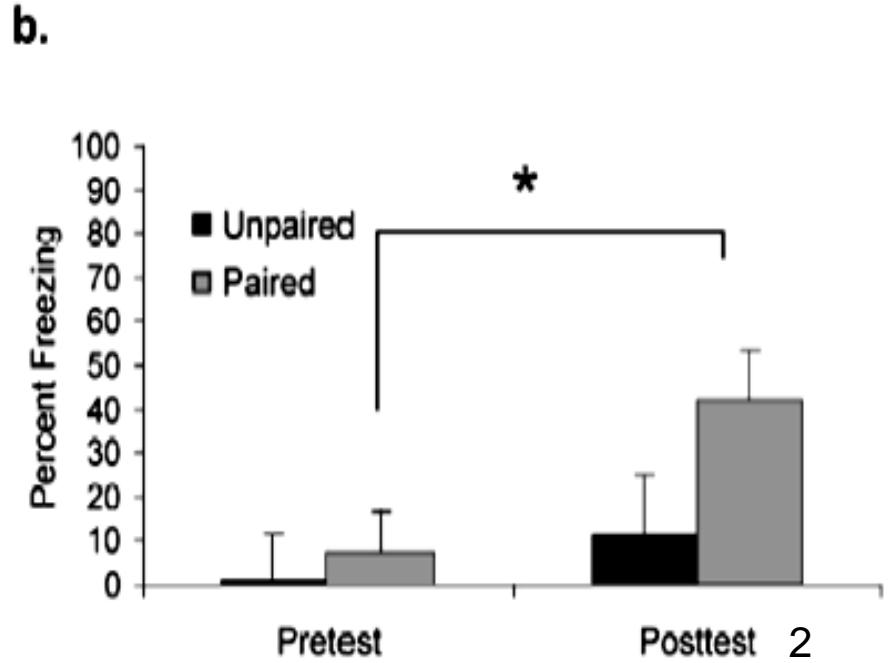
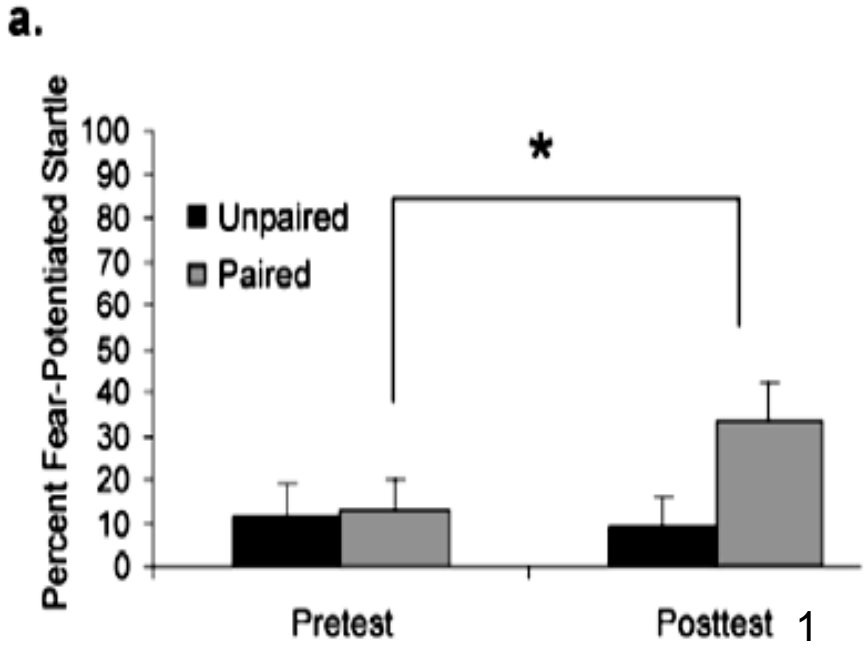
- In Guinea pigs (lower graph), food deprivation increases activity, whereas water deprivation decreases activity.

Drive induction data: Confirming evidence

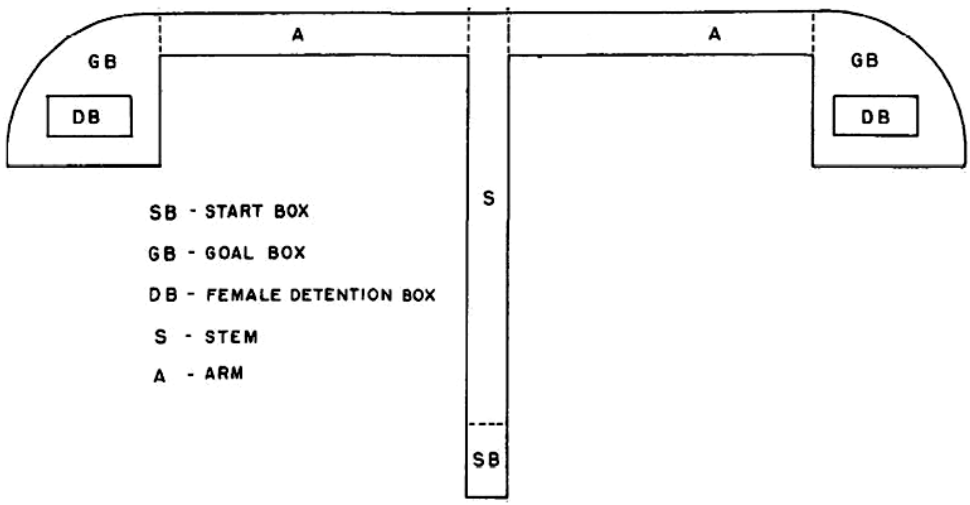
[Video]

Fear-potentiated startle:

Group	Pretest	Phase 1	Phase 2	Posttest 1	Posttest 2
Experimental	Odor+Noise	Odor→Shock	Noise→Startle	Odor+Noise	Odor
Control	Odor+Noise	Odor, Shock	Noise→Startle	Odor+Noise	Odor

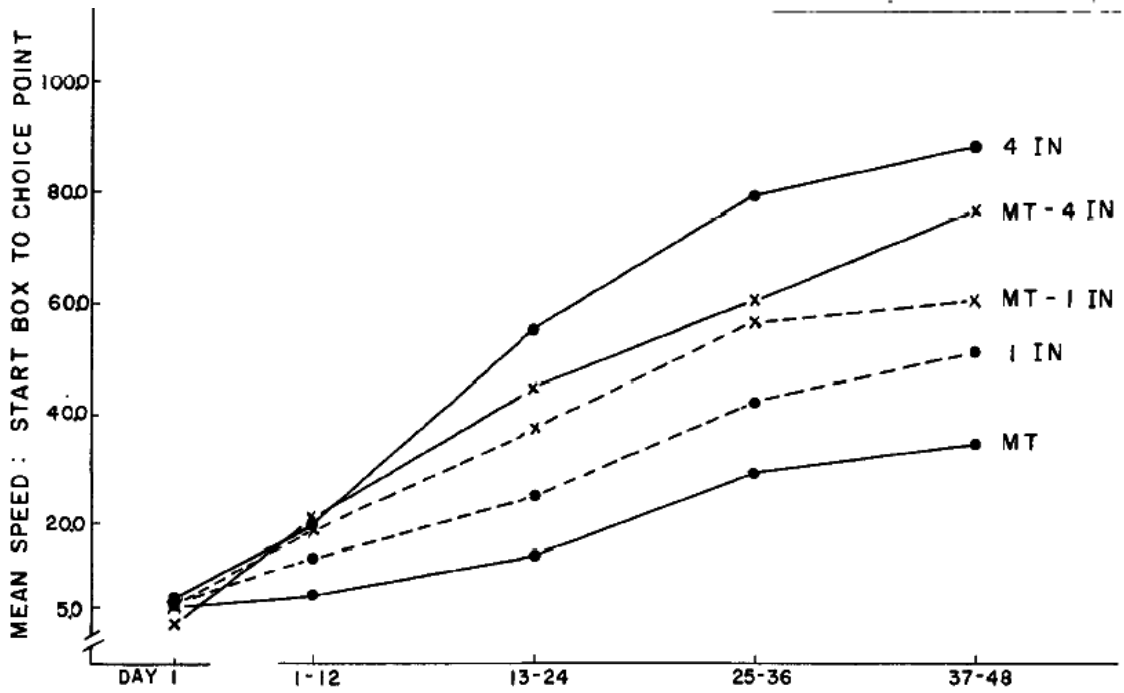


Drive reduction data: disconfirming evidence



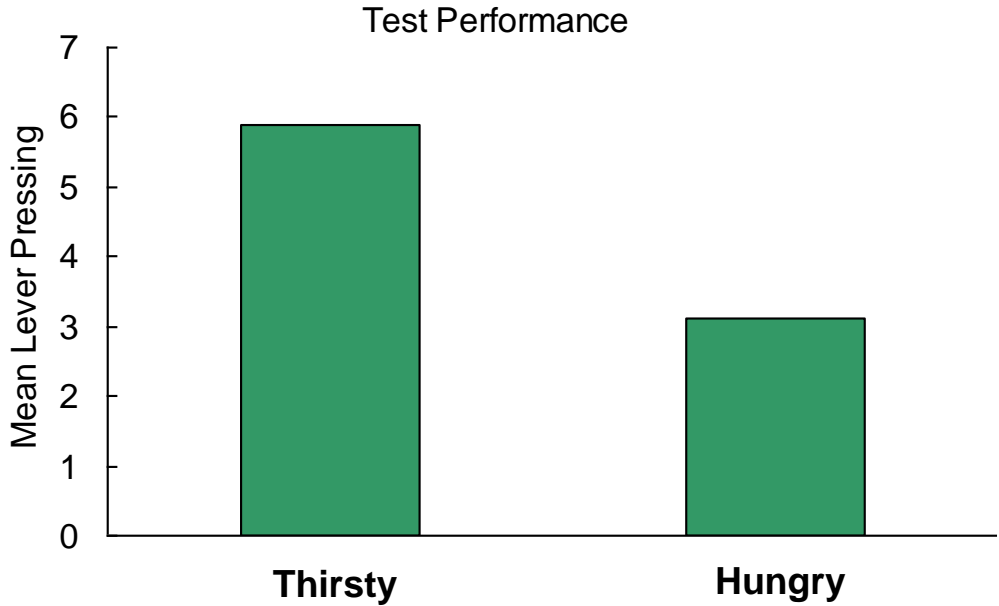
SUBGROUP DESIGNATIONS, EXPERIMENT 2

Group	"Positive" Goal	"Negative" Goal	Number of Males	
			Left "Positive"	Right "Positive"
MT	No reward	Mount without intromission	5	4
MT-1 IN	One intromission	Mount without intromission	5	4
MT-4 IN	Four intromissions	Mount without intromission	4	3
1 IN	One intromission	No reward	5	4
4 IN	Four intromissions	No reward	4	4



Whalen, J Comp Physiol Psychol, 1961, 409-415.

Incentive learning



Do we know that food is rewarding even before trying it the first time?



Incentive learning:

Group	Phase 1	Phase 2	Test
Hungry	FD: Lever → Sucrose FD: Pull → Food	FD: Sucrose FD: Food	WD: Lever?
Thirsty	FD: Lever → Sucrose FD: Pull → Food	WD: Sucrose WD: Food	WD: Lever?

Hull's Drive

Energizing effect on behavior

Stimulus feedback acting like any other stimulus

Water



(1) Trained while satiated,
Tested hungry → turn left
Tested thirsty → turn right

(2) Conditional discrimination:
If hungry → turn left
If thirsty → turn right

(3) Different levels of food deprivation:
If very hungry → turn right
If mildly hungry → turn left

(4) Runway performance:
If very hungry → no food → slow
If mildly hungry → food → fast

Food

Acquired drives

Do organisms treat signals of incentives similarly to the way they treat incentives?

Escape from fear:

Group	Phase 1	Test
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1	Peppermint context → Pain	Peppermint < Cinamon
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2	Cinamon context → Pain	Peppermint > Cinamon
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