

Why is OHS 50 Years Behind Psychological Research?

Dr. Peter Strahlendorf

School of Occupational and Public Health

Ryerson University

ENFORM PSC Banff

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Psychology and Safety

- What are some of the recent insights from psychology about how people see the workplace, remember details, make decisions?
- Neuroscience, brain physiology, cognitive psychology... much has happened in the last 10-15 years.
- Is OHS keeping up with the science?

Psychology and Safety

- For 10-15 years, “behaviour based safety” has been popular. It’s been heavily marketed – to CEOs -- who then impose it.
- It sounds good – cutting to the chase. Why bother with all that “systems” stuff if we can just modify the worker’s behaviour?
- If 90-95% of accidents involve the worker’s behaviour, then it seems to make sense to focus on the worker’s behaviour.

Psychology and Safety

Some terminology:

Psychology

Behavioural psychology

Do we want to understand how the mind causes behaviour, or do we want to ignore the mind and just manipulate behaviour (if we can)?

“Behavioural Psychology”

Historically “behavioural psychology” was a rejection of the mind.

It seems odd to say that any sort of “psychology” has nothing to do the mind.

“Behavioural psychology” was an extreme ideology that considered only observable physical phenomena – behaviour – observable stimulus & response.

“Behavioural Psychology”

Many behavioural psychologists switched to “behavioural science” so as to drop the word “psychology”.

“Behaviourism” is a philosophical approach based on behavioural psychology. Nothing else matters except stimulus and response.

Philosophers today don’t do “behaviourism”.

“Behavioural Psychology”

B.F. Skinner – the “Father of Behavioural Psychology”:

You can't measure anything in the mind, so ignore the mind. Treat the mind as an unknowable “black box”. Science must focus only on observable behaviour.

“Behavioural Psychology”

In the 1950's and 60's there wasn't much opportunity to look into the mind.

Today we can watch while the brain is “thinking”.

We have a pretty good idea which parts of the brain are designed to deal with which problems of survival and reproduction.

We have a better understanding of brain chemistry and how hormones work.

“Behavioural Psychology”

- Enormous numbers of experiments have been done on memory, perception, emotions, motivation, beliefs, etc.
- But none of this modern “neuroscience” comes under the heading “behavioural psychology”.

What Behavioural Psychology is Not About

Behavioural psychologists do not use terms like:

*Belief, attitude, morality, judgment, emotion,
logic, rationality, persuasion, memory, ethics,
courage, creativity ...*

...because these are forbidden cognitive terms.
If they are being used by “behaviour based
safety” proponents, then some other type of
psychology is being used – not “behavioural
psychology”

Since “Behavioural Psychology”

Over the last 50 years behavioural psychology has become outdated. We have seen the rise of:

- Cognitive psychology
- Social psychology
- Developmental psychology
- Personality psychology
- Evolutionary psychology
- Neuroscience
- Psychopharmacology

Psychology and Behaviour

- We are certainly interested in “behaviour” in OHS.
- We want “safe behaviour” and don’t want “unsafe behaviour”.
- Can we get what we want by **only** dealing with behaviour?
- If you think so, carry on with “behaviour modification”.

“Behaviour Based Safety” (BBS)

BBS means:

Techniques focused on a worker’s behaviour that are justified by a particular subdiscipline and theory called “behavioural psychology”.

“Behaviour Based Safety” (BBS)

ABC

Antecedent, Behaviour, Consequences

“Consequences cause behaviour.”

A behaviour that results in a rewarding outcome will happen again – because of that outcome. A worker who takes a short cut and gets some time off will take the short cut again.

“Behaviour Based Safety” (BBS)

- If safe behaviour is rewarded, and rewards for unsafe behaviour are eliminated, then workers will behave safely.
- After a while the safe behaviour will be a “habit”. The habit is supposed to continue when you remove the reward.
- There is nothing “psychological”, “cognitive”, “mental” about this.

“Behaviour Based Safety” (BBS)

When people are arguing about BBS they are often not talking about the same thing.

There are many proponents of BBS out there, and they are using a wide variety of techniques, explanations and theories; many things get called BBS which are not within the original meaning of the expression.

“Behaviour Based Safety” (BBS)

If you choose BBS and are consistent theoretically:

- You can't talk about values, attitude, culture.
- You're not serious about education and persuasion.
- Getting people to think about risk, or decide what is “reasonable”, is not an option for you.
- Your approach is based on a 50-60 year old theory that is out of date and incompatible with modern psychology.

Does it Matter?

Does it matter that BBS might be a technique that can work to some degree, but which has no underlying legitimate theory?

Perhaps the lack of proper theory explains why people are talking past each other and why there are so many incompatible versions of BBS.

BBS Works?

Where BBS works, it works for reasons other than behavioural psychology.

Where BBS doesn't work, BBS can't – in theory – provide an explanation.

ie: You can't use behavioural psychology to persuade a CEO to adopt BBS because "persuading" with arguments is in the realm of cognition not behaviour.

BBS Works?

If you engage in extensive training on BBS techniques and have the CEO launch the initiative with an inspiring speech, of course you're very likely to have some success ... because of the education and leadership ... not because of the behavioural psychology supposedly behind the technique.

Does it Matter?

- BBS is taking up intellectual space in the OHS profession.
- Because of its superficial appeal and grand promises BBS has a quasi-monopoly on “psychology and safety”.
- BBS is getting in the way of new ideas flowing from modern psychology into OHS.

What to Do?

- Be more skeptical and questioning of BBS.
- Stopping using the term “behavioural psychology” if we mean “psychology” -- the mind.
- Open up OHS to research from all areas of psychology.
- The key to success in OHS will be a better understanding of human nature in general and of unique individuals in particular.

Some Examples of Modern Psychology

**... that are not consistent with
behaviourism**

“Willpower” and Self-regulation

“Willpower”

- Seems old-fashioned
- Some philosophers deny it exists
- For many years was not a subject psychologists studied
- Been a rekindling of interest
- Called “self-regulation” or “self control”

“Willpower”

Used to be about “moral character”.

Now it’s about brain physiology.

The Famous Marshmallow Experiment

- Children told they could eat a marshmallow in front of them now, or wait and then have two marshmallows to eat later.
- Some couldn't control themselves and ate now; some postponed eating and had two.
- Years later, what sort of people did the children become?

The Famous Marshmallow Experiment

No Self-Control

Grew up to have greater likelihood of drug use, criminal behaviour, poor academic performance.

Self-Control

The opposite.

Many Further Experiments

- A person's supply of willpower is limited.
- You use the same willpower resource for all things. There's one "account".
- After making tough decisions your willpower is depleted.
- Willpower depletion is not easily sensed; there is no feeling of depletion.

Many Further Experiments

- Struggling with temptation and giving in is as depleting of willpower as struggling with temptation and not giving in. Struggling depletes willpower. Giving in doesn't.
- Forcing yourself to do something you don't really want to do depletes willpower as much as struggling to avoid doing what tempts you.

Many Further Experiments

- What depletes willpower is not what is objectively “tough” but what subjectively seems “tough”.

The Symptoms of Willpower Depletion

- Feel more bothered and irritated
- Things are felt more strongly
- It's harder to make up your mind about things
- Decision-making slows down
- There is reluctance to exert oneself
- Impulses are harder to resist

The Symptoms of Willpower Depletion

- Tend to favour short-term gains
- Tend to favour delayed costs
- Sense of fairness is lowered
- Tend to stick with the status quo

Negative Spiral of Willpower Depletion

- Willpower is depleted
- You screw up
- Results in more depletion
- And more screwups

What is “Willpower”?

- Seems like a form of “energy”
- Does it have a physical basis?
- Or is it abstract and metaphysical?

What is “Willpower”?

“Willpower” turns out to be **glucose** or “blood sugar”.

Willpower and Brain Physiology

- The brain uses a lot of chemical energy to function, which comes from glucose in the blood.
- There are rapid changes in levels of glucose.
- The greater the complexity, difficulty, “multi-tasking” and conflict between choices, the more glucose is used up.

Willpower and Brain Physiology

- Willpower is depleted as glucose is depleted.
- Willpower increases as glucose increases (to a point).

Willpower and Implications for Safety

Willpower and Safety

Greater probability of accidents if:

- You have trouble concentrating.
- You have trouble deciding.
- You have trouble resisting temptation.
- You are impatient.
- You are irritable.
- The present seems more important than the future.

Willpower and Safety

Low glucose and therefore low willpower means:

- Take short cuts.
- Don't follow procedures.
- Don't wear PPE.
- Don't apply training.
- Don't follow instruction.
- Don't co-operate with others.
- Don't ask for help.

Glucose and Safety

Glucose and Safety

- Sleep helps as less glucose used when resting.
- When a person is sick glucose is used up, so sick people tend to have willpower depletion effects.
- Can get a “quick fix” with sugar (candy, fruit juice), but doesn’t last long.
- Steady diet with protein and complex carbohydrates better – glucose is steadily produced from these.

Glucose and Safety

- Glucose depletion effects should be more serious just before mid-shift break and before end of shift.
- Rest (mentally) before complex, demanding tasks.
- Night shift effects may be glucose effects.

Stress Management

New Understanding of “Stress”

Stress is what causes extra brain activity and therefore glucose depletion and therefore willpower depletion.

Stress Management

“Stress management” should be thought of as “glucose management”.

Diabetes and Hypoglycemia

Diabetes

- Controlling diabetes is about controlling glucose in the blood.
- Diabetics not in control show symptoms of glucose depletion.

Diabetes and Safety

- Greater importance of the detection of diabetes earlier.
- Greater importance that assistance be provided for monitoring and control of diabetes in the workplace.
- Better understanding of “accommodation”.

Stressors Outside the Workplace

External Stressors

- Life Change Unit Theory of Accident Causation
- Long understood that a worker with stress in his or her personal life is at risk of workplace accidents.
- Employee Assistance Programs (EAPs) are justified by the LCU Theory.
- Preoccupation with personal problems while working depletes glucose and therefore willpower and self-control.

Systemic Distortions in How We See, Remember, Perceive

Systemic Distortions

Old model of the brain:

A generic, information-processing computer that may be distorted by outside influences.

New model of the brain:

A system of many parts, the parts having built-in biases. Some are general features of human nature and some are inherited adaptive strategies that not all share.

Systemic Distortions

Examples:

- Right handed people tend to turn right.
- A majority of people prefer blue and the #7.
- Once committed to an answer we are loathe to change it in spite of evidence.
- Risk to children is perceived much greater than it is.
- We selectively “see”.
- We selectively “remember”.

Systemic Distortions

Key points:

1. We are not aware of most of these distortions in brain function.
2. Often, even when we are aware of them, they still occur.

Why Do Distortions Matter?

Inspections:

- When we look for hazards, contraventions and defects, we are not taking in and recognizing much of what is there.
- We misinterpret what we do recognize.

Why Do Distortions Matter?

Investigations:

- Peoples' "stories" are subject to selective memory.
- "Stories" are smoothed out, simplified and tailored.
- When people selectively remember and exaggerate, they believe their distortions and create new memories.

Distortions

You remember what you believe:

If you **believe** in global warming...

You **remember** temperatures as being higher than they actually were.

If you don't **believe** in global warming...

You **remember** temperatures as being lower than they actually were.

Distortions

- If you are investigating or inspecting with a set of beliefs about the categories of things that cause accidents, those beliefs will affect what you remember seeing and hearing.
- They will also be affecting what other people (co-investigators/inspectors, witnesses) are remembering.

Distortions

Antidotes:

- As best we can, recognize our biases.
- Inquire directly and indirectly of the biases of others.
- Interviewing sooner is better than later.
- Recording sooner is better than later.
- More witnesses and investigators/inspectors better than fewer.

Distortions

Antidotes:

- People remember dramatically better if they are in same context as their initial experience.
- Ask for specific facts before asking for “their story”.
- Peoples’ stories are influenced by others’ stories, so not a group consensual effort.
- Atmosphere of openness and an acceptance of different perspectives... but critical analysis.

Distortions – Decision-making

Evolutionary psychology:

- Rapid decision-making adaptive – “quickly size up the situation”.
- But lose detail, and error rate increases. It’s a balance and a trade off.
- We tend to believe we haven’t missed anything.
- We have brains designed this way over millions of years.

Distortions – Memory Capacity

- The mind is not designed for high capacity short term memory.
- Experiment – 30% of people will forget a password after one week.
- Experiment – 15% of on-line newspaper subscribers are subscribers who forgot their passwords.

Distortions – Memory Capacity

- Short term memory deteriorates rapidly beyond 5 items to remember.

Accident causation:

Vehicles, equipment, machines. Many devices. Many inputs. So much to remember. If you have to remember more than 5 items to engage in an operation, error rate rapidly increases.

Learning and Remembering

Distortions – Bad Initial Information

- Once information is accepted and “learned” it is very difficult to “unlearn it”.
- If you have “learned” incorrect information, you will have difficulty not considering it even when you realize it is bad information.
- There is a form of commitment to what has been learned just because it has been learned.

Learning and Remembering and Context

Famous experiment:

- Learn items while in a wetsuit in the water, test later on land – high error rate.
- Learn items while in a wetsuit in the water, test later in wetsuit in the water – low error rate.

Learning and Remembering and Context

Bizarre Famous Experiment:

- Learn items while mildly intoxicated, test later while sober – high error rate.
- Learn items while mildly intoxicated, test later while mildly intoxicated – low error rate.

Learning and Remembering and Context

Enormous number of experiments have shown that context is a major factor in learning and remembering.

Antidote – “At the scene”

- Review procedures at the scene not in a classroom.
- Training in situ.
- Investigation– interviews and analysis at the scene.

“Looked But Didn’t See”

“Looked But Didn’t See”

The Burt Reynolds Bar Story.

It’s a myth that the eye “takes pictures”.

The eye sees only a tiny piece of the view at any given moment. The eye moves rapidly seeing many tiny pieces and then rapidly “guesses” at a reconstruction.

“Looked But Didn’t See”

Many experiments have undermined the credibility of “eye witnesses”.

1989-2007:

201 prisoners in USA freed because of DNA evidence. 77% were mis-identified by eye-witnesses.

Biased Seeing

Many decisions are made on the basis of factors we are not aware of.

People rate pictures of people (“competent”) but can’t say what factors were used in judgment.

People buy more French wine when French music is playing, but they aren’t aware of the influence.

Teams with black uniforms get more penalties.

Biased Seeing

Experiment – Purse snatching:

Female observers see and remember details about the female victim, not the thief.

Male observers remember details about the thief but not the female victim.

Biased Seeing

Experiment – Handedness:

Right-handed people see and remember objects oriented to the right.

Left-handed people see and remember objects oriented to the left.

(When approaching grocery checkout, right handed people should force themselves to look to the left – where the lines are shorter.)

“Change Blindness”

“Change Blindness”

Major Myth:

We believe we will notice any changes.

We rely on this with informal workplace inspections. We expect that people will notice anomalies, defects, contraventions, “things not right” and novelty.

“Change Blindness”

Famous “Door Experiment”:

Experimenters interviewed people. During the interview a couple of workers carrying a door walked between the interviewer and interviewee. One of the workers changed position with the interviewer. 50% of the time the interviewee did not notice the person interviewing them had changed.

“Change Blindness”

Millions of people can watch a movie and not see the incongruous error.

www.moviemistakes.com

Ben Hur – the damaged chariot is undamaged at end of the race. Race ends with more chariots than started.

“Change Blindness”

Key Point:

Experiments show that people are extremely **confident** they will see anomalies and defects and novelties.

“Frequency Bias”

“Frequency Bias”

**“If you don’t find it often, you
don’t find it.”**

“Frequency Bias”

“Quitting Threshold”:

The amount of time you look before you give up. You look harder and longer for things that are more likely to be there. You quit looking sooner if the thing is unlikely to be there.

Baggage screeners only see one gun in a million passengers. On tests, they miss 25% of planted guns.

“Frequency Bias”

Implications for Workplace Inspections:

High risk hazards are rare. Don't expect to find them very often. We give up looking for them sooner. A higher miss rate on high risk items.

Hind Sight Bias

Hind Sight Bias

- Why don't we learn from experience?
- We often blame the wrong cause.
- Looking back, knowing what happened distorts beliefs about why it happened.

Hind Sight Bias -- Foreseeability

- Looking back, we often over-estimate foreseeability.
- In OHS everyone is engaged in risk assessment, which requires assessing the probability that certain events will occur.
- What would the reasonable person have foreseen then, not what would the reasonable person have foreseen, knowing what we now know – a source of legal confusion and unfairness.

Action versus Inaction

- People feel vastly more responsible for actions than their inactions.
- People feel worse about changing a right answer to wrong answer than failing to change a wrong answer to a right answer.

(Powerful reluctance for people to change answers on a multiple choice exam.)

Action versus Inaction

1. People have to opt out of a workplace fitness or wellness program.
2. People have to sign up for the program.

Which strategy gets more people into the program?

“Default settings” are very powerful.

Changing Minds

When people change their minds they believe they always thought that way.

Not just opinions, but also facts.

Selective Memory

- People remember the past in a way that flatters themselves.

Experiments with Watergate tapes. Huge difference between memory of conversations and actual tape.

Selective Memory

Implication – Accident Investigation:

People will believe an accident happened in a way that reflects well on them.

They are not lying. They truly believe what they are saying.

“Task Saturation”

USAF 1987-1998:

98 airplane crashes. 190 deaths.

In most cases the crew was engrossed in what they were doing and lost the ability to fly the plane.

“Task Saturation” and the Myth of “Multi-tasking”

Office experiment:

Interrupted 20 times an hour.

Focus on a task no more than 3 minutes.

No such thing as “divided attention” – you can be aware of more than one thing at a time, but you can’t decide about two things at the same time.

“Task Saturation” and the Myth of “Multi-tasking”

- Can watch the brain “slow down” when juggling tasks.
- We forget what we were doing – working memory ... forgetting rate is 40%.
- Downtime. It takes up to 15 minutes to recover concentration after a phone call.

“Task Saturation” and Age

Rapid decline after age 40 in the ability to screen out distractions.

In 4 years the peak of the baby boomers hits 60.

Retirement boosted to 67 years.

We will see huge increase in “distractible workers”.

“Inattention Blindness”

Experiment with cameras in cars:

78% of all crashes:

- The drivers were looking away
- The drivers were engaged in a secondary task

In many cases driver did not “see” what he or she was looking at before hitting it.

“Inattention Blindness”

A two second glance away doubles the chance of an accident.

Takes average of 86 seconds to put an address in a GPS = 20-35 “glances away”.

Implication for complex devices on equipment.

Highly age dependent.

Sleep and Risk

Sleep and Risk

- Experiments show that sleep-deprived people gamble more recklessly than well-rested people.
- That's why casinos are open 24 hours/day.
- Implication for OHS: sleep-deprived workers more likely to take short cuts... and other risk-taking activities.
- An explanation for greater accidents on night shift, people working double shifts, truckers.

State of Mind (or Personality)

Happiness and Optimism

State of Mind (or Personality)

Happiness:

Experiments show that people who are in a state of “happiness”:

- Have better well-organized thinking
- Have more flexible problem-solving

State of Mind (or Personality)

Optimism:

People who are generally less optimistic about life make better decisions. Over-optimistic people are over-confident – a leading source of error.

(Be a happy pessimist.)

“Reading Errors”

- We don't actually read, we skim.
- The better and faster we “read”, the more we skim.
- We read the beginnings of words and then guess the rest.

e.g. inspection and investigation.

Big effect on error rate.

“2-D Errors”

People “straighten out” maps when they remember them.

Male and female differences.

Big impact on error rates in certain jobs.

“Learning Disabilities”

- Was what “accident proneness” was all about?
- Variations in how people receive and process information.
- Not “learned behaviour” – it’s brain structure and function.

Male and Female Differences

You think people are paying attention to you during training just because they're looking at you?

At any given moment during a lecture, 40% of young males are thinking about sex.

Male and Female Differences

Huge differences in risk-taking.

Risk-taking is generic – correlation between speeding tickets and churning stocks.

Males run yellow lights more, wear seatbelts less.

Why? Males are over-confident.

Males don't seek risk, they value the benefits of risk more than females... the perceived benefit.

Male and Female Differences

Males 3x more likely than females to die in car accidents.

Males 10x more likely than females to die on the job.

We think it's because males do riskier work, but there's more to it than that.

Male and Female Differences

Young males in groups with older males.

Social psychology.

Will a young male express concern about risk?

Will a young male engage in a work refusal?

“Accident Proneness” and Disease

- Some diseases cause a deterioration in nerve/muscle control.
- Long before a person is diagnosed with MS, they will have numerous minor events, close calls.

Some other strange things

Strange

- Certain drugs (for Parkinson's disease) can cause recklessness and gambling.
- Claim has been made that there is a “risk taking gene” DRD4.
- ADD drugs and “neuro-enhancers” – dramatically improve focus and concentration. Is the future a “drugged workforce”?

Summary

- We have been misled by the simplicity of BBS when it comes to Psychology and Safety.
- An enormous amount of relevant research in many areas... and it's not compatible with behavioural psychology.
- We should open up to new insights from modern psychology.
- We have only just begun to see the implications of modern psychology for safety.

Dr. Peter Strahlendorf

IQSEM Ltd.

PO Box 565, Stn Q

Toronto, ON, M4T 2N4

416-955-9195

Fax 416-955-9895

Peter.strahlendorf@iqsem.ca

www.iqsem.ca