

# Assessment in Virtual Reality

How it works, how to use it - a guide to best practice





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# Foreword

## **Virtual Reality is now real.**

You may have heard of it before, perhaps from it's nausea-inducing first appearance in the early nineties. Maybe you're familiar with it because of more recent seated or mobile-phone based Virtual Reality (VR) devices.

The good news is that you can forget all of that.

The technology has now finally, truly come of age. Full VR, if delivered in the right way, is convincing enough for your brain to truly believe you are there. It doesn't matter if you consciously know you're in a virtual world - if your subconscious accepts your fake reality, then sooner or later, it will take control.

## **In a global first, we at Capp have invested in research and a VR assessment platform which demonstrates the power of virtual reality for assessment.**

I'm excited to share our research findings in this white paper, and reveal the world's first true VR assessment platform – the Capp VR Assessment Lab.

You've probably already heard that VR will change the world. That isn't hyperbole. And if you don't believe it, or you think it's a gimmick, that's understandable – but you're wrong.

VR is going to change the world. And it's going to change the way we can assess people.

## **Welcome to a new assessment reality.**

### **Jamie Betts**

Head of Recruitment Solutions and VR Lead

**Capp**



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# DEFINING ‘VIRTUAL REALITY’

## What do we mean by ‘Virtual Reality’?

Imagine a virtual world so convincing, that your subconscious truly believes it is there. You can move around freely and naturally, reach out and use your hands, and are totally immersed in your surroundings. This is the reality of leading-edge VR, and what we refer to in this document as ‘full VR’.

## However, this isn’t the VR most people know.

Many people are familiar with basic or mobile VR devices which offer a seated experience. These devices only know which direction you’re looking.

What they don’t know, is where you are positioned in a 3D space. So if you get up, or walk around, your view in the virtual world won’t change (and, if you don’t stop moving, you’ll likely get motion sickness).

**In other words, you cannot explore the virtual world as you would in real life.**



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## DEFINING 'VIRTUAL REALITY'

**There's something else often missing too. Something really important - the ability to interact with the virtual world directly with your hands, as you would in real life.**

Many VR devices do not offer any way to track hand movements, although this is starting to change.

In our view, the minimum the VR hardware must do to deliver a truly immersive experience, is provide freedom of movement and some form of hand tracking.

Anything less isn't 'virtual reality' for most people, since walking around and using our hands is our primary mode of interacting with our reality.

In developing our own VR assessment platform, we ensured the VR hardware we selected delivered rotational head tracking, 360 degree room-scale positional tracking, and some form of accurate hand tracking.

This gives us a minimum baseline on which we can develop immersive VR experiences.

The bottom of the page features a decorative graphic consisting of several overlapping hexagons in various shades of blue and teal. Some hexagons are solid, while others are outlined. The overall aesthetic is modern and tech-oriented.

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# VISUAL FIDELITY AND OPTICS

**Like a high-end camera lens, the human eye is capable of remarkable things.**

It is not easily fooled into thinking it is actually somewhere else, such as the top of a virtual mountain, but a good VR experience can offer compelling visual deception.

Not only that - if it's good enough, your subconscious will accept the reality it sees, compelling you to respond in the virtual world as you would in real life.

**The visual fidelity of the VR experience is influenced by a combination of hardware and software.**

In terms of the hardware - high resolution and pixel density, wide field-of-view, and high quality optics are some of the key required features. The optics must also be calibrated for the inter-pupillary distance of the participant, or severe discomfort can occur.

But this is only one side of the visual fidelity coin. The other is software, which needs to be carefully developed specifically for VR, to ensure a comfortable and convincing experience, free from distracting visual aberrations.

**In developing our VR assessment platform, we paid close attention to all of these factors, to ensure an experience which is both comfortable and fully immersive.**



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# THE MAGIC OF 'PRESENCE'

## The 'Holy Grail' of VR is sustained presence.

That means creating a VR experience so compelling and believable, that your brain utterly believes it is 'there'.

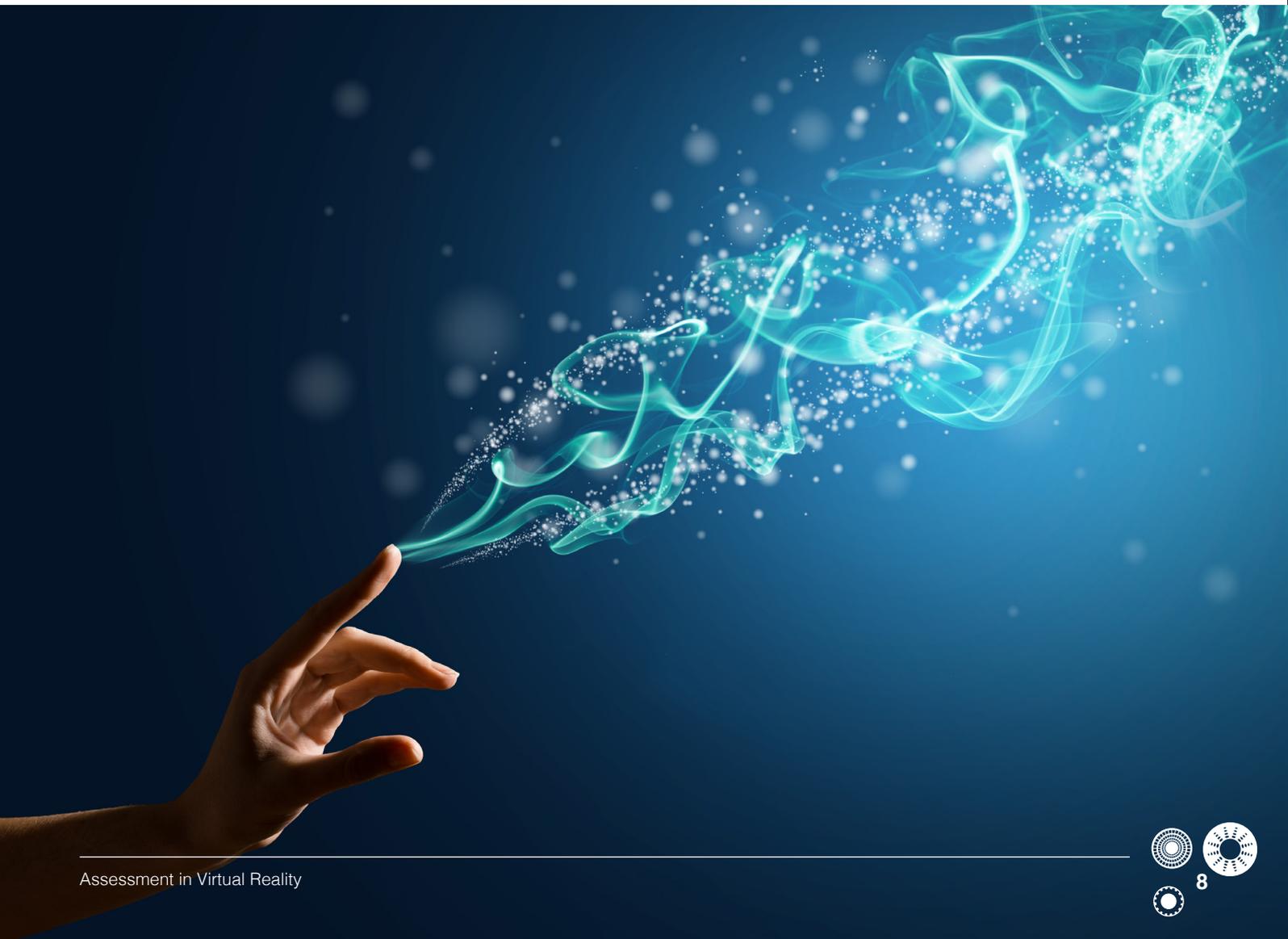
Presence is truly remarkable, both conceptually and as a hands-on experience, and it is powerful.

Take the Holy Grail to the right. If someone picked that up and swung it towards your head in real life, you'd flinch or duck on instinct, and perhaps raise your hands to protect your head.

## During moments of presence in VR, you'd do exactly the same thing, without even thinking about it.

Well crafted VR experiences deliver sustained presence, and the implications for assessment are huge. If people behave in VR as they would in real life, that means we can assess people in a virtual environment and draw accurate conclusions regarding their likely real-life responses.

**In our own VR assessment platform, we've ensured presence can be created and sustained, to deliver a consistently immersive experience.**



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# MAXIMISING IMMERSION

**Delivering sustained immersion and presence is an optional extra - if you're thinking about using VR for educational or entertainment purposes.**

However, if VR is used as a tool to assess people, particularly from a behavioural perspective, then presence and immersion are not helpful optional extras – they are absolutely essential. People don't respond to virtual worlds in a life-like manner unless their subconscious brain believes they are there.

The largest presence multipliers that we have identified are as follows:

- Six degrees of freedom of movement with 360 degree large room-scale tracking
- Hand tracking (direct or through tracked motion controls)
- 100% natural locomotion
- No 'immersion breakers' such as loading screens during the experience
- Relatable environments, such as those the participant is familiar with 3D positional audio

Paying attention to the small details which can break immersion is critical. Although VR hardware is technically impressive, in and of itself it can do nothing – it is the software which delivers sustained immersion and maximises the chances of attaining presence.



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# OVERCOMING KEY CHALLENGES

## Let's deal with VR motion sickness.

It's very much real. Or at least, it can be, if VR is not carefully designed and executed. It is caused by the disconnect between what you see, and what you feel, when moving.

A bad VR experience which induces serious motion sickness can be a pretty horrible thing. You may take the best part of a day to fully recover. It's enough to put off some people from ever trying VR again, and understandably so.

Motion sickness caused by VR entertainment is highly undesirable, but motion sickness caused by VR used for assessment is entirely unacceptable.

## Making people ill as you assess them is simply not an option.

Fortunately, we now have a good understanding of what is likely to cause VR motion sickness. This means that virtual reality software designers are able to effectively eliminate motion sickness, albeit with some considerable compromises to certain types of movement.

**For the purposes of developing assessment tools in VR, we take a zero tolerance view of any locomotion mechanic which may cause motion sickness. For our own VR Assessment platform, we have eliminated motion sickness entirely.**

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# MAXIMISING COMFORT

**There's more to attaining a comfortable VR experience than the elimination of motion sickness.**

For our own VR assessment platform, we see administration of a comfortable experience as critically important.

For example, everyone has a certain inter-pupillary distance, or IPD – that is, the distance between the centre of your pupils. It averages out at around 65mm for men and 62mm for women, but can vary considerably.

**Get the IPD wrong, and the result can be a severe headache. We therefore always accurately measure IPD and adjust the distance precisely prior to any VR experience.**

Attention should also be paid to the weight distribution of the VR headset. Correctly adjusting the headset is essential to ensure a comfortable experience which is not overly front-heavy. There is a 'goldilocks zone' of the headset being neither too loose, nor too tight, and everyone has a slightly different head shape which requires accommodating.

**This is important not just for reasons of comfort – it also allows people to relax into the VR experience without being distracted by physical discomfort. This helps ensure that participants have the best chance of being fully immersed in their experience and attaining sustained presence.**

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## OUR RESEARCH

### **We start with a simple question - does VR have the potential to assess behavioural preferences or cognitive ability?**

Cognitive ability assessment is pretty straightforward and, dare we say it, uninteresting from a VR perspective. You can assess cognitive ability (such as verbal or numerical reasoning) in VR, by conducting a test in a virtual environment, but VR adds little or nothing considering the increased cost of administration. The exception to this would be assessments of spatial reasoning.

Where things get a lot more interesting is behavioural assessment.

To understand if VR has potential in behavioural assessment, we need to know one thing – do people respond in VR as they would in the real world? If people do act in VR as they would in real-life, this means we can make accurate predictions based on VR assessments.

To answer this question, we took a group of 40 volunteers through a series of structured VR experiences and assessed their reactions and responses.

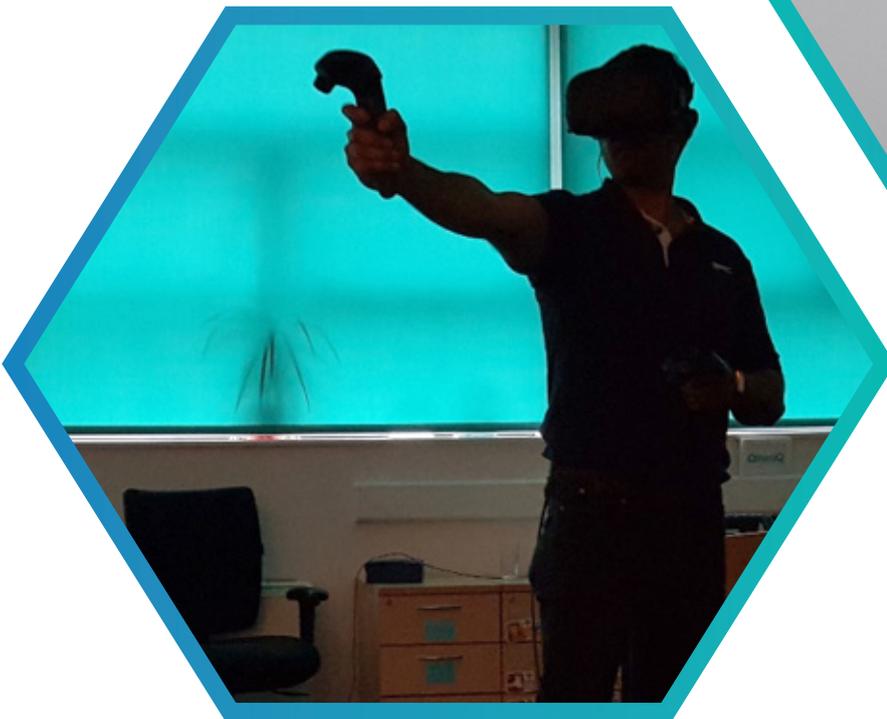
Our volunteers consisted of 20 men and 20 women, aged from 18 to 65. As a control measure, we included a number of individuals with previous VR experience and also accounted for such factors as self-reported interest in video games, levels of courage, and phobias.

The results, revealed on the following pages, are fascinating.



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# OUR RESEARCH



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# RESULTS: FIRST IMPRESSIONS

**Experiencing full VR for the first time - that is, freedom of movement, hand tracking, and fully immersive visuals, is quite the experience.**

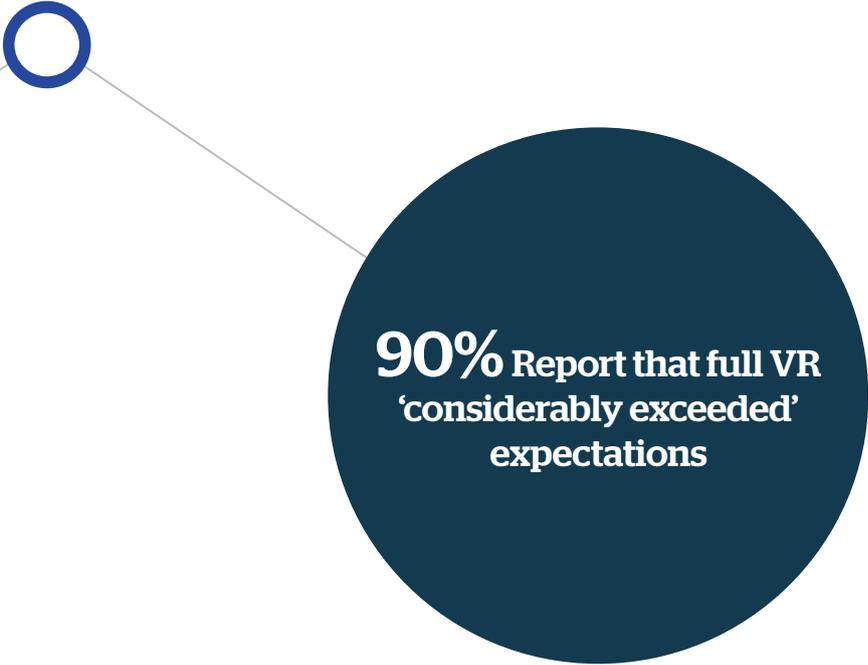
To accustom the participants to VR, in their first experience they encountered a life-sized blue whale while underwater. All of our participants were immediately impressed – including those who had experienced seated or basic VR beforehand. Reactions ranged from a simple ‘wow’ or nervous laughter, to euphoria and disbelief.

Because the interaction with the virtual world is instinctive (if you want to pick something up from the floor, bend down and pick it up), little guidance was necessary beyond an initial introduction.

**Some highlights from these first impressions include:**

- **97.5%** of participants ranked the experience as comfortable
- **100%** were impressed, with 90% being ‘very impressed’
- **90%** found their expectations of VR were ‘considerably exceeded’
- **95%** found size and distance as easy to judge as real life
- **85%** of participants reported feeling intimidated by the size of the whale

The message from these first impressions is loud and clear – when done right, full VR is deeply impressive. Of course, you can only have a ‘first experience’ once, but even those with prior VR experience were left universally enthused.



**90%** Report that full VR  
‘considerably exceeded’  
expectations

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# RESULTS: PSYCHOLOGICAL IMPACT

## Where better to start understanding if people respond in VR as they would in real life, than by asking people to walk off a cliff?

It's something none of us would entertain, and indeed, in real life many of us couldn't even get close to the edge due to fear of heights and the resulting vertigo.

And so it proved in full VR.

Participants had three opportunities to walk off the cliff edge. First, without prompting and of their own free will. Not a single person did this. Participants were then invited to walk slowly toward the edge. However, some refused to even approach it.

Finally, participants were asked to continue walking forward.

- **60%** completely refused to walk off the edge
- **40%** agreed to try, and all displayed signs of hesitation and/or discomfort

There was also a range of physiological side effects in evidence including sweating palms, dry mouth, elevated heart rate and blood pressure, and shaking hands.

Participants knew full well that the cliff was not real. They knew they were in a safe environment, on a carpeted, level floor. It didn't matter. Presence had been attained, and their brain was not prepared to give their conscious, rational thought the benefit of the doubt.



**0%** Walked off  
the edge purely of their  
own free will

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# PSYCHOLOGICAL IMPACT: INSTINCT

## Walking off cliffs is all very well. But how about something a little more mundane?

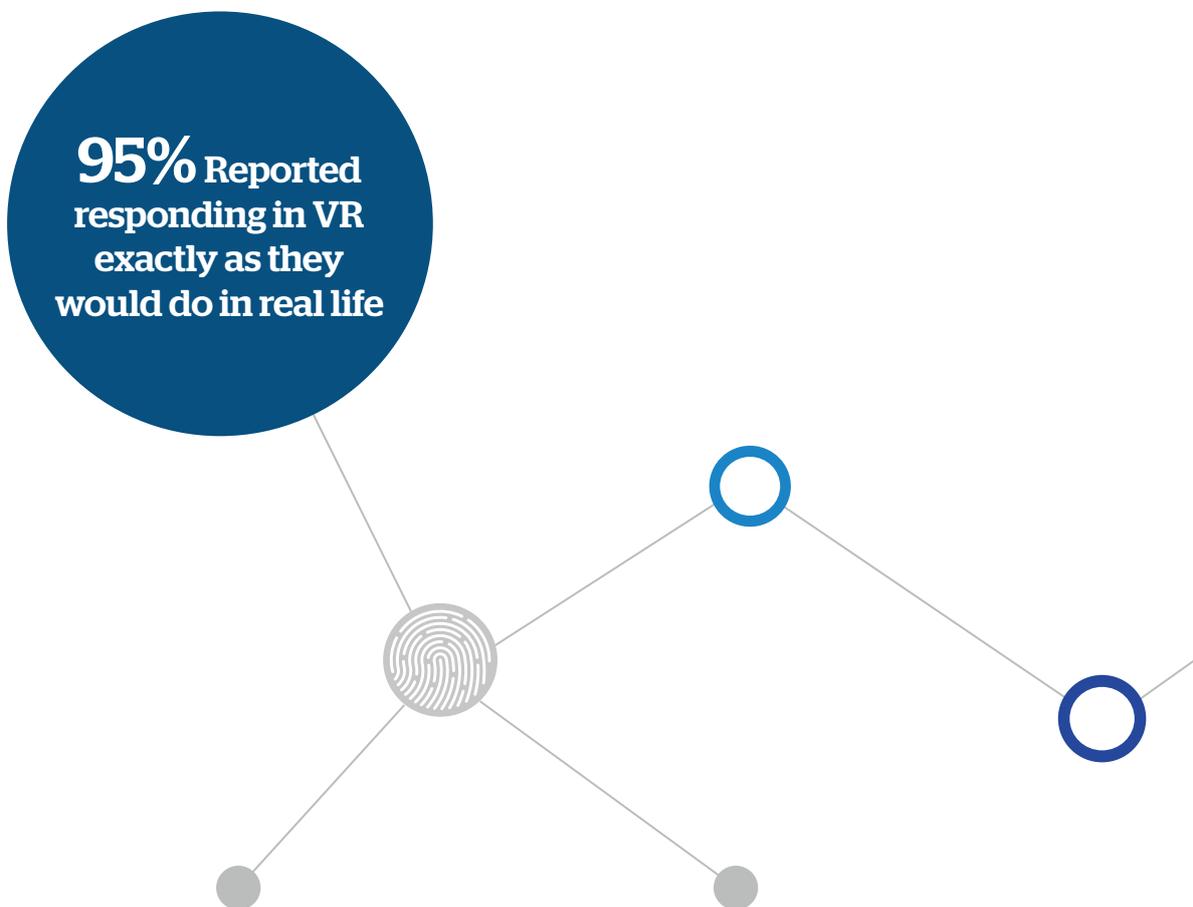
If we were standing in front of a doorway, many of us would give way to someone walking through the door. And, if they're walking fast, we'd probably do so quickly on instinct, to avoid a collision.

But what happens in VR, when in fact, there would be no collision and there is no rational reason to inconvenience yourself and move out of the way?

**We instructed participants to stand directly in the middle of a doorway as it opened, and someone entered the room. The vast majority, despite being instructed to do otherwise, moved out of the way.**

- **92.5%** moved out of the way despite being instructed to stand in the middle of the doorway
- **90%** reported a strong desire to move out of the way, and of feeling that they were 'there'
- **95%** reported that they responded exactly as they would have done in real life, despite knowing it was not real

The results are clear – once presence is attained, instinct takes over. People respond in the virtual world as they would in real life, even for the less dramatic and everyday experiences such as opening a door.



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# PSYCHOLOGICAL IMPACT: STRESS AND FEAR

**It wasn't all fun and games for our research participants. We also wanted to understand the impact a stressful, life threatening virtual situation would have on them.**

Of course, at no point were they genuinely under threat or in any real danger, and they were able to end the experience at any time.

The temptation however with VR, is that you can place participants in experiences you would never ethically replicate in real life, but which may be helpful in measuring certain responses and behaviours, such as courage or resilience.

## **But how far should you take that?**

Not too far, is the clear message from our research. The impact of stressful, threatening situations on our participants was very much real.

- **95%** reported feeling unnerved by their experience
- **90%** reported feeling some level of genuine fear
- **92.5%** experienced elevated blood pressure
- **85%** believe it is possible to cause psychological harm through an intense VR experience

The last point should be read twice. Let it sink in. After experiencing it first hand, the vast majority of participants believe it is possible to cause psychological harm through VR.

**This gives us a clear message to use VR in assessment ethically and responsibly.**



**90% Reported feeling genuine fear and elevated stress levels**

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## RESULTS: PHYSIOLOGICAL IMPACT

**The psychological impact of immersive, full VR is clear. To complete the picture, we also wanted to understand the effect on physiological markers such as blood pressure and pulse rate.**

At the start of each research session, we took the participants blood pressure and pulse as a baseline.

This provided a reference point on which we could measure the impact of a VR experience. We expected blood pressure and pulse to be slightly elevated at the start, due to being in an unfamiliar environment and potentially being excited or nervous about their participation.

Nonetheless, we were looking for the changes in blood pressure and pulse rate from that baseline. Our thinking in advance was that if it was already slightly elevated, the impact may be subdued.

**To our surprise, the impact we found was anything but subdued, indeed it was stronger than we anticipated.**

Participants who began with normal, healthy, or even low blood pressure would complete a stressful VR experience with considerably elevated blood pressure.

This feeds into the narrative of reported stress and fear levels explored on the previous page. VR is not a toy and it should be used responsibly, particularly in an assessment context. However, properly managed, this is not a cause for concern, provided VR assessment experiences are thoughtfully and ethically designed.

The bottom of the page features several overlapping geometric shapes, primarily hexagons and pentagons, in various shades of blue and teal. These shapes are arranged in a cluster, with some being solid and others being hollow outlines, creating a modern, abstract design.

# PHYSIOLOGICAL IMPACT: BLOOD PRESSURE

All participants had blood pressure measured before and after a stressful, intense VR experience.

The impact of that experience on participant blood pressure is detailed in the tables below, where you can observe that 36 out of 40 participants experienced significant increases in systolic blood pressure.

## Systolic Blood Pressure

90-120	Normal
121-139	Pre-hypertension
140-159	High (stage 1)
160+	High (stage 2)

### Before

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24
25	26	27	28
29	30	31	32
33	34	35	36
37	38	39	40

### After

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24
25	26	27	28
29	30	31	32
33	34	35	36
37	38	39	40

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## RESULTS: KEY FINDINGS

**Not only is Virtual Reality now real, it has reached a tipping point where, if done right, our brain accepts the virtual environment as readily as it does the real world.**

This means that VR has the power to help us to make predictions about likely real-life behaviour:

- The vast majority respond to situations in full VR as they would in real life, giving it tremendous power as a form of assessment
- Once people have experienced full VR, 95% state they would view an assessment process which included VR in a positive light
- 90% would have a more favourable view of an organisation which used full VR as part of a selection or development process
- Full VR can produce strong yet predictable physiological reactions – stressful and intense virtual situations will elevate blood pressure, and should be managed with care

**Overall, VR brings with it many opportunities for forms of assessment which, until this point, were impossible or extremely expensive to replicate in reality.**

The new world of opportunity to create assessment experiences in a virtual world is vast, and limited only by our imagination. Managed professionally and in alignment with best practice, VR experiences can be both comfortable and hugely impressive.

**A new dawn of virtual reality assessment has arrived.**

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# IMAGINE THE POSSIBILITIES

**Very rarely does an entirely new platform arrive, on which we can build assessment tools.**

Capp is in at the start – and you can be, too. We have a once-in-a-lifetime opportunity to be innovators – discovering what works, setting the standards, and expanding new horizons.

**We see two areas of demand for VR assessment:**

- Only in VR: It is possible to build experiences in VR that are simply impossible to replicate in reality
- Enhanced in VR: Assessment activities which are made better through the consistency and immersion possible within VR software

As an example, dealing with a crisis in the control room of a nuclear power station is relatively simple to execute in VR, compared to the challenges of replicating in a realistic and consistent fashion in the real world.

More broadly speaking, a whole host of behaviours and attributes are better assessed in a controlled, consistent virtual world, which can be readily administered as part of an assessment process.

**The possibilities are almost without limit.**

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# THE CAPP VR ASSESSMENT LAB

**In a global first, Capp are proud to announce the VR Assessment Lab.**

Built as a demonstration of the power of VR for assessment, the VR Assessment Lab is a fully modular series of virtual reality assessment experiences, designed to tap specifically into key behavioural strengths.

Making full use of leading edge technology such as room-scale tracking and hand motion controls, the VR Assessment Lab is designed for sustained presence, and can also be fully client branded for added impact.

Not only that, but through design we've eliminated VR motion sickness entirely, meaning a perfectly comfortable experience for all participants.

For more information or to organise a demonstration session, contact us [capp@capp.co](mailto:capp@capp.co) – or call us on +44 (0)2476 323 363

## A note on Augmented Reality

*Augmented Reality, such as that offered by Microsoft HoloLens, mixes the reality you see with overlaid projections of additional virtual objects. It uses the geometry of the real world as it's baseline.*

*AR is impressive and has a tremendous future ahead of it, and is likely to be more commonly used in business environments than full VR. But, it is vastly less immersive than full VR, and while it will have some uses in assessment, due to the lack of presence those uses will be more limited. For this reason, we have focused on VR as an assessment platform with unique potential.*

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# THE CAPP VR ASSESSMENT LAB

**Our research convinced us of the power of VR as an assessment platform.**

So, in a global first, we have invested in the creation of the Capp VR Assessment Lab.

Utilising the latest in VR technology, and incorporating a highly innovative modular design, the Capp VR Assessment Lab is built for behavioural assessment from the ground up.

**This goes well beyond any gamification or 'immersive' assessment you may have seen before.**

Participants start in a simple reception room, and from there, the flexible and modular nature of the Capp VR Assessment Lab kicks in – and they can be directed to wherever you wish to take them, to assess the behaviour you are seeking to measure. Our research has proven beyond doubt that, when VR is done right, people respond just as they would in real life.

**This gives the Capp VR Assessment Lab tremendous power as an assessment tool which is fair, consistent, and predictive.**

And if you really want to impress participants, we can brand the Capp VR Assessment Lab fully with your company logo.

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# SET-UP, LICENSING, AND BRANDING

## We've made it easy to take advantage of the Capp VR Assessment Lab

### Provision of hardware

Most organisations don't yet have their own dedicated VR rooms. No problem - we can set up a temporary one for you. We just need a 4x5metre space and a power socket – we'll do the rest.

We will set it all up, tidy up at the end of the day (or week, or month, as required), and supply a technician to administer it for you. You can simply relax and assess.

### VR Assessment Lab software licensing

Use of the Capp VR Assessment lab is offered on a licensed basis, with each license valid for 12 months.

The investment required depends on your volumes. We offer a discount for larger volumes, and have annual licensing packages available, ranging from 10 to 1000 uses.

### Branding options

The full VR Assessment Lab experience can be branded throughout, with the additions of high quality 3D models of your company logo. There is an additional charge for this enhancement.

### Bespoke VR Assessment software builds

We can develop 100% bespoke VR assessment experiences, for your exclusive use. These are priced according to complexity and development time. We'd be pleased to discuss your requirements and provide a quotation on request.

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# GET IN TOUCH

## Keen to hear more? We'd love to talk.

The research findings shared in this white paper are the tip of the iceberg. We have access to a broader range of data and we have developed the world's first VR assessment platform.

If you'd like to find out more about the potential of assessment in virtual reality, or arrange a demonstration so you can experience it for yourself, get in touch.

[www.capp.co/virtualreality](http://www.capp.co/virtualreality)

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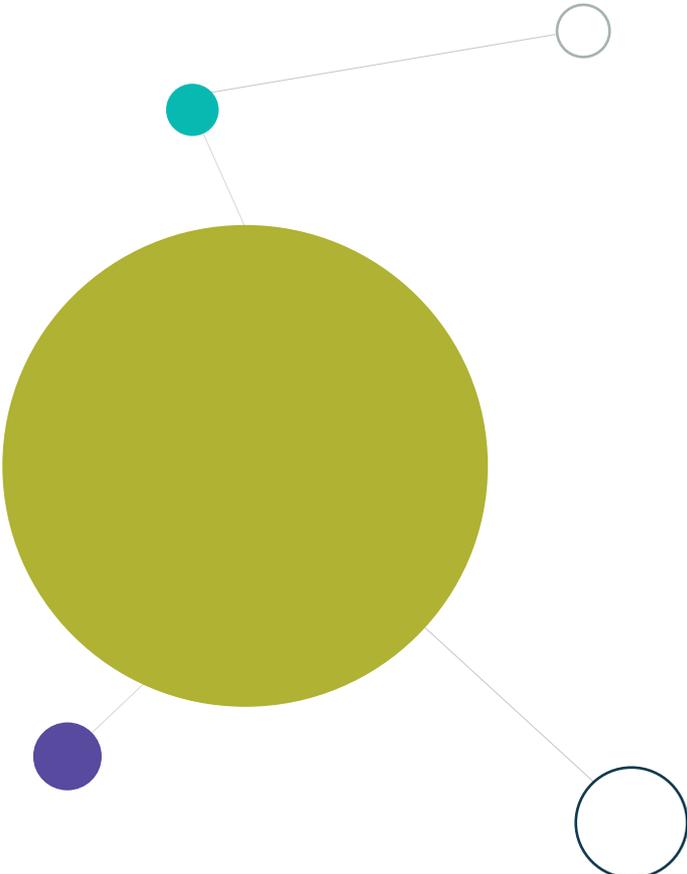
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