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Reversal Theory: Designing for Motivational States

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The built environment can play a significant role in one's emotional and psychological state. Reversal theory, developed by Michael Apter in the late 1970s, aims to explain how and why the built environment aids specific motivational and functional states of mind. In addition, it provides a description of how specific spaces may be lacking in response to motivational objectives. It also can be used to set up a framework for physical attributes of a space that can be used to create curated environments that enhance motivational states, mental health, and wellbeing.

Practitioners have generated a substantial body of research based on the overall concepts of work modalities and the mental states required for different work tasks. The matrix identifies seven categories based on performance tasks and spatial needs. Within this study, reversal theory and workplace modalities function concurrently in order to create multi-dimensional environments for productive thought.

Within this theory, things are not only objects and rooms. They are everything around us because anything that generates a powerful reaction within our memory can induce a mental state, that is why some researchers relate reversal theory so close to culture. Therefore, tests, such as the "8 rooms technique" help identify elements that induce each mental state.

This paper will document the process of designing a training to teach designers how to implement Reversal Theory. Research gathered was in direct relationship to DLR Group and its R+D studio and the application of findings, in addition to the 8-rooms survey. Findings will provide needed insight on how the design process can incorporate Reversal Theory and how to implement it. This will provide architects with additional skills to tackle problems related to motivational states and elevate the human experience through design.

Keywords: Reversal Theory, Workplace, Work Modalities

Introduction

As the world expands and the need for products and innovation continues to grow, building owners and designers are racing to configure workspaces that foster an adaptive work environment that fosters every employee's overall well-being. (Sauin & Ratcliffe, 2011; Alaithan, 2019; Grant et al., 2019) Design communities are currently

trying to tackle problems within the workplace by employing strategies that are associated with an increase in efficiency, productivity, indoor environmental quality (IEQ) ratings, and avoiding conditions that cause employees to feel demotivated or stressed because goals for production may seem unachievable. One method designers and researchers are using to combat these productivity challenges by using Reversal Theory, and the motivational states it outlines, through the lens of evidence-based design and research informed design within the workplace.

Reversal Theory initially appeared in publications of the psychology community [SB7] in the mid-1970s in Britain by Smith and Apter (Apter & Smith, 1975), but it did not become a complete system until the 1980s. Michael J. Apter coined Reversal Theory in his first publication on the topic titled *Reversal Theory: The Dynamics of Motivation, Emotion, and Personality,* completing the overall system of the concept. (Apter, 2007) Its intent is to integrate data from multiple different ideologies within the umbrella of psychology into one unified theory, hence why it was once called "grand theory" or the "Theory of Things." This system challenges the assumption of homeostasis (Cannon, 1932) which refers to a tendency to maintain a balanced or constant internal state of mind and find equilibrium, but in contrast, Apter argued that there are two alternative systems, and each has its own optimal point at opposite ends. (Apter 2007) This starts to introduce a second argument which is the concept of bistability, a phenomenon of spontaneously switching between two or more interpretations of an object or thing under continuous interaction. (Apter 2007) Since then the theory has been applied to multiple fields including psychology (Svebak & Apter, 1997), education (Lewinski, 2015), sports (Hudson, Males, Ker, 2016), the built environment (Augustin & Apter, 2016) and others.

Background

Reversal Theory is[SB10] [H11] [H12] a phenomenological approach used to design spaces [SB13] for people to have their own desired experiences. (Apter, 2007) The theory suggests that we, as individuals, shift between different motivations for our actions over the course of a single day. This means that, effectively , each of us is a different person at different moments, and over time we display diverse personalities (Apter, 2007). It is perceived by us and others that we may be, or may seem like due to the contradictory actions/personalities of a different person at different moments throughout time.

The first pair of states that Apter proposes are the telic and paratelic. When an individual is in the telic state while conducting a task, they gain satisfaction from

moving towards the completion of a task. A person within the telic states main goal is to achieve the task that they were given. When an individual is experiencing the paratelic state, they gain satisfaction from the process of completing a task, not the actual completion of a task. The main objective of a person in the paratelic state is to foster a creative process rather than to have a quick solution. In short, the telic state is often associated with a “serious” mentality and the paratelic “playful”(Apter, 1989; Apter, 2007).

The second pair of opposites Apter’s framework suggests are autic and alloic states (Apter,1989, 2007). An individual may display self-serving actions while in the autic state. While individuals in the alloic state may display actions that are more concerned with others rather than themselves. In the autic state, success brings a sense of pride, and being humiliated is considered a loss. An individual in the autic state’s main goal is to advance towards their own achievements than help others. In the alloic state success at the cost of others causes feelings of shame. In the alloic state and individuals’ main goal is to help others progress toward their own achievements.

The third pair of states Apter’s framework includes is the mastery and sympathy states (Apter,1989, 2007). When in the mastery state one feels powerful and in control; this does not mean that an individual is powerful, but it is a feeling a person may desire in that particular moment. In the sympathy state, one is closely intertwined with their emotional relationships. It does not mean that an individual is sympathetic towards others but also that the person is seeking sympathy. The goal in the mastery state is to feel powerful (competitive), while the goal in the sympathy state is to have transactional feelings of fondness between the individual and the rest of the group (Apter 2007, Augustine & Apter, 2016).

The last pairing Apter’s framework suggests are the conforming and negativistic states (Apter,1989, 2007). An individual in the conforming state wants to be a part of a collective and often chooses to conform to societal norms, while an individual in the negativistic state wants to push against societal norms. People within the conforming state are usually more orderly, while people in the negativistic state act in a way often considered more creative or rule breaking. The goal of a person within the conforming state is to fit in while the goal of a person within the negativistic state is to stand out.

At any given point, a person is in one experience and one state, forming eight combinations. Each state can be induced, meaning an object or experience causes it to rise up and the center of attention within an individual's current state of mind. Therefore, when a state is induced it has the most influence over a person’s actions. [SB26] For example, think about each pair of motivational states as an on/off switch, when a state is induced it can easily turn on and or be suppressed and turned off

just as quickly. Though motivational states hold influence within the moment, a person may switch between different states as the moment develops. Each pair is the on/off directions and they can easily be flipped due to different moods/interpretations and the “flips" can happen frequently.

Motivational states are based on different behavioral settings [SB29] [H30] and can fluidly move between each other as the setting changes being location, activity, objects or the surrounding built environment. Reversal theory has begun to gain traction with articles from Micheal Apter & Sally Augustin [SB31] (Augustin & Apter, 2016; 2014) that mention how it can be used within the built environment. This has generated interest within the design community to start exploring ways in which motivational states can influence the built environment and you can see it in design firms, and in architectural web platforms like Archdaily. (Souza, 2020; Cold, 2001; Ottoni et al, 2016; hadavi, 2017)

Methods

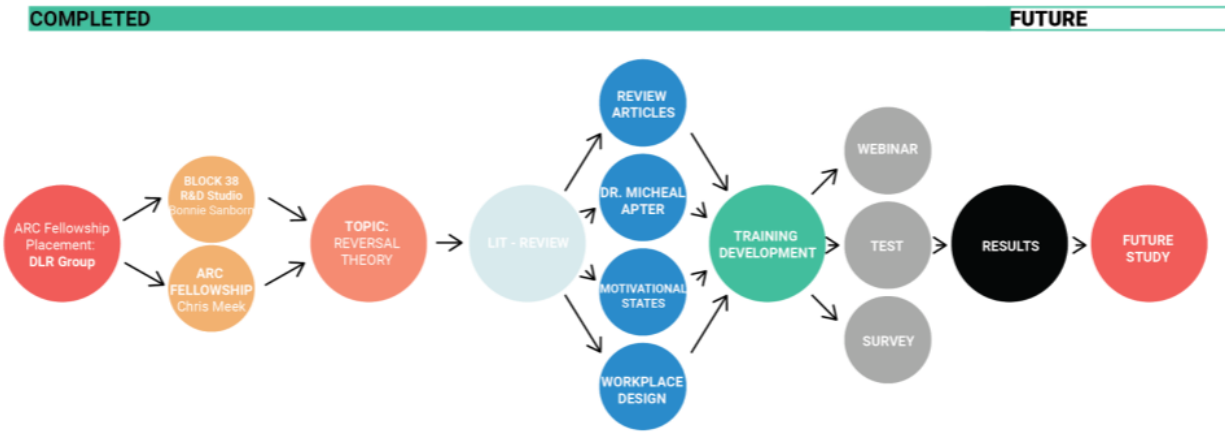

Figure 1: Research timeline for the study.

To better understand the application of Reversal Theory in the delivery of building design, members of a design team were recruited to participate in a training, evaluation, and on-line survey seeking to understand opportunities for implementation of the theory within their work. This was completed as part of a four-part process including: (1) the development of training materials, (2) the delivery of a webinar-based education and training program, (3) an web-based test to assess learning uptake, and, (4) a survey to understand participants' role, interest, and ability to implement Reversal Theory within their work.

1. Training Development

The training was developed to be relevant to design professionals and to communicate researchers' attitudes towards the built environment in reference to reversal theory and how it influences people's behaviors such as personality, motivation, emotion and their perceived experience in an environment. It draws from other psychological theories that validate the "grand-theory" of reversals. Specifically the literature focuses on Reversal Theory and to provide a narrative of positive experiences in environments caused by objects and things.

The training was developed to share evidence of the positive impacts Reversal Theory has on one's motivational state as well as possible implications or lack of research within the design profession and possible next steps to deepen our knowledge. It provided an introduction to topics related to reversal theory, design, architecture, cognitive function, motivational states, and place making which all are involved in creating environments that promote optimal motivational states that boosts productivity within the workplace.

Originally the training portion was planned as a one-on-one training but due to the COVID-19 pandemic the format was changed to an online format. Since the survey switched to online the marketing strategy switched from an in-office sourcing of participants to firm wide sourcing. The online format provided the opportunity to reach a larger pool of participants firm wide. The training was marketed via Square1 and word of mouth to allow everyone who is interested to access the training within the firm. The training material covered a brief history of Reversal Theory and how it was developed by Dr. Apter in the 1980s, more specifically the training covered his concept of bistability and how the brain can switch from one mental state to the other, and this leads to his theory of 4 experiences with two sides, similar to a light switch that people switch between depending on their environment. Within each of the eight states the training covered key concepts, design elements to use to induce the state and images showing elements within a physical space. After all of the elements were explained, there was a brief introduction of the web-based test and survey. Once participants were fully informed the learning assessment and survey was administered.

Training Webinar

The webinar section of the training was a 45 minute presentation that included various visual aids to assist different learning styles for participants. At the beginning of the webinar participants were given a brief introduction and why Reversal Theory can become an important component of the design process. Participants then were given a brief introduction to Reversal theory and the eight motivational states within it. Once participants were introduced into the key concepts of Reversal Theory, the

webinar covered each state. During the webinar the administrator paused after each section for questions for additional questions before the test and survey was administered. The webinar was conducted to educate participants on each of the eight motivational states within Reversal Theory and how to induce them within the built environment. For each state the webinar had 3 slides, one included key indicators to identify the state, the next slide contained a quick study notecard (figure 2) , lastly a slide showing two examples of office spaces that could represent the state. The first slide includes a brief overview that explains what a person's goals may be within the state or perceive their environment. The notecard graphic has a definition of the state, and a list of colors, symbolic characteristics, and built characteristics associated with the state. The last slide displays those characteristics within some office spaces. Two office spaces were shown to convey multiple client types, both traditional clients like an accounting office and contemporary clients such as young start ups.

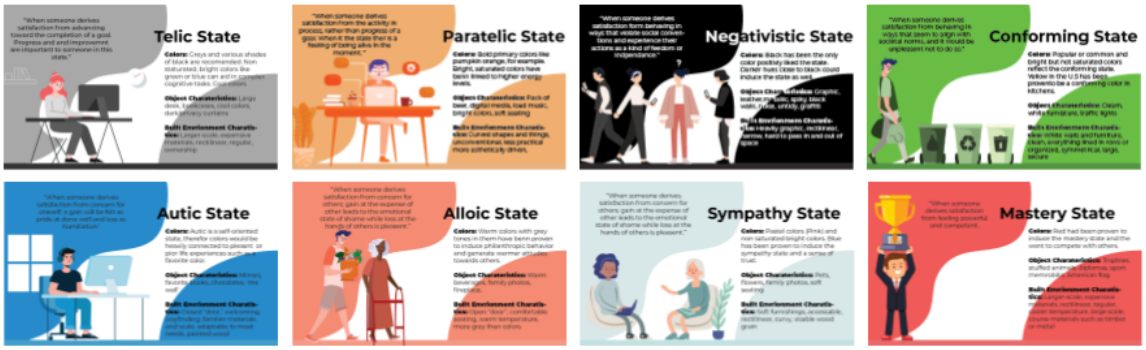

Figure 2: Notecards used in the webinar.

2. Learning Assessment

The goal of the learning assessment was to gauge how well participants were able to retain the information they learned and display the knowledge in a test format. Once the tools given in the webinar were successfully demonstrated in the test, the research could then be taken into a real world design implementation. The intention of this study is to build a foundation for participants to use the research-informed tools learned in everyday practice.

The learning assessment consisted of two sections: a test and a drag-and-drop graphical exercise. The test was developed to evaluate participants' knowledge on each of the eight states and the following section to display their knowledge of each state within the built environment. For this pool of participants the test was

administered digitally due to the unforeseen circumstances during the period of this study. Qualtrics, a web-based survey tool, was the platform used to develop and administer the test and evaluation. Within the first section of the test there were 16 multiple choice questions to assess whether the participants could identify what state a person would be in given the prompt. Two types of prompts were given for each state, one would use an everyday work task and how someone would respond to the assignment given, the other was a design specific task. This was in order to ensure that participants could associate the state with people's behavior and to find ways in which to induce it through design to facilitate or discourage that behavior. The other type of question that was in the first section of the test were drag and drop questions. This exercise was to test if participants could identify which object best represented each state, further evaluating their understanding of the use of Reversal Theory in the design decision process.

The second section of the learning assessment consisted entirely of a drag-and-drop graphical exercise consisting of multiple choice questions containing a set of four images of work environments that could or could not represent a singular state. Participants were asked to choose the image that was best designed to promote each state with the answers given. Images used for this section were created to highlight the nuances within each state to better understand if participants were retaining all the information given in the webinar. Simple changes like color or the shape of a piece of future could cause the vignette of an answer to be false. Within this section values were given to the questions because similarities between images in each question so that participants who understood the core concepts of the state would get partial credit (1 point) and participants who understood the entirety of the state would get full credit (3 points) To prevent bias within the numerical order of all test questions, answers were randomized. In addition to this, prior to the administration of the learning assessment a “test-run” was administered to a small pool of participants to evaluate whether the questions asked were confusing or needed further clarification before the actual training and administration of the test to the larger pool of participants.

The training and learning assessment is intended to to gauge the amount of information each individual can retain and use within each stage of the training. This study is being conducted to set the foundation for future studies on Reversal theory within the physical built environment[SB38] . Tools generated for this study are designed to be administered to participants who are interested in learning more about Reversal Theory and its connection to the built environment – ideally designers in the fields of architecture, engineering, interior design, and other environmental design disciplines. The learning assessment was intended to measure how much an individual is able to retain and to self-assess their ability to implement Reversal Theory. Ultimately, using this information a future study can be proposed on implementing

Reversal Theory into the built environment physically and evaluating its effects on building occupants.

3. Evaluation

After participants completed the learning assessment they were asked to complete a survey. It was created to gauge participants' interest in Reversal Theory after the training and test. Six questions were asked of participants. The first one asked participants how useful Reversal Theory would be to them and their work. This was in order to gauge the relevance of Reversal Theory within the design profession and if it would indeed be useful for design professionals. The second question is how interested the participant is in learning more about Reversal Theory. While there is limited research on the theory in design it was important to to learn if there is an audience other researchers that would interested in getting to know and learn more. The third question directly asked participants if they would use this in their everyday design process. If there is an audience and they are willing to use the theory in the design process it could further validate our research and promote future research. The last three questions of the evaluation asked for the participants email to ask further questions, if they participated in the “dry-run”, and their job title. Job titles were gathered to see the disciplines of the participants within this integrated design firm and how they perceived their ability to include Reversal Theory into the design process. Participants ranged from traditional architects, to project managers and marketing teams.

Results

It is important to note that over 50% of participants found the information with the training to be useful within their work, are interested in learning more about Reversal Theory, and saw themselves using what they learned from the training in their work. This suggests that for the participants who responded to the survey, Reversal Theory was deemed relevant to their work and indicates that more development of the topic is worthwhile.

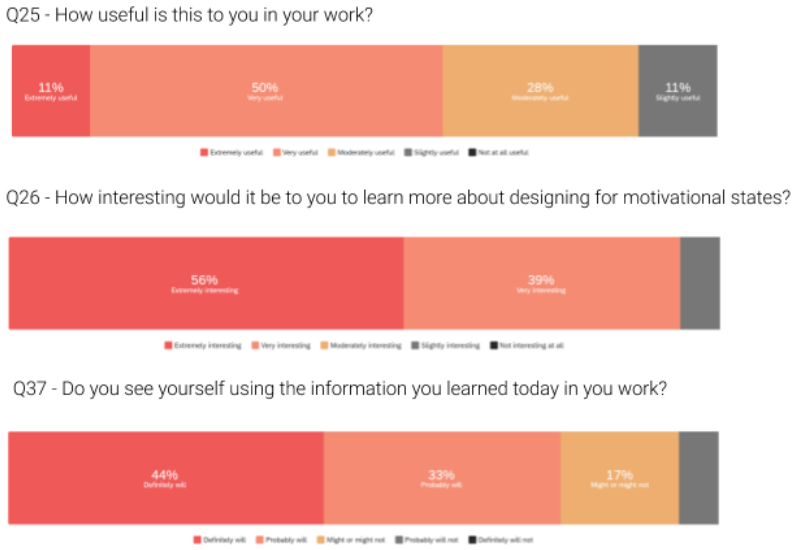

Figure 3: Survey Results from Participants.

Of the 1,200 participants invited to take the training, 59 registered for the webinar, 27 attended the webinar and 18 participants took the training, test, and survey. The pool of participants that participated in the entirety of the training came from varying backgrounds connected to the design practice. Overall participants were successful in demonstrating their understanding of Reversal Theory.

Some common errors within the first section of the test is the distinction between sympathy and alloic. For example, question 16 (figure 3) had over 30% (6/18) of participants choose the sympathy state instead of alloic. This could be because of various reasons, one being that the diction between sympathy or alloic was not properly made in the training or that people tend to associate sympathy with empathy. In the case of Reversal Theory empathy more associated with the alloic state while wanting to be liked by someone prompts the action of being kind towards an individual is closely linked to their sympathy state. Similar instances were found in questions 1,2,4,5,6,7,9,11,12,13,16,17,and 19. Sympathy was the common denominator in the decision making process and it seems that it is the state that caused the most confusion among participants.

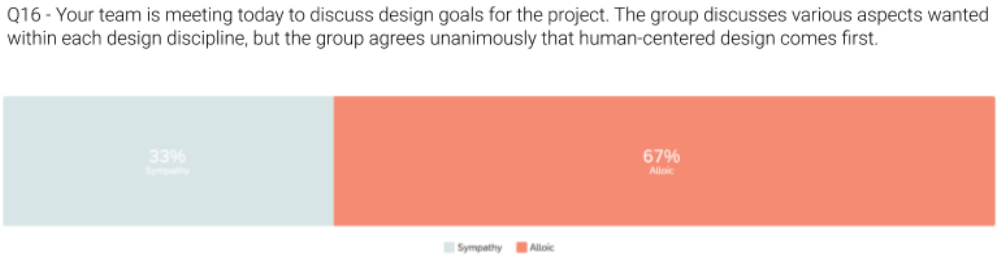

Figure 4: Example question from the learning assessment.

Similar instances were found in the drag-and-drop questions within the first section involving the sympathy, alloic and autic states. While the majority of the drag and drop questions involving two states were successfully answered, questions containing four states caused uncertainty among participants. See drag-and-drop Q31, Q20 , Q15, Q33 for these common errors. It is possible that these errors occurred because the images were not distinct enough for participants to identify the differences between each image. Another reason that participants would have experienced confusion is that they did not prepare or did not fully retain the content given in the webinar.

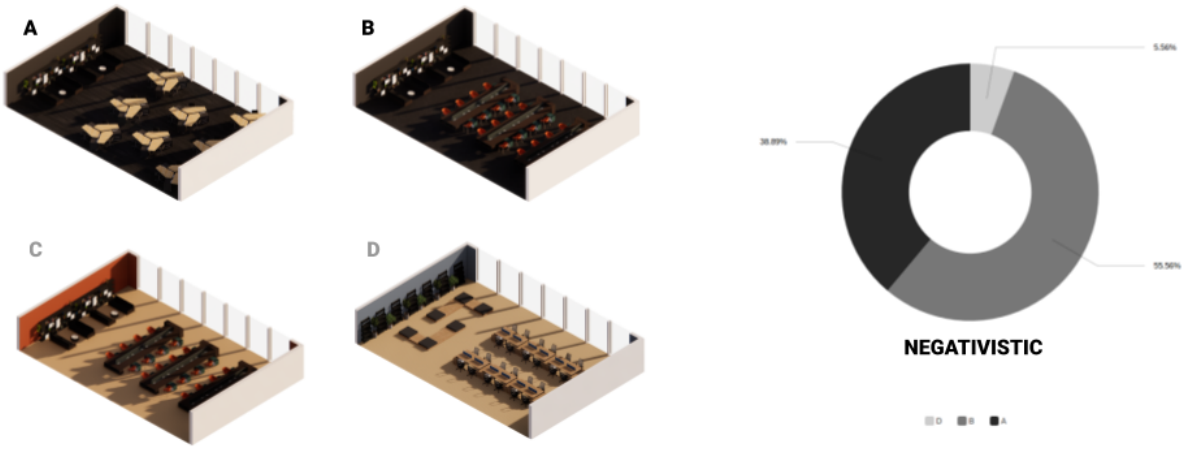

Figure 5: Example question for the design implementation section.

The second portion of the test is the design implementation section. Through these results participants were able to validate the connection between a color and a motivational state. Color seemed to be the main determining factor in participants' decision making process when selecting an office environment. Figure 5 & 6 shows common errors between the telic, negativistic, and the conforming state, where participants struggled to identify the correct office space for the state. Images within these questions contained office spaces with the same colors and textures but different furniture or organization. For example, the conforming state contained images with white furniture in all images, which is a key indicator of the conforming state but the floor texture and wall colors in all answers were different. That is why the results split around 30% each for answers B, D, and D. It would be important for the webinar section within this training to highlight both the large and small differences between each of the states to prevent confusion.

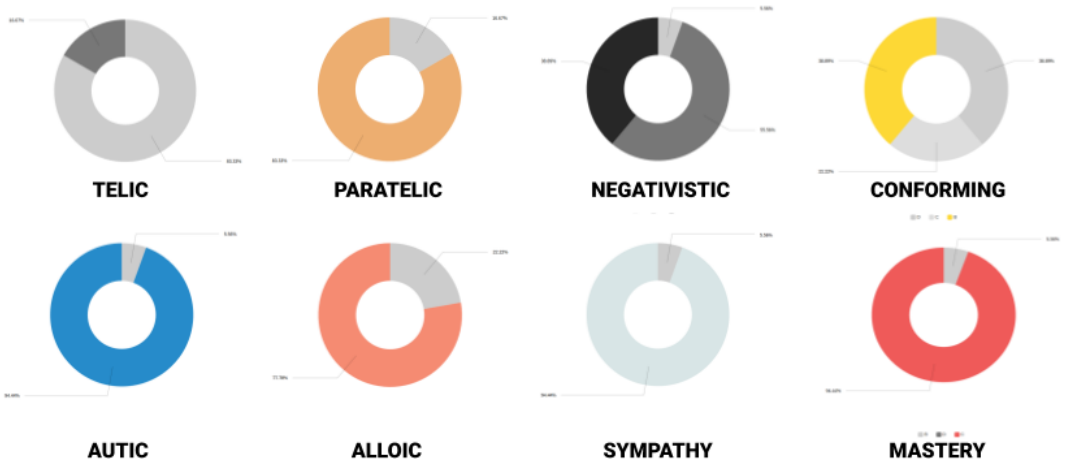

Figure 6: Results from the design implementation section.

Discussion

The aim of this study was to produce a framework for designers to learn about Reversal Theory and successfully identify what elements within a space induce a particular motivational state. The findings have provided insight into the different interpretations people have of motivational states. Especially how their own perceptions and preferences influence their decision making process even through

the training material says otherwise. In addition it would be interesting to see those preferences and also influenced by their professional background or the webinar of the training itself.

Participants who did attend the training seemed to enjoy the content and display what they learned in the training successfully. While there were some common errors that added additional complexity to the training it highlighted the ways in which the training could be improved. The reason for some of these complexities remains unclear and requires further explanation from participants which will be conducted using the emails provided in the survey. Some basic estimates would relate the confusion to either a misunderstanding in the training process, which could've been further hindered by the online format, or, that the personal preferences of the participants still influenced their design decisions.

During the first phase of the training process, we were able to reach a larger pool of participants with the webinar being online but it has been interesting to see that still the learning experience between and in person training and online training are different. Some difficulties with the webinar was that participants were in a group setting for the duration of the lesson. This did allow for some questions after the pauses of each section but for those participants who would prefer not to ask public questions may have suffered in the training. In addition to that, with the switch of the in-person survey to the online survey, the participants were only given the 45 minute training session and the notes taken to refer to for the learning assessment, compared to the in-person training that would provide materials for participants to study for a week, plus the lesson part of the training. Although participants could have been more prepared in-person training they showed great success with the materials and process that was given to them.

In the learning assessment of this training, participants seemed receptive to the content provided and were able to display what they learned successfully. There were some common errors revolving around the definition of specific states, for example, their sympathy state, and impact of not having a long enough study time between the webinar and learning assessment. Participants were able to display their knowledge of each state correctly for the majority of the learning assessment but, when it came to further analysis of a space that involved a deeper understanding of each state's characteristics, that is where error occurred.

Although the original intention of this research was to produce a framework for designers to learn about Reversal Theory and successfully identify what elements within a space induce a particular motivational state, the findings did highlight how complex of a method Reversal Theory is and it can generally cause confusion. It is important to acknowledge that and make the theory and easier process to learn and that is through the development and refinement of the training to best suit

designers and propel them towards better informed design decisions that can be backed but by research.

Some findings from future research could provide needed insight is the testing of two sets of training, one with the color coded study materials and one without this could show if participants retain mainly the colors that identified each state rather than the entirety of the content or if it is a content issue within the material itself. Other testing could involve the testing between in-person training and an online one to see if it could benefit different learning styles by adding additional time and study materials. One participant wrote:

"As Design Research Leader at DLR Group, it's important for me to identify topics that resonate and generate interest for our integrated design teams. Haley's work is very methodical, in that she's asking not only if people understand what she shared in her training, but also if it is relevant to their work or interesting to them personally. The enthusiastic response is a great sign that this training is one way to expand our research-informed design practice - focusing on cognition and emotion as ways to elevate the human experience through design."

Since the study received so much support from it's participants and added feedback from other firm owners who were excited about the research, it aligns with DLR Groups want for topics that not only benefits the firm but that firms owners are wanting to invest their time in. This study was conducted in the hope of providing another opportunity to expand the research-informed design practice. Once the training is complete the goal for future research is to implement the tools learned in the training into a real life design and see how designers respond to the process as well as how the people who inhabit the space react to the design given. The overall result from this study is that it has gained a lot of enthusiasm for Reversal theory and designers are excited to use the training to successfully integrate it into the design process.

Citations

Michael, J. (1989). Reversal theory: A new approach to motivation, emotion and personality. *Anuario de psicología/The UB Journal of psychology*, (42), 17-30

Wright, J. J., Wright, S., Sadlo, G., & Stew, G. (2014). A reversal theory exploration of flow process and the flow channel. *Journal of Occupational Science*, *21*(2), 188-201.

Apter, M. J. (2015). Exploring the concept of focus in reversal theory. *Journal of Motivation, Emotion, and Personality*, *4*(4), 1-8.

Smith, K. C. P., Apter, M. J. (1975). A Theory of Psychological Reversals. United Kingdom: Picton Publishing.

Pellegrini, R. J., Schauss, A. G., & Miller, M. E. (1981). Room color and aggression in a criminal detention holding cell: A test of the "tranquilizing pink" hypothesis. *Journal of Othomolecular Psychiatry*, *10*, 174-181.

Hill, R. A., & Barton, R. A. (2005). Red enhances human performance in contests. *Nature*, *435*(7040), 293-293.

Attrill, M. J., Gresty, K. A., Hill, R. A., & Barton, R. A. (2008). Red shirt colour is associated with long-term team success in English football. *Journal of sports sciences*, *26*(6), 577-582.

Frank, M. G., & Gilovich, T. (1988). The dark side of self-and social perception: Black uniforms and aggression in professional sports. *Journal of personality and social psychology*, *54*(1), 74.

Mikulas, W. L., & Vodanovich, S. J. (1993). The essence of boredom. *The Psychological Record*, *43*(1), 3.

ALTMAN, I. (1978). Manwatching: A field guide to human behavior. *Psyccritiques*, *23*(7).

Apter, M. J. (2001). *Motivational styles in everyday life: A guide to reversal theory*. American Psychological Association.

Desselles, M. L., & Apter, M. J. (2013). Manipulating motivational states: A review. *Journal of Motivation, Emotion, and Personality*, *1*, 44-49.

Tinbergen, N. (1951). The study of instinct.

Kuhl, J., & Koole, S. L. (2008). The functional architecture of approach and avoidance motivation. *Handbook of approach and avoidance motivation*, 535-553.

Lewinski, P. (2015). Effects of classrooms' architecture on academic performance in view of telic versus paratelic motivation: a review. *Frontiers in psychology*, *6*, 746.

Fogg, B. J. (2009, April). A behavior model for persuasive design. In *Proceedings of the 4th international Conference on Persuasive Technology* (pp. 1-7).

Khalid, H. M. (2006). Embracing diversity in user needs for affective design. *Applied ergonomics*, *37*(4), 409-418.

Helander, M. G., & Khalid, H. M. (2005, September). Underlying theories of hedonomics for affective and pleasurable design. In *Proceedings of the Human Factors and Ergonomics Society Annual Meeting* (Vol. 49, No. 18, pp. 1691-1695). Sage CA: Los Angeles, CA: SAGE Publications.

Augustin, S., & Apter, M. J. (2016). Architecture and the Protective Frame. *Journal of Motivation, Emotion & Personality*, *5*(1), 8-17.

Apter, M. J. (2014). Towards a theory of things: reversal theory and design. *Journal of Motivation, Emotion, and Personality*, *2*(2), 3-11.

Norman, D. A. (1988). *The psychology of everyday things*. Basic books.

Augustin, S., Frankel, N., & Coleman, C. (2009). *Place advantage: Applied psychology for interior architecture*. John Wiley & Sons.

Cook, M. R., Gerkovich, M. M., Potocky, M., & O'Connell, K. A. (1993). Instruments for the assessment of reversal theory states. *Patient Education and Counseling*, *22*(2), 99-106.

Apter, M. J., Mallows, R., & Williams, S. (1998). The development of the motivational style profile. *Personality and Individual Differences*, *24*(1), 7-18.

Apter, M. J. (2013). Developing reversal theory: Some suggestions for future research. *Journal of Motivation, Emotion, and Personality*, *1*(1), 1-8.

Desselles, M. L., Murphy, S. L., & Theys, E. R. (2014). The development of the reversal theory state measure. *Journal of Motivation, Emotion, and Personality*, *2*(1), 10-21.

O'Connell, K. A., & Calhoun, J. E. (2001). The telic/paratelic state instrument (T/PSI): validating a reversal theory measure. *Personality and Individual Differences*, *30*(2), 193-204.