A Preliminary Investigation into the Role of Virtual Sport Training Technology as Emotional Coping Mechanism During a National Pandemic Lockdown

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Abstract. The COVID-19 pandemic and the subsequent response by governments to introduce national lockdown regulations have confined individuals to their residential premises. As a result, no recreational or sport activities are allowed outside the (often small) boundaries of family homes, a situation often rapidly introducing social isolation. Research has proven that emotional coping mechanisms, such as sport, can lower the stressful and uncertainty burden on individuals. However, without the availability of this coping mechanism, many individuals have been forced to use virtual sport training technology to keep active. This preliminary quantitative study investigated the role of technology, in particular virtual sport training technology (if any) by cyclists as emotional coping mechanism during a period of national lockdown.

The results of an online survey indicated that sport, in general, has always been an emotional coping mechanism during normal challenging situations but that slightly more respondents used sport as mechanism during the lockdown period. Respondents indicated that virtual cycling training technology enabled them to continue with using their normal coping mechanism even in a period of national lockdown.

One of the benefits of a virtual training environment is the ability to socialize by riding with virtual team members. Surprisingly, the number of cyclists who preferred riding alone in the virtual cycling environment was slightly more than the cyclists who preferred to join scheduled rides with virtual team members.

The research is the first step towards an in-depth investigation into the adoption of technology as an emotional coping mechanism in stressful environments.

Keywords: Virtual sport training · Emotional coping · Pandemic

1 Introduction

The global COVID-19 pandemic has forced many countries to implement national lockdown regulations as part of their national disaster response programs in an attempt to curb the spread of the virus. An example is the lockdown regulations specified in the Disaster Management Act, 2002, Section 27(2) in South Africa [1]. In South Africa

these regulations broadly restrict the movement of people and goods, prohibit public transport as well as the manufacturing and supply of goods and services for the initial period of 21 days extended by another 14 days. Failure to adhere to these regulations were punishable by 6 month imprisonment or a fine [1]. The restriction placed on personal movement is of particular interest during the national lockdown period and specifies, in South Africa, that no person is allowed to leave his/her place of residence for any other purpose than: "*performing an essential service, obtaining an essential good or service, collecting a social grant, or seeking emergency, life-saving, or chronic medical attention*" [2]. Furthermore, movement between geographical provinces or district areas were prohibited; no gatherings were allowed with special permission required to conduct funerals; and no shopping malls were allowed to trade. The implication of these restrictions were that no person is allowed to engage in any form of physical recreational activity, including sport, outside the boundaries of his/her own residence [2].

Physical movement restrictions enforced on individuals have globally introduced major uncertainties due to the inability to perform daily activities such as going to work (to earn a living) and engaging in social and sport activities. Not disregarding the financial uncertainties, the lack of social contact can introduce personal feelings of anxiety, depression, and stress as a result of loneliness and/or social isolation due to the restrictions [3]. Loneliness refer to the feeling of being alone, a negative feeling due to the discrepancy between actual and desired actual contact [4]. Clinical psychologists distinguish between reactive loneliness (experienced after life changing events such as the passing of a partner), or chronic loneliness (the loneliness becomes permanent due to the lack of mental, emotional or financial resources to satisfy social interaction needs). It should be noted that loneliness is not restricted to physical isolation but the feeling of personal dissatisfaction of social connectedness. It is not uncommon for individuals surrounded by people to experience feelings of loneliness. Research has suggested that these feelings can have a detrimental impact on individual physical and mental health and even increase the risk of premature mortality [5].

Social isolation refers to the lack of regular contact and involvement with fellow human beings, either for the purpose of meeting social or work related objectives [6]. Due to the social nature of human beings, research has, not surprisingly, indicated that social isolated people were more vulnerable and experienced more challenges in coping with stressful situations than social connectedly people [7].

Although a correlation between social isolation and loneliness exist, the two words are not synonyms. The main difference between loneliness and social isolation is that loneliness is often perceived as temporary and involuntary contact with other people, whilst social isolation, also often temporary in nature, refers to the complete lack of contact between an individual and society. Social isolation can lead to feelings of loneliness. On the other hand, social connectedness refers to the feeling of being valued through interpersonal relationships, in this particular instance using virtual sport training technology.

This study focusses on social isolation, the result of physical movement restrictions introduced as part of South Africa's attempt to limit the effects of the COVID-19 virus outbreak. Humans are social beings and without social interaction, consequences such as stress, anxiety and depression have been identified [8]. There are many stress coping

mechanism humans adopt in dealing with stressful situations which include task-oriented, emotion-oriented and avoidance-oriented [9]. Since no tasks can be directed to lessen the impact of a national pandemic (task-oriented) and the situation can not be avoided (avoidance-oriented), this study consider emotion-oriented styles (for example, meditation, relaxation, distractions) to coping with the current status quo of the national lockdown. The research question under investigation is *did virtual sport training technology assisted cyclists to cope emotionally during the national pandemic lockdown?* The outline of the article is as follow – stress coping mechanisms are identified, followed by the adoption of virtual technology in various industries and subsequent for the purpose of sport and recreation. The research design is described, followed by the data analysis, discussion and a conclusion section.

2   Stress Coping Mechanisms

The term coping refers to the ability of an individual to consciously address any problem (such as personal or interpersonal problems) in order to reduce the problem into a smaller, manageable, tolerable input [10–14]. Successful coping strategies (also referred to as constructive strategies) can reduce individual stress levels whilst some strategies will increase stress (referred to as maladaptive). Reactive coping is a direct result of a stressor whilst proactive coping focus on releasing future stressors. The effectiveness of the coping strategy adopted by the individual depend on the type of stress (acute, episodic acute or chronic), the individual (personality type including habits) and circumstances (social environment) [8].

No consensus exist amongst scholars when the classification of stress coping mechanisms are presented [8]. The classification of coping strategies proved to be challenging due to the ability of individuals to adopt mechanisms from more than one category; combine coping mechanisms across categories; and the variation of the combination of mechanisms over time and context. Furthermore, Folkman and Moskowitz [15] attributed the variation in classification due to the rationale behind the classification and the underlying empirical techniques used (for example factor analysis).

Although the objective of this research is not to present a psychological founded study on the stress coping classification categories, some of the most agreed classification categories are discussed. Broad classification coping mechanisms identified in literature include adaptive cognitive (appraisal-focused) [13], problem-focused (also referred to as adaptive behavioral) [8, 10, 13, 16, 17], emotion-focused [8, 10, 13, 16–18], support seeking, in some instances classified as part of emotion-focused [8, 10, 16], meaning-making coping (Folkman and Lazarus, 1986, 1980), occupation-focused [13] and avoidance [8, 17, 18]. Adaptive cognitive coping mechanisms refer to strategies adopted as a result of the way individuals think, for example denial or the alteration of values and goals to cope with the stressor [13]. Problem focused coping mechanisms refer to addressing the cause of the stressor or input by means of applying tasks to either address the stressor or lesser the potential impact [8]. Emotion focused coping mechanisms refer to applying internal personal mechanisms such as emotions as response to the stressor. These responses can be positive, for example relaxation and

sport, whilst some can be negative crying etc. Some authors [10, 16] classify support-seeking mechanisms as a stand-alone category, whilst others classify the mechanism as part of the emotion focused category. It should also be noted that problem and emotion focused strategies are often seen as complimentary [8]. Meaning-making focused mechanisms refers to the utilization of individual beliefs and values in order to re-classify life priorities [8, 10, 16]. Occupation-focused coping mechanisms, as introduced by Weiten and Lloyd (2008) refers to the changing of occupations in an attempt to deal with stressors. For example, an accountant might decide to opt for a lecturer job with less stress.

The most prevalent coping mechanism, and the focus of this study, is the emotional coping mechanism employed by respondents in an attempt to deal with extraordinary circumstances during the national lockdown period.

Many scholars have investigated the adoption of stress coping mechanisms to deal with stressful events. For example Garber [19] found that active coping, acceptance and planning were used by pharmaceutical students during stressful times, whilst venting and self-blame contributed to higher stress levels. The study found that the adoption of an exercise regime contributed to lower stress levels.

Under normal circumstances, the adoption of exercise as coping mechanism has been identified as the 8th most important stress coping mechanism in Canada. The national survey conducted during 2014 was completed by more than 35,000 respondents. The results of the study indicated that participants who exercised were able to adopt more positive coping strategies than their counterparts. Therefore, the study suggested that exercise should be promoted in stressful environments and situations as possible coping mechanism [20].

3   Virtual Environments

Virtual environments refers to the re-creation of an existing physical environment using digital platforms [21]. These constructed digital environments allow users to interact with the environment and fellow virtually present people. Literature make an important distinction between virtual reality (environments), augmented reality and mixed reality [21]. Virtual reality (VR), probably the most well-known of the three concepts, allow users to physically interact in a virtual world through the use of hardware that interacts with specific software. The user actively engages in the environment and can apply their senses to actually perform tasks, therefore being fully immersive. For example, in military training, soldiers are prepared for combat by physically engage in sessions. Augmented reality (AR) uses technology to create a digital overlay overall an existing, real world. As a result, augmented reality is not fully immersive as in the instance of virtual reality. Augmented reality (MR) use, for example glasses or smartphones, to engage in the environment. A popular example of an augmented reality environment is Pokémon GO. Mixed reality provides a blend of virtual reality and augmented reality. User can physically interact, in real-time, with virtual objects placed in a virtual environment. The objects will interact with the user, similar to objects in a real-world example.

Virtual environments, irrespective of the application of VR, AR or MR, is no novelty and has been extensively used in many industries, including medical (online

consultations), education (virtual classrooms), gaming/video, medicine (medical procedure simulation) and advertising [22].

3.1   Virtual Environments in Sport

In sport, such as cycling, virtual environments are often used whereby the rider's actual performance (power and speed) is transferred into a virtually created world. Through the selection of pre-programmed workouts and routes, the rider, represented by an avatar, is able to ride specific predefined virtual routes. The software calculates speed and power depending on the rider's weight. For example, the profile of the environment, such as a steep uphill, will interact with the physical hardware trainer (smart trainer), adjusting the resistance accordingly to simulate an uphill. This will force the rider to increase pedal output (measured in watts) that will be shown on screen together with fellow riders in the virtual environment. For riders without a smart trainer, a non-smart trainer and power meter combination also allow for riding in a virtual environment but without the automatic adjustment of resistance according to the terrain.

There are many software applications available to online cyclists that typically offer monthly subscriptions. Examples include Zwift, TrainerRoad and Sufferfest (to name few). Below an example of the Zwift training environment (Fig. 1).
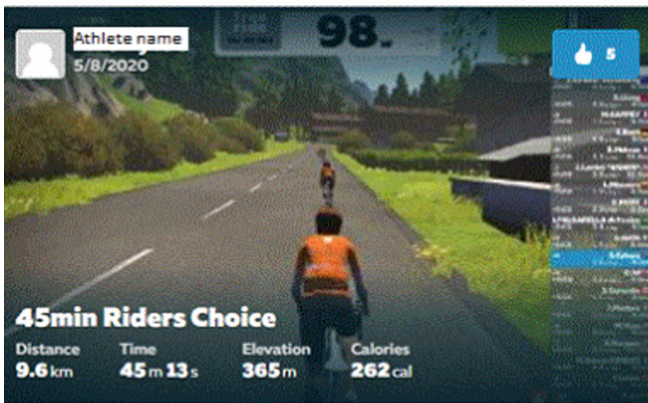

Fig. 1. Zwift cycling rider screen

The utilization of virtual reality technology in a sport training environment is a vibrant research topic [23] with varying objectives - from the improvement of physical motor skills (for example ball sports) [23, 24] to the psychological exposure of athletes to simulated environments to deal with competitive anxiety and stress during competitions (for example during a shooting range competitions) [24]. Although there is strong evidence of the successful application of virtual environments in these scenarios, researcher was not conclusive on the effect of, for example, a virtual audience on how an athlete adjusted behavior [24]. Also, [24] highlighted that the challenge often lies in reproducing an environment of "high pressure" [24], for example the pressure to score a goal in the last seconds of a football game.

4   Research Design

An online survey was developed that contain 10 questions mainly focusing on the utilization of virtual training technology by cycling enthusiasts during the national lockdown period. The survey was tested by three independent parties to ensure construct validity and reliability. After the testing phase adjustments were made to potential ambiguous questions. The target population was cyclists, irrespective of the age, gender or objective of their participation in the sport (recreational, serious or professional). The survey link was distributed by means of WhatsApp messages to cycling groups and it was therefore mostly completed on smart mobile devices. A total of 38 respondents started the survey whilst 29 completed the survey (a 76% completion rate) in an average time of 4 min.

5   Discussion of Results

The majority of the participants were residents of South Africa (97.4%) with a small minority (2.4%) based in the United Kingdom. Sixty one percent (61%) of respondents were male, whilst thirty nine percent (39%) were female. The majority of respondents belonged to an older generation with 43% of respondents older than forty five years, 25% older than 55 and 4% older than 64 years of age. Twenty nine percent were younger than 44 years of age (35–55 years 14%; 25–34 years 11% and 18–24 years 3%).

The study was completed by recreational cycles who ride more than three times a week. No professional cyclists completed the survey. The national lockdown had a profound impact on the respondents as the 79% of respondents prefer to cycle outdoors. These cyclists are now constrained to their own residential properties.

The survey allowed for respondents to complete the questions even if they do not have access to smart virtual trainer setup. The majority of respondents indicated that they have access (46%) whilst 36% used non-smart training equipment (for example cycling rollers). 18% of respondents didn't have access to either smart virtual trainers or non-smart training equipment. Although the overwhelming response was that respondents experienced tension or stress as a result of the current national lockdown situation (62%), surprisingly 31% didn't experience any tension, whilst 8% wasn't sure.

Not surprisingly, given the target population of the study, the majority of respondents indicated that they use any form of sport as emotional coping mechanism during normal stressful situations. During the national lockdown period, slightly more respondents indicated that they use sport as coping mechanism as this value increased from 26% to 28%. Given the values, a strong correlation of 0.803 indicated that cyclists use sport as coping mechanism under normal stressful conditions, and that the national lockdown situation didn't change that. Virtual cycling, however, did enable them to continue with their 'normal' coping mechanisms. Given the high overall correlation between normal coping mechanisms and COVID-19 coping mechanisms the individual coping mechanisms also indicated a strong correlation. A perfect correlation of 1 between the adoption of 'distancing themselves from the problem' as identified as normal coping mechanism and coping mechanism during COVID-19. Table 1 below display a summary of the individual coping mechanism correlations.

Table 1. Summary of coping mechanism correlation values

#	Coping mechanism	Correlation Value
1	Address the cause of the stressor	0.803
2	Learn new skills to address the cause of the stressor	0.818
3	Take control of the problem causing the stress	0.818
4	Distract myself	0.892
5	Relaxation techniques such as meditation	0.914
6	Avoid the cause of the stress	0.947
7	Seek social support	0.979
8	See the cause of the stressor in a positive light	0.978
9	Accept with no action	0.995
10	Distance myself from it	1
11	Use any form of sport to ease the stress	0.803

The standard deviation for the various survey questions are displayed in Table 2. In general the standard deviation is relatively low, except for question number 6, 7 and 8. This indicates the many different training software application used by cyclists (question 6) and the variety of coping mechanism adopted by participants (under normal and extra-ordinary circumstances, question 7 and 8).

Table 2. Summary of standard deviation per survey question

#	Survey question	Standard deviation
1	What cycling environment setup do you have at home?	1.10
2	How would you classify yourself as a cyclist?	0.74
3	Under normal circumstances, i.e. during times prior to the national lockout, how many times did you ride outdoors?	1.03
4	Do you prefer riding indoors or do you prefer riding outside?	0.88
5	If you have a smart trainer, do you ride alone or do you prefer to meet up with virtual team members?	1.05
6	Which virtual training software application do you prefer?	6.06
7	How do you normally cope with extra-ordinary or stressful situations? (you may choose more than 1)	3.71
8	How do you cope with the national COVID-19 lockdown situation? (you may choose more than 1)	3.59
9	If you have access to a smart cycling training environment, does the ability to ride in a virtual training environment with fellow team members assist you in dealing with the current situation during national COVID-19 lockdown?	1.45
10	Do you experience tension and/or stress as a result of the current COVID-19 lockdown?	0.65

The findings can be summarized as follow:

- Although the majority of respondents experienced tension or stress during the national lock down period, a very high percentage of respondents did not.
- Sport has always been an emotional coping mechanism, but this has slightly increased during the national lock down period.
- Virtual training technologies allowed cyclists to continue adopting normal coping mechanisms even during a period of national lockdown.
- Other emotional coping mechanism used during the lockdown period were the use of distractions, although no further information was available on the type of distraction adopted.
- In normal situations, even with a high local crime rate, the majority of respondents preferred cycling outdoors.
- The option to ride with fellow virtual team members wasn't preferred and used by respondents to the extent as one would expect.

6   Conclusion

The objective of the preliminary study was to investigate the role of technology, in particular virtual sport training technology, as emotional coping mechanism by cyclists during a global pandemic. Although the majority of results were not surprising and in line with limited literature published on the topic, what was surprising was that participants preferred to ride alone opting out of the opportunity to cycle with fellow riders. Also, virtual cycling technology allowed participants to continue adopting normal coping mechanisms even in a time where movement was restricted. It will be interesting, and recommended, that this study is expanded to include a bigger population, possibly participants from around the globe.

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