How GPS tracking technology can assist SLSA to increase current sports participation: a brief commentary

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Summary

This paper provides a brief commentary on how GPS tracking technology can assist SLSA better facilitate and enhance positive sporting experiences. Awareness and correct implementation of GPS tracking technology has the potential to provide invaluable performance information to athletes at all levels, ultimately increasing sporting engagement and attractiveness. As an example, an analysis of the 2013 Australian Open Ironman finalists (n=15) is provided to demonstrate how such technology may be used to provide internal reinforcement in the surf lifesaving sports setting. Mean values for average velocity and distance covered for each leg of the race has been calculated. A relevant and appropriate interpretation of how results may be used in competition and training, in-line with current coaching principles, follows. Finally, a detailed discussion on how GPS tracking technology can effectively be applied to surf lifesaving sport and how it may directly influence participation is offered. In light of SLSA's *National Sport & Recreation Review*, it is this author's hope that stakeholders consider implementing technological innovation to their sport, and develop a strategy to further engage their members which appropriately addresses intrinsic factors of motivation.

Background

Innovation represents everything that is 'new' and can help facilitate sport attractiveness and increase participant engagement. Broadly defined, innovation is the introduction of a new idea or behaviour in the form of technology, product, service, structure, system or process (Ringuet-Riot, 2013). In a sporting context, innovations that are solutions to a pre-identified problem or need, are critical to developing sport and maximising the experiences and performances of individuals and organisations (Ringuet-Riot, 2013). Surf Life Saving Australia (SLSA) has recently completed the '*National Sport & Recreation Review'* which seeks to understand how sport and recreation programs and products can be better leveraged to enhance achievement of SLSA's core purpose of saving lives through increasing participation rates. One focus, and a core question asked of stakeholders was: "*How can we increase engagement in sport and recreation programs?"* (Surf Life Saving Australia, 2015). This paper proposes that the innovation of GPS tracking technology can assist SLSA and its members to better facilitate and enhance sporting experiences and performances at all levels of the sport.

It is well known that achievement and advancement in a dominatingly positive environment are a large part of maximising motivation for sport. Participants will enjoy competitive experiences, and by association the surf lifesaving environment, if the atmosphere is both positive and a source of very frequent success (Pyke, 1991). Consequential events following a sporting performance, or experience, can take a number of forms. In the majority of circumstances, it is best to concentrate on providing positive consequences (*"positive reinforcement"*) to incite sustained motivation and achievement (Rushall, 2011). Different types of positive consequences/reinforcers, exist in the surf lifesaving sports setting. However, the one reinforcer that is considered to have major effectiveness in developing engagement is missing. That significant reinforcer is information or feedback about behaviour and performance (Rushall, 2011). More specifically, information that occurs naturally; that which is intrinsic to the activity. Examples of intrinsic performance information are: time, pace (average velocity) or distance covered for an event; a good feeling when a technique change is attempted; and, a skill being experienced with faster execution. The provision of significant intrinsic performance information usually keeps participants interested for long periods without outside prompting (Rushall, 2011).

The timing of swimming, athletics and kayaking events can be considered to significantly contribute, and is important, to maintaining the participation rates seen in the respective sporting organisations. Under this condition, participants will complete races with little encouragement. Participants in these sports are continually motivated by their intrinsic desire to achieve a personal best time and evidently increase their average speed for specific races. When compared to the timed events listed above, it is obvious that surf lifesaving currently provides very limited individual performance information to participants. Knowing ones finishing position relative to other participants does not provide any useful performance information to the athlete. For instance, at the end a surf board race, the participant has no accurate method for determining if they paddled with faster or slower velocity than a previous performance despite their finishing position.[1] In addition, they also have no useful personal standard to compare future performances.[2] In the context of surf sports, it is obvious that determining finalists between heats based on time would be an unfair ruling due to the forever-changing conditions. However, in terms of increasing engagement, especially for participants that do not make it "through to the next round", surf sports stakeholders must ask themselves: *how can awareness of performance information, to increase positive reinforcement and sporting engagement, be achieved?*

Motivation can be provided with the correct elements of positive reinforcement engineered by sporting organisations. The provision of continuous positive reinforcement requires some organisational changes in the normal accepted surf lifesaving sports setting. One possibility is to develop devices that supply performance information, possibly on a continuous basis. When changes must be made in the shortest time possible, a situation that provides the strongest type of reinforcer from the strongest source of reinforcement has to be constructed (Rushall, 2011). Awareness of intrinsic performance information, and its associated positive reinforcement, could significantly contribute to increasing engagement and participation rates in surf lifesaving sport and recreation programs. Specifically, it is thought that greater awareness and the correct implementation of GPS tracking technology has the potential to provide invaluable performance information that will assist increasing SLSA's member engagement in sporting events. This writer was surprised to find

[1] It is important to note that an athlete's relative finishing position compared to other participants in a race is not reflective of personal performance information. Although an athlete may have improved their relative position (compared to a specific athlete or in general), this does not mean that they have improved in performance variables; i.e. an athlete's finishing position is dependent on the performances of other participants.

[2] It is a wonder how athletes currently return to training after a weekend of competition without determining if their training has actually produced a beneficial training response (i.e. made them faster)?

that the technology in-focus has already been trialled at the highest level of competition, but without explicit intention to be used as a positive reinforcer.

The 2013 '*Aussies'* implemented individual athlete GPS tracking as a marketing tool to primarily compliment media broadcasting by commentating athlete speeds during specific races. To this author's knowledge, the data recorded has never been published, or used to reinforce an athlete's performance, since the 2013 national competition. The aim of this article is to showcase some of the invaluable data that was captured during the 2013 Aussies, and discuss the potential GPS tracking has to offer surf lifesaving athletes, coaches and the organisation to create a more attractive sporting and recreational environment.

Methods

Finalists of the 2013 Australian Open Ironman were provided with individual *VX Sport*® GPS trackers that were worn under a hi-visibility rash-vest using a *VX Sport® Vest*. For each athlete, velocity (km/h), distance (meters) and relative GPS position were recorded at a frequency of 4 Hz. One tracker failed to provide any data for one athlete and was subsequently not included in the analysis. Data from the remaining ironmen's trackers (n=15) were analysed using '*VX View*®' software for Windows®. A '*Location Report'* was generated for each athlete. Viewing options were set to show speed points and enabled to '*Pick Segments'*. For each ironman, average velocity and distance were recorded for each leg of the race (swim, ski, board and run) and analysed. The mean velocity and distance covered for each leg was calculated (see Table 1). A race leg was determined to begin when speed immediately changed from a 'full' or 'fast' speed ($\geq$9.0 km/h) to a lesser speed (<9.0 km/h) within the area considered to be knee-depth water, and ended when the athlete exited the water at a similar evaluation of position. An exception to this rule was for the first leg of the race (swim) where the start and short sprint into the water was included in the total leg.

Results

Table 1. 2013 Open Men's Ironman finalists leg velocity and distance

	Swim leg		Run leg 1		Ski leg		Run leg 2		Board leg		Run leg 3	
Athlete Identification	**Avg. Velocity (km/h)**	**Dist. (m)**	**Avg. Velocity (km/h)**	**Dist. (m)**	**Avg. Velocity (km/h)**	**Dist. (m)**	**Avg. Velocity (km/h)**	**Dist. (m)**	**Avg. Velocity (km/h)**	**Dist. (m)**	**Avg. Velocity (km/h)**	**Dist. (m)**
2	5.6	379	16.8	88	12.6	579	15.3	135	8.7	481	12.5	75
5	5.8	376	16.8	109	13.2	567	16.5	133	8.5	430	20.3	128
6	5.8	357	16.1	120	13.2	596	16.9	123	8.8	456	16.3	108
7	5.8	365	15.5	123	13.1	582	16.6	128	9.2	493	8.50	71
8	6.0	387	15.2	113	13.4	573	17.0	125	9.2	495	16.3	93
9	6.0	374	16.2	115	13.0	582	18.5	138	8.7	453	12.6	90
10	5.5	347	16.7	115	13.1	583	17.3	136	9.0	478	15.0	94
11	5.8	385	15.9	110	12.8	553	16.4	137	8.8	465	14.7	91
12	5.6	369	15.3	117	12.8	570	17.6	156	9.1	438	22.6	118
13	5.8	375	17.5	118	12.8	557	18.0	136	9.0	467	20.8	107
14	5.8	362	14.2	118	13.1	566	17.6	135	8.7	454	20.5	117
15	5.6	362	15.7	120	13.2	561	18.3	123	8.8	466	15.9	85
16	6.1	384	14.5	117	13.0	573	17.1	134	9.1	473	12.3	95
17	5.8	382	17.4	122	13.6	573	16.9	133	9.0	483	22.5	123
20	5.8	390	13.5	118	13.2	537	15.7	143	9.4	476	21.1	94
Mean	**5.8**	**373**	**15.8**	**115**	**13.1**	**570**	**17.0**	**134**	**8.9**	**467**	**16.8**	**99**

Discussion

Stroke technique is specific to the velocity of swimming and is of most significance to competition success (Rushall, 2014). As such, it is thought to be just as important for other semi-supported cyclic sports (i.e. cycling, kayaking, and surf ski and board paddling. If preparation for competitions is important then as much practice as possible should be performed at competition paces (i.e. race-paces) (Rushall, 2014). The data presented in this article, provides a set of goals for athletes aspiring to compete in an Open Australian Ironman final. For example, the average velocity of the ski leg in the 2013 Open Ironman final was found to be 13.1 km/h over an average of 570 m. These results provide a standard pace and distance for athletes when training towards the ski leg of an ironman race. Continuing a similar train-of-thought, the results suggest an athlete should be able to maintain an average pace of 5.8 km/h for an average of 370 m swimming, and 8.9 km/h for an average of 470 m board paddling, if aiming to meet qualifying standards for the Australian Open Ironman final. Similar pacing standards can be obtained for the 2013 Australian Open Iron Woman, Double Ski, Surf Board, Surf Ski, and Flags finals.[3] These results now provide iron competitors with tangible and relevant performance goals to strive towards.

Since one can rarely do anything about an opponent's performance in a competition, specific goals should relate to an athlete's own performance quality (Rushall, 2008). For example, a football player can tackle an opponent in an attempt to halt progress but it is the quality of the tackle that will determine the outcome. It would be better for a player to focus on performing the skill elements that will result in the best tackle possible, rather than attempting to achieve a more general aim such as stopping the player. The latter focus does not ensure a desirable result, whereas the former does promote the best attempt possible that, if achieved, will produce the outcome (Rushall, 2008). By achieving skill and strategy elements in a competition, the individual will also inevitably experience feelings of achievement; i.e. positive reinforcement.

This is a difficult concept for some coaches and athletes to grasp. It requires concentration on the process of performing sport activities rather than striving for some score or effect (Rushall, 2008). A typical example often occurs in surf lifesaving when athletes start to look at their finishing position with increasing frequency as the season progresses towards the final championship event. Such behaviour suggests that the athlete is trying to make progress or get ahead of another athlete. However, that approach does not direct the athlete's training in any particular manner. A better goal-oriented focus would be to perform race techniques and repetitions better and faster, and improve racing skills and strategies. If those features are attended to in detail then the quality of a race should improve which, hopefully, will produce a more desirable balance in finishing position. Put simply, if the technique, pace, skills and strategies are in place, the place position will look after itself. Goals should focus on what has to be done in the activity, not what will result from it (Rushall, 2008).

To elaborate, most athletes should have a target pace over an average distance that is unique to them for each surf lifesaving event for which they compete and train. After sufficient instruction from a coach, each athlete should take responsibility for determining the pace and distance for each event. At the completion of every competition, athletes should record in log-books or journals the nature of the race, the average pace, and the total distance covered. Knowing the pace to hold over an average race-distance should be a result of the athlete analysing their past performances and determining their future goals. Athletes should be responsible for monitoring their pace and distance covered for all competitions and training repetitions, and know how they are performing relative to their race-pace targets. An athlete must decide if the target was beaten or equalled, or if their pace was too slow. At any time, athletes should know their numbers and be able to recite

[3] Results and analysis of these events have not been included in this paper due to the limitations of presenting extensive data. For further information, please contact the author.

them to the coach or use them to determine if a completed race is an improvement over the most recent competition. Each evaluation is an opportunity to self-reinforce and to use performance-feedback to modify the next race or repetition if necessary (Rushall, 2011). Currently, GPS tracking technology is the only foreseeable avenue in which surf lifesaving athletes may gain this invaluable information and meet the required self-evaluations to evoke an overly positive response to their sport. The results presented in this paper present an example of the race-pace targets athletes may gain from GPS tracking technology and used to evaluate competition and training performances.

The routine of evaluating and modifying performance through training or competition is not only in accord with basic principles of goal-setting and motor-performance development, but partly also simulates the race-focus that is needed for concentration at the elite level of competition (Pyke, 1991). Allowing athletes to take ownership of the most important part of their racing, and subsequent training, is the most significant motivational factor for sporting participants (Pyke, 1991). In addition, GPS tracking technology also has the ability to measure and manage an athlete's physical and psychological load. For instance, athlete learning and performance levels decrease when intensity levels are too high or too low (VX Sport(R), 2015). As has been demonstrated in this paper, performances can be monitored with GPS tracking devices and analysed using computer software. The resultant data can then be used to adjust training loads and targets. In this regard, the innovation of GPS technology in surf lifesaving sport has the potential to optimise training and competitive achievements by providing useful insights required to build performance profiles and training plans (Ringuet-Riot, et al., 2014). In the future, this writer can only imagine surf lifesaving competitors achieving success at the highest level through detailed analysis and evaluation of individual performance data obtained from GPS tracking devices worn at every training and competitive experience.

Similarly, GPS tracking technology can provide sufficient internal reinforcement, increasing intrinsic motivation for continued sporting participation. Often, enjoyment (fun) is the most frequently cited motivational factor that is attributable to participating frequently and fully in sport (Rushall, 1998). The overall experience in sport should be viewed as being rewarding and enjoyable (Pyke, 1991). Specific factors that contribute to the positiveness of a sporting experience are: frequent indications of success in completing sporting tasks (positive performance feedback), public recognition of successes, and self-appraisals of success in skill improvements (Rushall, 1998). These factors indicate GPS tracking technology could be most beneficial to all levels of surf lifesaving athletes by providing individual performance information that contribute to a positive sporting experience. Frequent self-appraisals of competition performance variables in a public environment (e.g. peers, coaches, parents) can be considered a very motivating experience. If GPS tracking technology were to be implemented in this respect, one can envisage participants eagerly awaiting their 'stats' to be posted after a competition and sharing their performances with friends. An intrinsic feeling of motivation would be expected to follow, encouraging further participation and performance improvement at the next possible opportunity.

Advances in technology are part of the growing global sports and recreation industry (Ringuet-Riot, 2013). At the individual level, technological innovation is changing the way that we practice and connect with sport. For instance, innovative users of technology are now helping spread expert knowledge about best practice coaching, addressing the needs of recreational sport participants for more interactive experiences. In addition, at levels of *elite* sport, technological innovations are continually being applied to sports science, sports medicine, and sports coaching and is now integral to athlete development and performance (Ringuet-Riot, 2013). As was discussed above, GPS tracking technologies provide quality feedback for performance analysis and monitoring, and enhance training and competition outcomes (Ringuet-Riot, 2013). At the organisational level, they are commonly acknowledged as a source of competitive advantage (Ringuet-Riot, 2013). These

examples highlight how GPS technology could be used to grow consumer interest and increase funding for surf lifesaving (e.g. through improved sport coverage and broadcasting) and improve the quality and access of sporting experiences (e.g. through advances in sport safety). Yet, anecdotal evidence suggests that approaches to identify technological or organisational innovation needs are often adhoc and not well structured. That is, innovative 'solutions' are often developed before a problem has been identified; commonly referred to as 'solutions in search of a problem'. In this respect, SLSA has been presented with a unique opportunity. GPS tracking technology could be the innovative solution to reverse declining participation rates in its sport and recreation programs. It has been shown that innovations that address pre-identified needs have a greater capacity to grow sport (Ringuet-Riot, 2013).

The application or adoption of technology in sport is highly dependent upon the capability of a sport organisation to support an innovation, which is often influenced by the organisation's economic structure (e.g. availability of funding, sponsoring and administration) (Ringuet-Riot, et al., 2014). Despite the potential benefits of innovations, many sports remain slow to adopt new technologies (Ringuet-Riot, et al., 2014). In one study, a technology needs assessment was conducted for the sport of swimming (stakeholder and context-driven) to identify a range of performance metrics to assist in the integration of existing research with evolving inertial sensor technology (Ride, et al., 2013). The study revealed the importance of conducting a needs assessment and analysis for technological innovation in sport. Ride et al. (2013) found that coaches and support staff need to be more aware of the technologies by being involved in the innovation process. They also revealed the importance of transferring useful information (usable data) to users in sports (e.g. athlete, coach). Their investigation established the need for technological innovation to address workload monitoring and target athletes' welfare and injury prevention. Research and development in this area will be required to strengthen the contribution technologies offer to the development and performance of surf lifesaving athletes (Ringuet-Riot, et al., 2014). This could be addressed by facilitating greater collaborations and partnerships with SLSA and technological companies/institutes to increase awareness of current research and developments in sporting products across all sectors of sport (i.e. recreational and elite). Companies such as *VX Sport* are ready to share their wearable/portable GPS tracking system to enhance experiences and optimise performance outcomes in sporting organisations.

In light of SLSA's *National Sport & Recreation Review*, those responsible for implementing change should carefully consider creating a sporting environment where the conduct of surf lifesaving competition is controlled by athletes. The review's analysis of member responses has so far failed to recognise the underlying psychological and motivational factors that influence sustained participation in its sport. By comparison to other sports that offer individual and consistent internal reinforces, in the form of performance metrics (e.g. swimming, kayaking, athletics), it is obvious that surf sports will continue to suffer until this issue is addressed appropriately. This author believes member engagement and participation could be vastly improved by addressing the intrinsic feedback hole that currently exists. Hopefully this paper provides examples of how wearable GPS tracking technology could provide positive-self reinforcement in the surf lifesaving sports setting. It is envisaged that all surf lifesaving athletes will rely upon individual performance information from GPS technology to maintain motivation and participation in the future. Further empirical research is required to broaden stakeholders' understanding of the underlying psychology and intrinsic motivation of SLSA members to participate in surf lifesaving sports. It is also suggested that SLSA appropriately address engagement issues and create an attractive sporting environment for its members by conducting a GPS technology needs assessment. Future innovation in surf sports should focus on identifying individual and organisational needs for technological innovation that enhance sporting experiences and performances at all levels.

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