

## **Towards critical benchmarks for Return-To-Sport following injury rehabilitation at collegiate level in Teachers Colleges of Zimbabwe**

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**Abstract:** *This study examined the critical benchmarks impacting on players' return-to-sport following injury sustenance in selected Tertiary Institutions of Zimbabwe. The study was a descriptive, prospective cohort design anchored on quantitative approach. Its population was 453 with a sample of 228 participants that comprised coaches, fitness trainers, physiotherapists, psychologists, and handball players drawn from 10 selected Teachers Colleges in Zimbabwe. Male and female handball players were from original collegiate handball teams for the entire period of study. Questionnaires were used as data collection tools. All data were statistically performed using IBM SPSS Version 23 and presented on a multi-part graph and table. Emerging findings revealed absence of quality return-to-sport training modes for re-enacting players' musculoskeletal deficits. Quality social support synergies for full resurgence of return-to-sport players' physiological and socio-psychological tenets lacked among health service providers. The study recommends that co-opting multi-social-support synergies during rehabilitation and return-to-sport episodes could significantly address players' socio-psychological and physiological tenets. Health service providers with amplified skill sets should fully re-orient athletes' fractured return-to-sport hope pathways. Further appropriately designed, quality contemporary evidence-based multi-modal training batteries should resonate critical evaluative 'viaducts' and 'mainstay' of rehabilitation and return-to-sport transitions for enhancement of players' socio-psychological and mitochondrial tenacity levels. Scientific monitoring approaches could further substantiate reduction of inherent injury tendencies through HIFT regimens.*

**Keywords:** Return-to-sport, rehabilitation, training modes, competition, social support.

### **Introduction**

Provision of safe participatory grounds forms the basis of critical alleyways for injured players' return-to-competitive sport contexts at global level (Mountjoy, Moran and Ahmed (2020). Transitionalising return-to-sport athletes back into competitive contexts following injury sustenance requires regimes capable of fully re-enacting dysfunctional neuromuscular deficits (Jord, Morris and Lane (2020) for pre-injury conditions to be met. Despite such possibilities, return-to-sport athletes are often subjugated to a myriad of challenges regarding renewed perspective on sport and levels of physiological tenacities (D'Astous, Podlog, Burns, Newton and Fawver (2020). Globally, sports are an amalgamating agent to sport-enthusiasts the world over since it potentially provides positive living health habits, participation and spectatorship which form the basis for a pluralistic living in the society

and nation at large. Although this brings optimistic reasons for commitment into sports, competitive contexts have always ended up in despair, anger and regret due to injury sustenance. Absence of lucid viaducts for physiological, emotional, social and psychological restorative grounds during transitional rehabilitation and return-to-competition segments critically determine athletes' career-ending aspirations and prospective hope pathways in sports. Subsequently, clear rehabilitation benchmarks are a worrisome issue in Zimbabwean tertiary handball hence a felt need to conduct this study. Thus, this study explored the interface between transitional phases of rehabilitation and social support networks for players' odds of participation upon their re-introduction into competitive and training environments. Furthermore, it provided insights into critical pathways and quality of training modes for

transitionalizing return-to-sport players following injury rehabilitation. The study was guided by the following research questions:

1. From which sources did injured players receive support during rehabilitation?
2. How far does the quality of training modes influence players' return-to-sport following injury sustenance?

## **Review of Related Literature**

This part presents both the theoretical and Empirical review of literature related to the topic.

### **Theoretical Underpinnings**

The Sports Commitment and Protection Motivation Theories (PMT) were adopted for this study. Regarding the Sports Commitment Theory, injured athletes derive their hope and commitment pathways from eight critical sources including sports enjoyment, personal investment, valuable opportunities, desire to excel, social constraints, social support, enthusiastic commitment and constrained commitment decision which underpin their adherence to rehabilitation for early come back to sport (Majewski, 2018; Hancock, 2018, Scanlan, Chou, Sousa, Scanlan and Knifsend (2016). The PMT's restorative potency is based on recuperating athletes' personal endorsements to emotionally and practically re-engage in prescribed rehabilitative regimens (Shen, Junzhou, Qian and Junyi (2019; Hildingsson, Fitzgerald and Alrinsson 2018) rendered its suitability for this study.

### **Significance of social support synergies to injured athletes**

Networking of social support synergies for recuperating athletes has been acknowledged. In their qualitative phenomenological study of 12 Iranian handball national team players involving eight men and four women, Mohammadi, Meshkati and Zhiapour (2018) found out that in-team interactions with respect to social support on injured players existed. Social support particularly emerged at the time of injury sustenance, foul and success. Friendship emerged as the underlying principle of in-group interaction and emanated from cultural acceptance and reciprocal trustworthiness as internal efficacy sources. From external sources, participants reported full cover provision from the family on emotional and financial support regarding continuity of sport carrier. A greater input of social support during rehabilitation also came from

coaches and medical team (Mohammadi et al., 2018).

Rosen, Kottop, Friden, Frohman and Heijne's (2018) study of 340 injured elite athletes from 16 different sports, handball included, established the significant roles of friends and families in creating a palatable social context. Despite such encouraging situation, cases of incompatible medical support were reported from other schools where some athletes incurred personal medical care expenses. The same study reported cases of loss of self-identity, loneliness and isolation on players under rehabilitation, who felt treated as 'ex-athletes' when others were involved in handball workouts. Though conducted from different settings, the foregoing study findings could, in some way, have a similar replication in Zimbabwean locales especially under the on-going distressing socio-economic turmoil. Hence this study was conducted.

Hagiwara, Iwatsuki, Isogai, Van Raalte and Brewer's (2017) study on relationships between social support and mental health problems among 204 injured male and female American intercollegiate athletes showed that teammates' social support for female athletes was negatively correlated with depression and sports helplessness. The authors concluded that relationships between teammates, social support and mental health problems in inter-collegiate student-athletes are gender specific despite there being no reports of significant relationships.

Conversely, Burland et al.'s (2018) qualitative cohort study on psychological factors among twelve male and female athletes revealed that encouragement and external support systems greatly facilitated their recovery and return-to-sport. Participants highly spoke of rejuvenated confidence and positive outlook on their injuries from the received support as a source of empathy during rehabilitation. One participant, for instance, recounted: "My teammates, my former coaches, my family were all supportive and urged me to try and get back as much as I could" (Burland et al., 2018, p. 457). Also, good athlete-therapist and athlete-trainer relationships fostered good recovery environments for recuperating athletes. Their parameters of athletic identities, competitive personality and self-motivation rekindled their intrinsic hope pathways during the entire process of rehabilitation and recovery. In spite of these positives, the same study also reported hesitation to RTS feelings (kinesiophobia) and subdued levels of self-

confidence, resulting in self-limitation tendencies in muscular-bound activities. From a social support perspective, Rosen et al. (2018) stress on the significance of immediately dealing with emotional support following an injury instead of giving it when athletes are on the threshold of return-to-sport. Thus, early symptoms of psychological panic (anxiety, regret, and fear) should be identified and critically dealt with during the early stages of rehabilitation than when athletes are on the verge of return-to-sport phases. Besides, absence of full social support for players during the rehabilitation cycle creates feelings of rejection, which could end up in the surfacing of non-adherent and non-compliant attitudes towards prescribed regimes.

Emerging findings from a recent study of 406 injured Japanese university student-athletes indicates recovery assistance, understanding and respect, empathy and acceptance, and sense of belonging as critical support tenets (Katagami, Fujimura, Aita & Tsuchiya, 2020). Collegiate athletes with depressive-oriented symptoms have been found to be in need of tangible social support as this provides the basis for good performance and overall mental health (Sullivan, Moore, Blom & Slater, 2020). Although this might serve as a palatable ground, injured athletes have continually been subjugated to life stress (Courtenay & Reiner, 2020) as they could be alienated from social support services (Sullivan et al., 2020). Thus far, the Back in the Game intervention recently popularised, is a 24-week Internet delved towards self-guidance program that provides augmentation to rehabilitation progress on various psychological strategies (Arden, Hooper, O'Halloran Webster & Kvist, 2021). Coaches and sports clinicians, in this regard, should enticingly embrace themselves with novel-oriented and evidence-based advances as evaluative tools so that their skill sets appropriately provides 'comfort zones' on recuperating players' socio-psychological deficiencies.

### **Return-to-sport decision route and assessment modes**

Defining 'return-to-sport' route often presents some challenges to researchers. Different trajectories have been put forth as to whether to base successful Return-to-Sport on athlete s' low muscular capacities, engaging in a different but less demanding sport, or same- sport return but at lower pre-injury level of performance or after sustaining a second injury after return to active sport (Dingenen and Gokeler, 2017). Despite the imminence of

return-to-sport in athletes (81%), only 65% are believed to reclaim their pre-injury skill proficiency and hardly 55% will enjoy their pre-injury full capacities (Arden et al., 2014).

From a practical perspective, research indicates that the target aerobic training zone of a handball player ranges between 85% and 100% of maximal aerobic uptake- $VO_{2max}$  (Dello Iacono, Karcher and Michalsik, 2018). In light of this, Morin and Samozino (2016) indicate that training specificity (for return-to-sport handball players) needs to rope in the force vector hypothesis and movement specificity between functional tasks and physical activities during rehabilitation (Dello Iacono et al., 2018). Laidlaw and Diduck, cited in Marquez, Andrade, Pereira and Mendes (2019) suggest that the use of force vector application can provide transfer effects towards actual force production demands. Alongside this, hip thrust exercises have been reported to improve acceleration and sprint manoeuvres and motor patterns, together with plyometrics training for directional drills, in recuperating handball players (Dello Iacono et al., 2018; Contreras et al., 2017). Thus, well thought-out training regimens that cater for players' physiological, psychological, emotional and social resources need to be arrived at through collaborative efforts of sports medicine professionals for safe return-to-sport.

Hagglund, Walden and Ekstrand (2018), further substantiate the importance connected with full rehabilitation of players' motor performance. They stress early rehabilitation engagement following foot and ankle injuries as a way to increase tissue resilience and loading capacity for early Return-to-Sport of players. They recommend the use of proprioceptive balances, Range of Motion and strength training regimens to address functional and sensomotoric deficits incurred. Institutionalisation of evaluative battery tests on the physiological and psychological parameters for RTS handball players, punctuated with evidence-based non-surgical treatment protocols, should be prioritised. A recent cross-sectional cohort study has been conducted by Abassi, Bleakly and Whiteley (2019) among eighty seven (87) ankle-stricken male athletes at late rehabilitation and twenty five (25) healthy subjects to test their oesteo-articulation (dorsiflexion, plantar-flexion, inversion, and eversion). Results showed presence of reduced ROM in the injured leg in all four directions with different magnitudes.

Return-to-sport should fully provide details and characteristics of athlete (age, sex), protective

devices (taping, bracing), intensity, duration and exposure frequency as well as activity structure (pivoting, non-pivoting) (Dingenen & Gokeler, 2017). Further, the level of participation (competitive or recreational), performance and duration levels of sports following injury, need a clear delineation. Conditions are still indistinct in respect of rehabilitation timeframe for a clear and successful spell out of RTS. Consensus decisions by sports medicine professionals (Arden et al., 2016), as to how best an athlete should be re-oriented to return to active participation in sport should therefore be sought for.

Not only should contemporary RTS entirely take physiological recovery as a stand-alone variable to full athlete recovery, but psychological recovery as well (Arden, 2015). Consequently, contextual factors can potentially trim down kinesiophobia, hence promoting psychological readiness to pre-injury knee functional condition (Arden, 2015). Athletes' inspiration during rehabilitation has been reported to increase recovery and returns rates, and subsequently re-affirms pre-injury states (Sonesson, Kvist, Arden, Osterberg and Silbernagel 2017). This heightens their self-efficacy more than the non-returning athletes (Hamrin, Semorski, Samuelsson and Thomee, 2016). The use of a twelve item questionnaire could be a beneficial approach for assessing ACL RTS athletes' emotions, confidence and risk appraisals so as to delineate returning from non-returning athletes (Arden, Taylor, Feller and Webster (2013). From a holistic approach, Arden and Kvist (2016) validate the significance of meticulously assessing psychological factors, making early evaluations and recognitions of dysfunctional responses during rehabilitation. This could assist clinicians in providing interventional strategies on modifiable deficits prior to RTS (Te Wierike, van der Sluis and van den Akker-Scheck (2013).

### **Enhancing return-to-sport route**

Since injured athletes are traumatized by a myriad of psychological challenges, their readiness to return-to-sport is a prominent stage. Repeatedly, return-to-sport approach should attractively impersonate progressive rehabilitation, performance and prevention with a multi-disciplinary decision-making framework of the shared decision-making process (Wollin, Pollock & Thorborg 2020; Rollo et al., 2020). Further, suggestions have been forthwith put that rehabilitation or performance programs co-opt 3 critical notions of the 'floor' (athlete's current

status), the 'ceiling' (athlete's capacity to handle specific sport routines) and transit 'time' from floor right through to ceiling loads (Gabbert, 2020). Subsequently, load intensity and load tolerance should sufficiently ameliorate players' physiological impairments if the motif is to develop an in-depth basis for sporting capacities.

The return-to-sport decision-making route, in consequence, need to be viewed as a periodised continuum (Nyland et al., 2016), with rehabilitation segments synchronised to RTS. This gradual metamorphosed approach should be visible in the kinetic chain of recovery, right through to return-to-sport, as shown by its resonance in contemporary criteria-based or systematic rehabilitation approaches. It differs from the traditional approach at the hypothetical end of rehabilitation (Wilk and Arrigo, 2017; Nyland, Mattocks, and Kibbe (2016). Athletes' assessments require persistent segmentations during rehabilitation and unobstructed performances assigned as building blocks towards RTS (Arden et al., 2016). Upholding and follow-up programs to keep abreast of the body's level of functionality should form the crux of rehabilitation (Nyland, Mattocks and Kibbe (2016). Rehabilitation regimens should interlude in succession, with inhibited training under clinical supervision and practice through uncentralised activities during the rehabilitation period. Overcapacitating the recuperating body with non-sport-specific activities may breakdown athletes' physiological, neurocognitive and psychological resources (Dingenen and Gokeler, 2017). The possible eventualities here can be athletes' loss of confidence, feelings of insecurity and development of kinesiophobia instincts. Incorporating athletes into active sport by advancing them through four (4) segments: first, return to less intensified levels with non-contact situations, second, return to full training intensities coupled with contact situations, third, returns through adapted friendly games, and finally, return to competitive contexts through full match encounters, could effectively trim down these effects (Bizzini, Hancock and Impellizzeri (2012). Furthermore, Arden et al. (2016) articulate that a more detailed RTS of this nature, with clear sub-systems, can be better positioned to achieve success in the contemporary RTS rehabilitation continuum.

Whereas well thought-out return-to-sport training modes constitute crucial components in revitalising players' odds of participation, ad hoc approaches

can, subsequently, trigger wretched compliance rates to training regimens on players' instincts. For instance, Tyler, Schmitt, Nicholas and McHugh's (2017) long term follow-up of 50 hamstring-stricken players revealed 16% non-compliance rate to eccentrically-based rehabilitation strengthening protocols. Administered tests revealed that these players exhibited a 43% hamstring weakness prior to return-to-competitive contexts than the compliant group. Results indicate the co-existence between rehabilitation compliance and early recovery while non-compliance is associated with re-injuries and low healing capacities. The essences of training modes that address specific musculoskeletal deficits have been further advanced by Romero, Rejano, Fernandez, and Moriana (2021), Chen, (2021), Chapman, Whitting, Broadbent, McHattan and Meir (2021) and Kinsella, Cowan and Pizzari (2017). Their study findings revealed that isometric, concentric and eccentric exercises promoted intra-cortisol inhibitions with pain relieving and enhancement of healing in multi-oriented injuries. Thus return-to-sport rehabilitation needs to address musculoskeletal dysfunctions through multi-modal training approaches that help abate high chronicity levels of injury. Certainly, this could further instigate positive image of rehabilitation with motivational grounds for early return rates to competitive sport.

To effectively monitor athlete's pliability on the workload demands of training and competition to abate re-injury, Blanch and Gabbett (2016), incorporated an acute/chronic work-load ratio. It depicts the relation between work load of the last four (4) weeks (chronic workload) in relation to rising and falling average workload of the last 4 weeks (chronic workload). Subsequently, decision-making for RTS needs not be done in isolation, neither should it be an individual-centred decision, but should be a consensus-bound interdisciplinary team effort (Shrier, Safai and Charland, 2015). This ensures athlete's full resurgence upon return-to-active sport. Despite these clarities, findings of this study depict high deficiency levels in providing meaningful rehabilitation regimes among some professionals.

Creighton, Shrier, Shulter, Meeuwisse and Matheson (2010) have authenticated a graded progression assessment of a three (3) -step return to competition decision model, the Injury Psychological Readiness to Return-to-Sport Scale and Re-injury Anxiety Inventory. Its approach allows for conceptualisation of athletes' return-to-sport at

each level, assisted by trainers and physicians (Blanch and Gabbett, 2016). Stage 1 sets the platform for the evaluation of athletes' return medical status (history, laboratory tests such as magnetic resonance imaging, injury severity, functional ability and psychological state). Stage 2 makes an assessment of risks associated with participation (contact or non-contact, collision, playing position, competitive level, protective devices use, and limb dominance). Stage 3 looks at non-medical factors that can impact on return-to-sport. This includes in-season timings (play-offs, pressure from coaches or teammates, athletes' family, ability to mask injury pain, diversity of interests (potential financial gains, fear of litigation). This framework delineates the complex interaction of variables that lead to return to competition decisions and provides practitioners with clear return-to-sport parameters (Podlog, Banham, and Wadley (2015). Accordingly, health service providers require understanding on the crossing points of rehabilitation phases so that their expertise is appropriately instituted for returning-to-sport athletes. Incompetence in implementing such guidelines by health service providers may lead to physiological defects, re-ignition of index injuries and early exit in sport contexts.

The 'training load', 'structure-specific cumulative load' and 'structure-specific load capacity' concepts in relation to athlete's training capacities have been popularised by Nielsen et al. (2017). The training load represents step count: throws, distance run and/or time spent on a workout (Bertelsen, et al., 2017). The athletic trainer is envisioned to calculate and monitor any resultant changes with regard to administered training work load for given regimens over a specified time-frame. For instance, acute chronic workloads ratio and weekly changes as a time-varying exposure to sports injury (Moller et al., 2017) can be monitored.

With regard to structure specific cumulative load, the central cog now rests on the sum total of step-specific or throw-specific loads that a certain musculoskeletal structure is exposed to during a workout. One then quantifies the load distribution and load magnitude that an athlete is exposed to and their ability to handle the workout (Nielsen et al., 2017). For instance, the total number of repetition maximums to be performed by a player when testing knee anterolateral structures' capacity to tolerate given loads during a handball jump shot skill need to be

within the recuperating structure capacity level to withstand the given load. Rotary motion tests of the shoulder girdle for shoulder-oriented injuries can be done to avoid overloading or under-loading recuperating tissues. Magnitude-related variables, such as body weight and vertical movement, interact with the training load to produce a structure-specific load through an increase or decrease in load extent (Nielsen et al., 2017; Moller et al., 2017).

Subsequently, applied loads may be differently distributed at a structural level in relation to the athlete's distribution-related variables such as equipment, surface type or technique. For instance, plantar flexion, inversion, eversion and sudden directional change tests performed during handball jump shots may lead to unequal force production of the rear foot and forefoot subsequently causing musculoskeletal injuries. In this situation, magnitude-related and distribution-related variables collectively network with training load to produce the structure-specific cumulative loads that athletes are exposed to in the workouts (Nielsen et al., 2017). At this stage, athletes are positioned to participate in each training workout, with certain structure-specific capacities to withstand the training load (Nielsen et al., 2017). Magnitude-related, distribution-related and capacity-related variables are critical determinants of athlete's prescribed training load prior to injury sustenance, the point at which Bertelsen, et al. (2017) believe the tissue specific load exceeds the tissue-specific capacity. Confirming the above contributions, Moller et al. (2017) proposed a novel and transferrable approach informing how athletes' characteristics modified the influence of training load changes on shoulder-related injury risks among handball players. Their assessment revealed an alliance between changes in handball training load and handball-related shoulder injuries across levels of distribution-related injury risks. Findings indicated disparities with traditional scientific analysis, not treating distribution-related variables as confounders, but as potential effective measure modifiers (Moller et al., 2017).

Recently, the High Intensity Fitness Training (HIFT) has much been popularised among fitness enthusiasts as a 'Top 10 Fitness Trend in 2018' (Thompson, 2018; Feito, Henrich, Butcher and Piston (2018)). The training mode stresses functional multi-joint movements through aerobic and muscle

strengthening and elicits universal motor recruitment patterns in multiple plannary movements eventually improving cardiovascular endurance, strength and flexibility (Poston et al., 2016; Murawska-Cialowicz, Wojna and Zuwala-Jogiello, 2015; Heinrich et al., 2015). Their multi-modal orientation with an inclination towards functional exercises than HIIT unimodal-orientated activities (Thompson, 2018; Feito, Henrich, Butcher and Piston, 2018) makes them more ideal for return-to-sport training regimens as they can fit well in rehabilitating any type of injury.

Taken together, return-to-sport criteria need to take a systematic approach, one that fully presumes a gradual transmutation and episodic trajectory, so that each sub-system focuses on achieving a successful healing process. Intertwining these phases of return-to-sport ensures full athlete monitoring at each subsequent stage, so that appropriate adjustments could be instituted when necessary. From a public health perspective, the recuperating athlete is the focal point for allied health-service providers, hence the mainstay for their safe returns to sport should entrench 'athlete-centred-medicine' that enshrine 'athlete-centred-care' attitudes. Hence, this was part of the crux of this study, so that a safe turf could be established in sporting circles for handball players.

## **Research Methodology**

### **Research Design**

The study employed the descriptive, prospective cohort design anchored on the quantitative approach.

### **Population and Sampling**

The study population was 453 from which a sample of 228 participants that comprised coaches, physiotherapists, psychologists, handball players and fitness trainers from 10 selected Teachers Colleges in Zimbabwe were drawn. Male and female handball players were from original teams for the entire period of study. Selected participants for the study had specific roles in their team functions. In drawing up a sample size of 228 participant, stratified random sampling was adopted with Yamani's (1970) formula used to determine a convenient size (Collins, Davis & Chou (2017)). Bowley's proportional allocation formula was then used to statistically allocate participants into their particular strata.

### Instruments used

Structured questionnaire was adopted as tools for collecting the time data (Bailasha, Kibera, Rintaugu, and Mwisukha (2015). The instrument was pilot-tested using a smaller related sample prior to its administration to the intended respondents.

### Validity and Reliability

Cronbach alpha statistics was used to determine the internal consistency of the questionnaire items before the instrument was used in the field. The test yielded the Cronbach's Alpha of 0.8 which indicates acceptable reliability.

### Statistical Treatment of Data

Data presentation was performed using IBM SPSS Statistical Version 23 and presented on a multi-part graph and table.

### Ethical considerations

Ethical clearance was sought from the Zimbabwe Open University Higher Degrees Committee, Ministry of Higher and Tertiary Education, Science and Technology Development and Teachers' College authorities. Informed consent was sought from study participants drawn from the selected institutions. Anonymity and Confidentiality of data were established to meet ethical standards.

### Results and Discussion

Results of the study are forthwith presented and clued up by two research questions which guided the study.

**Research question 1:** From which sources did injured players receive support during rehabilitation?

**Table 1: Support received during rehabilitation**

Sources of support rendered	F	%
Coaches	86	89.6
Social (friends)	72	84.7
Team Trainers	63	75.9
Family (Parents)	64	71.9
Team Medics	52	67.5
Medical	41	57.7
Spots Psychologists	37	54.4
Financial	24	35.8
Physiotherapists	22	33.3

Table 1 explicates that the most popular sources of support during rehabilitation were coaches (89.6%),

friends (84.7%), Team Trainers (75.9%) and parents (71.9%). Results also show that injured players got support from Medics (67.5%), Medical assistance (57.7%) and Psychologists (54.4%). Fewer respondents received financial support (35.8%) and from Physiotherapists (33.3%). The general trend in the table indicates that a substantial number of injured players got support from various sources.

The high figures of 84.7% and 71.9% support received from friends and parents confirm study findings from Rosen et al.'s (2018) multi-sport study (handball included), in which friends and family members provided critical roles in creating palatable social contexts during rehabilitation. Similar trends were described by study findings of Burland et al. (2018) in which encouragement and support from friends and family greatly facilitated the recovery and return-to-sport of 12 recuperating male and female athletes. The study reported empathy, confidence and positive outlook for athletes' early recovery as important aspects during the rehabilitation period. In the same vein, Mohammadi, Meshkati and Zhiapour's (2018) study of 12 injured elite Iranian handball national team players revealed the family as a critical external source in providing support on players' emotional and financial support. Coaches and medics team, in addition, had greater input of social support during rehabilitation.

Provision of tangible support of this nature is crucial for depressive-oriented players in order to foster good recovery and overall mental health (Sullivan, Moore, Blom and Slater 2020). This service requires sustainability right from the onset of rehabilitation cycle through the return-to-sport phase (Rosen et al., 2018).

The amount of medical support reported in this study (57.7% differs from the findings of Mohammadi et al. (2018) which reported unsatisfactory medical support. The lowest figure of 33.3% reported for physiotherapy compromises training quality as physiotherapists are essential for quick recovery.

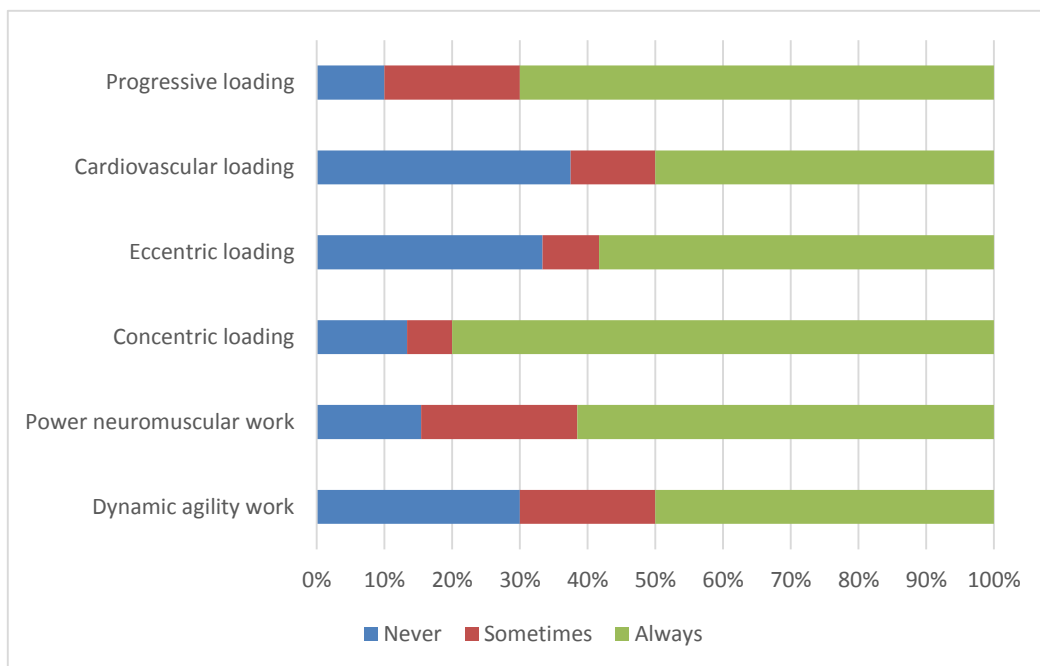
**Research question 2:** How far does the quality of training modes influence players' return-to-sport following injury sustenance?

Results indicate that a substantial number of training regimens were administered to athletes returning from injury as seen in Figure where respondents affirmed that the following training

types were always used: concentric loading (80%), progressive loading (70%), power neuromuscular work (62%), eccentric loading (59%), cardiovascular loading (50%) and, dynamic agility work (50%). Among those that were sometimes used, the most popular were power neuromuscular work (25%), followed by progressive loading (20%), dynamic and agility work (20%), cardiovascular loading (12%), eccentric loading (7%) and concentric loading (5%). Some respondents rated cardiovascular loading (47%), eccentric loading (35%), dynamic agility works (30%), power neuromuscular work (15%), concentric loading (13%) and progressive loading (10%) as regimens that were never used. Although results in figure 1 confirm observance of critical benchmarks regarding quality return-to-sport assessment modes (concentric loading, 80%, progressive loading, 70%, power neuromuscular work, 62%), an interesting finding noted is that not all professionals involved in the rehabilitation exercise could meet this standard (eccentric loading, 35%, dynamic agility works, 30%, concentric loading, 13%, progressive loading, 10%). This indicated a

service gap that could see some players prematurely ending their possible careers due to sustained injuries that could later develop into chronic degenerative forms.

Eccentric works are critical in fully resolving musculoskeletal power, speed, balance and strength which is an essential insulating ingredient of an ideal rehabilitation regime (Romero, Rejano, Fernandez and Moriana, 2021; Chapman et al., 2021; Chen, 2021; Rio et al., 2017; Kinsella, Cowan, & Pizzari (2017). Although Abassi, Bleakly & Whiteley (2019) recommend on the significance of training batteries that test osteo-articulation system for RTS players for increased ROM, surprisingly, a substantial number of fitness trainers and coaches (34%) in this study indicated absence of this important component in their return-to-sport training regimens or sometimes used it (7%). This knowledge service gap could imply high susceptibility levels to multiple injuries for players from insufficient musculoskeletal recoveries following poor rehabilitation approaches.



**Figure 1:** Quality assessment of return-to-sport training modes rendered

Moreover, contemporary fitness trends such as HIFT have been adopted for their multimodal capacities to address multi-joint movements and universal motor recruitment patterns through multiple plannary movements (Thompson, 2018; Feito, Henrich, Butcher and Piston (2018). This is, however, unlike the good affirmation of 59% from the participants as indicated in figure 1. Absence of

such critical regimens, could inevitably, trigger increased non-compliance rates to prescribed rehabilitation protocols as some players may not prefer engaging themselves in seemingly unproductive regimens or may have preferential choices. This correlates with findings from Tyler, Schmitt, Nicholas and McHugh's (2017) in which they announced 16% non-compliance rate to



prescribed eccentric strengthening protocols. Upon clearance to full participation 43% hamstring weakness from the 50 stricken athletes were reported while a 7% additional strength was observed from the compliant group.

The essences of training modes that address specific musculoskeletal deficits have been further advanced by Romero, Rejano, Fernandez, and Moriana (2021), Chen, (2021), Chapman, Whitting, Broadbent, McHattan and Meir(2021) and Kinsella, Cowan and Pizzari(2017). The study findings revealed that isometric, concentric and eccentric exercises promoted intra-cortisol inhibitions with pain relieving and enhancement of healing. Turning on to results of this study, it is quite encouraging as the aspects of concentric (80%) and eccentric (59%) loading are in alliance with Rio et al.'s study findings. From this, health service providers could appropriately design return-to-sport rehabilitation training modes able to address and subdue a multiplicity of musculoskeletal dysfunctions.

Cardio-vascular loading is critical for Total Lung Efficiency and functioning during maximal and sub-maximal workouts of a player and essentially determines oxygen transportation networks to working muscles ( $VO_2$  max) and encroachment of fatigue. Overwhelmingly, 39% never attempted and (11%) sometimes engaged return-to-sport players in cardio-vascular fitness exercises. While the target aerobic training zone of between 85% and 100% of maximal oxygen uptake ( $VO_{2max}$ ) has been recommended to yield positive results for a handball player (Dello Iacono, Padulo and Seitz (2018) in view of the physiological demands of the game, results of this study reveal that return-to-sport training regimens did not fully capacitate recuperating players.

The criticality of force vector application for directional drills that are handball-specific on functional rehabilitation tasks for players on the verge of returning to sport has been well explained by Contreras et al. (2017) and Morin and Samozino (2016) but appear not to find a place in this study.

Findings of this study, further reveals that some participants indicated non-existence of dynamic agility works (30%), power neuromuscular work (15%), concentric loading (13%) and progressive loading (10%) for return-to-sport players. This is unlike the majority of participants who indicated the existence of such aspects. In effect, absence of multi-modal training approaches of this nature

could turn into volatile grounds for a host of subsequent re-injuries if ideal 'bio safe zones' are not created during rehabilitation.

Although working within pre-defined precincts of maximal aerobic uptake and training zones are highly regarded facts (Dello Iacono, Padulo and Seitz, 2018; Morin and Samozino, 2016) there appear to be lack of training programmes, among some professionals, hinged on the critical aspects of eccentric, concentric, cardiovascular loading, dynamic agility works, power neuromuscular work and progressive loading during rehabilitation. Nielsen et al. (2017) stressed that coaches and fitness trainers need to ensure prescribed 'training load', 'structured-specific cumulative load' and 'structure-specific load capacity' concepts which are within player's training capacities. Turning to results of this study, incorporating these specifics could assist coaches and fitness trainers in monitoring and evaluating any transmutation changes with respect to given workload over a specific time-frame. Hence this significant knowledge gap regarding return-to-sport training protocols among some tertiary coaches and fitness trainers need to be plugged.

Moller et al. (2017) further advanced the criticality of 'acute-chronic workloads ratio' basing on Nielsen et al.'s tri-load training structure' This could serve as evaluative tools in determining, calculating and monitoring the progress of any given RTS motoric episodes. Chosen training modes (HIFT) as averred by Thompson (2018), Feito, Henrich, Butcher and Piston (2018) and Poston et al. 2016 need to stress on functional multi-joint movements with multi-modal orientation that elicits universal motor recruitment patterns via multi-plannary movements This should work towards the capacitation of cardio-vascular endurance, strength and flexibility. Despite the novelty that the above RTS suggestions bring, Arden, Glasgow and Schneider (2016) argue that the issue of collective decision-making by sports medicine professionals is a 'critical cog' as to how best an athlete should be re-oriented to active sport contexts. Regarding results of this study, professional expertise seem to lack among other health service providers regarding effective functional RTS training modes, an aspect that should be highly esteemed in health circles. Hence the possibilities of using ad hoc rehabilitation approaches that do not address player's functional capacities were high among such people.

Arden et al.'s (2021) popularized Back in the Game (24-week internet) intervention provides multi-

oriented psychological augmentation rehabilitation strategies. Such novel-oriented advances could realign recuperating players' fractured tenets of emotional intelligence which elicit distinctive and high physiological patterned responses. Subsequently, this could improve adherence levels to prescribed rehabilitation regimes. In spite of noticeable expert deficiencies among some of the sports clinicians, Arden et al. (2021) additionally provides a useful practically-based operational framework for rehabilitation and return-to-sport contexts.

Taken together, allied health service providers in Tertiary institutions need to understand that RTS criteria need to take a systematic approach that fully assumes a gradual metamorphosis for each sub-system to attain a successful healing process. From a public health perspective, the 'mainstay' for athletes' RTS needs to entrench the concept of 'athlete-centred medicine' that enshrines 'athlete-centred care' attitudes for all sports medicine professionals in Tertiary handball. Besides, the issue of players' objective profiles (injury records), activity structure (pivoting, non-pivoting), duration and exposure frequency advocated for by Dingenen and Gokeler (2017) need not to be undermined in the RTS training regimens by sports clinicians. More importantly, High Intensity Functional Training (HIFT) regimens could better serve to address multiple sensomotoric osteo-articulation systems and neurophysiologic deficiencies of recuperating tissues. Thus, this can only take a definitive shape through regularised educational clinic developments to improve skill sets of team members and inter-disciplinary team work at micro and macro settings.

## Conclusions and Recommendations

In this section the researcher gives the conclusions and the recommendations of the study.

### Conclusions

Basing on emerging findings of this study, there appear to be a gap between theory and practice during rehabilitation and return-to-sport transitional periods. Emerging findings revealed absence of quality return-to-sport training modes for re-enacting players' musculoskeletal systems. Quality social support synergies for full resurgence of return-to-sport players' physiological and socio-psychological tenets lacked among some health service providers. Financial resources proved to be a major setback for the take-off of meaningful rehabilitation programs. Additionally, lack of

practicalisation and specialist base levels regarding quality rehabilitation and return-to-sport training modes emerged among some sports medicine professionals which further contributed to volatile grounds for a host of subsequent re-injuries.

### Recommendations

The study recommends that co-opting multi-social support synergies during rehabilitation and return-to-sport episodes could significantly address players' socio-psychological and physiological tenets. Health service providers with amplified skill sets should fully re-orient athletes' fractured return-to-sport hope pathways. Further appropriately designed, quality contemporary evidence-based multi-modal training batteries should constitute critical evaluative 'viaducts' and 'mainstay' of rehabilitation and return-to-sport transitions for enhancement of players' socio-psychological and mitochondrial tenacity levels. This could further constitute winning ways for their self-authored adherence and commitment levels to prescribed rehabilitation training regimes. Adoption of scientific monitoring approaches could further substantiate reduction of inherent injury tendencies through HIFT regimens. Financial resource bases should be adequate enough to trigger multi-social support expertise for crucial rehabilitation and return-to-sport programs. The study further recommends that sports therapists receive periodically relevant and practically-oriented trainings to increase their knowledge resource bases in the field of sports injury rehabilitation.

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