Castle View School

Core PE Reading Tasks

Year 10

2020/2021

Name…….

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'Take the next shot' - the new message from Kobe Bryant's final game

By Harry Lambert
BBC Sport

-
- From the sectionBasketball

It is the last game of Kobe Bryant's career, on the final day of the 2016 NBA season, and his Los Angeles Lakers are down 10 with three minutes and change to go.

The result of this game has little meaning. His Lakers team, well past their prime, are not heading to the play-offs, and neither are their opponents, the Utah Jazz. The NBA story of the day is north of LA in Oakland, where the Golden State Warriors are about to become the most successful regular season team in NBA history. This is Kobe's final game, but the action is elsewhere, and he is going to lose.

The Lakers were the worst team in the Western Conference that year, having finished second-last the year before. Kobe, then 37, was a titan of the game - a winner of five championships - but he had hobbled towards retirement, overpaid and underproductive, barking at young and inadequate team-mates all year. Two years earlier, an Achilles injury had robbed him of his powers, closing the window on 15 years of greatness after he had, in 1998, become the youngest All-Star in league history. He was 19.

Three minutes 11 seconds remain in the game. Kobe has the ball on the left block, his back to the basket. He surveys the NBA floor, as he has done 1,565 times before. Only two men have scored more points than him. He is built no differently than the average NBA player - 6ft 6in, strong, athletic - yet he has eclipsed almost all of them, not least his idol Michael Jordan, who is one place behind him on the all-time list. Kobe spins, drives and hops to the basket, evading two defenders. Lay-up. Eight-point game.

I fell in love with the game of basketball at 13. When I visited my grandparents soon after, in the hoopless hillside gloom of the Welsh countryside, I dribbled a ball every day until dark, down flat, empty roads. I have since spent more time playing basketball - usually alone on a hoop - than I have doing just about anything else. I have spun, driven and hopped to the basket, and evaded the countless defenders in my mind. I have come back from impossible deficits and drained the game-winning shot. And I have walked off an empty court, as alone in that knowledge as any daydreaming kid.

Two minutes 23 seconds to go. After a Utah bucket, the Lakers' deficit is back to 10. Kobe, on the left wing but now facing his defender, dribbles from side to side. He makes for the middle of the floor, then spins and dives to the hoop, drawing a foul. He heads to the line, making both free-throws to muffled chants of "MVP". Eight-point game.

I was one of hundreds of millions of new NBA fans in the 2000s. The game is now global, second in popularity only to football. More than anyone, Kobe was the face of that revolution. Jordan came first and LeBron James has followed, but Kobe was the first truly global icon. Jordan and LeBron were better, but Kobe was, for many, the image of the NBA. Every current NBA player grew up watching him. LeBron, who was 13 when Kobe made his first All-Star game, revered him, while the superstars of today - my generation - discovered him at his peak. "I started playing ball because of Kobe after watching the 2010 finals," wrote Joel Embiid - the Cameroonian star of Kobe's hometown team, Philadelphia - **after his death at the age of 41.** "I had never watched ball before that and that finals was the turning point of my life."

With one minute 49 seconds to go, Kobe pushes the ball down the floor. He slips past his team-mate's screen and ploughs through the defender up ahead, avoiding the reaching hand of another. Two giant steps and he is at the cup. He flicks the ball high off the glass. It drops in. Six-point game. The crowd roars. The broadcast cuts to his wife and two of his daughters - smiling, clapping, basking in the moment.

I did not love Kobe growing up. I loved AI - Allen Iverson. He was an equally complex and generational athlete; a 6ft maestro in a game of giants, whose will to win defied gravity, and was only matched by Kobe. AI never reached Kobe's heights - which made Kobe an enemy, not a hero. In one of Iverson's final moments of brilliance in 2010, it was Kobe who put an end to his run, just as he had in the 2001 NBA Finals - Iverson's only shot at the title. In all sports, only a handful of opponents are ever worthy of your hate. When they die, you realise the hate was love.

The camera is back on Kobe - bent double, grimacing, striving for air. It is Lakers ball, down six. Kobe nods, his team-mate inbounds, and with 94 seconds left in his career, he dribbles up court.

As a boy, the first headline I remember seeing on ESPN was the **collapse of the rape case against Bryant in 2004.** I knew nothing about the league or its stars. This was my introduction. The story disappeared, and I was too young to chase it. I never did, not wanting to find a reality that would scar the game. Never, that is, until Kobe's death. Last week I read of the 19-year-old hotel employee who accused Bryant, then 24, of raping her. At first Kobe denied having sex with her. Then he relented but maintained it was consensual. She was bruised. He claimed it was part of games he played. "My hands are strong. I don't know," he said. The case was settled. Bryant apologised, without admitting guilt. How does this change everything? I do not yet know.

Kobe calls for a high screen from a team-mate. Two Jazz defenders swarm. In the split-second before they reach him, Kobe throws the ball ahead and dives into the gap between them. He stops on a dime, pulls up. The net snaps back in perfection. The crowd erupts. Jay-Z, Jack Nicholson, Kendrick Lamar, David Beckham, Kanye West. The world is here. Four-point game.

Barack Obama has written that basketball taught him "an attitude that didn't just have to do with the sport". Respect, the future US president wrote in Dreams Of My Father, "came from what you did and not who your daddy was". It was on the court that Obama,

the stoic of the Oval Office, learned that you "didn't let anyone sneak up behind you to see emotions… you didn't want them to see".

Kobe is calm. Whatever he is feeling is hidden to the 20,000 fans now on their feet and the five Utah Jazz players in front of him. With 64 seconds left as a basketball player, he takes a screen and drifts to the left arc. He head-fakes his defender to get a step on him, but the guy is right there. Then he rises, out of nothing, falling away, one foot an inch beyond the three-point line, the other almost out of bounds. He rises, the defender rising with him at full stretch. He has no business making this shot. Even the best shooters miss more than half the time - and from out here Kobe is not one of the best, he is barely even average. But this shot is not average, it is hard. It is the shot you do not think he can make - the one he should not take - and that makes it the one he is going to make. "Bryant… on its way… it's a one-point game!"

The world, wrote VS Naipaul, is a cold place. Those who are nothing, who allow themselves to become nothing, have no place in it. But Kobe was colder than the world. He was, I told myself as I played, ice cold. Growing up in the internet era, which Kobe's career mirrored and helped shape, it became my username: icecold13. "Don't let up, don't cruise, don't give them hope," I told myself whenever I was up. "Be Kobe. Be merciless. Win." With the game on the line, I knew where I was going: to the right block - to spin, kick, rise, snap, and fade from 15 feet. To ice the game, just like Kobe.

Thirty-six seconds left, down one. This is it. Every second of the past two and a half minutes - of the past 20 years - has been for this. Down one, what have you got? The arena is in meltdown. Everyone in the building knows Kobe is pulling up, but from where? He hovers at half court, calculating. The screen comes, inviting Kobe left. He takes three steps, just enough to make his defender chase - and then dives back to the right, shaking his man. He pushes the ball ahead and begins to shape towards the basket. That is it, he has already decided. He is 28 feet away, way out of range - but the second defender is a few feet back; he is going to live or die from here. He takes one sharp, left-hand dribble, gets to 22 feet, stops on a pin and pulls up.

He hangs in the air, two feet off the ground. His whole body is in perfect alignment with the hoop, his elbow at right angles. He could be suspended by an invisible thread. All that is left is for him to let it fly. "Bryant... for the lead!" Bang. As the ball snaps through the net, Kobe has already landed - his balance in tact, his arm outstretched, his entire being oblivious to the roar of the 20,000 surrounding him. It is the perfect shot. Lakers by one. For the first time, Kobe's ice mask breaks. He thuds his chest. It is over.

In the hours after Bryant's death, one famed coach spoke, between tears, of "looking at my young players and seeing how emotional they are", despite the fact "they didn't even know him". But we all knew him. No-one - in LA or anywhere else - stepped on to a basketball court without soon hearing Kobe's name. After his death, we went online. "This will never seem real," wrote one NBA player. "I need to get off Twitter but I can't close it," a friend texted me two hours after the news broke. In a tweet liked 244,000 times, someone wrote: "Kobe probably in heaven looking down at us like: 'You over there crying and you need to be in the gym putting in work.'" We went online. And then we went to a gym, a court, a hoop - and put in work. Spin, kick, rise, snap, fade. Spin, kick, rise, snap, fade. Spin, kick, rise, snap, fade.

With nothing left, Kobe Bean Bryant put up 15 straight points. Left, right, lay-up, pull-up, two, three - whatever it took. In his final act, he left his message. You can miss, trail, lose, fail - but take the next shot. And the shot after that. Kobe kept shooting that night, as he always did. With three minutes left, he had shot 45 times - an unprecedented number. The Lakers were down 10. He had failed - the fighter who did not know how to quit. And then he took one more shot, and the one after that. He kept shooting, until the buzzer sounded and he had won. He won that final night in 2016. In death, he is in the minds of a billion people. Long after grief, he will live. He is dead. He is more alive than ever.

Super Bowl 2020: Vince Lombardi, the story behind the name on NFL's biggest prize

By Alex Bysouth
BBC Sport

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There is a name that resonates with American football fans across generations. When Kansas City Chiefs and San Francisco 49ers meet in the Super Bowl on Sunday, the very prize on offer carries it.

The Vince Lombardi Trophy.

Lombardi was a five-time National Football League-winning coach, an icon of the game who is still celebrated half a century on from his death, as the NFL's 100th season comes to a close.

His legend speaks of a man who inspired players through fear, iron discipline, and confrontational coaching techniques. A leader who took a no-hope Green Bay Packers team and won five titles in seven years between 1961 and 1967.

But beneath the steely exterior of his success are deeper achievements that carry Lombardi's legacy beyond sport, in battling discrimination, championing equality and breaking down racial barriers.

Born in 1913 New York, the son of an Italian meatpacker who studied for the priesthood in his teens, as a young man Lombardi bounced between career paths. Law school and the world of finance didn't suit him. But an offer from an old team-mate to become a high school assistant coach lit an old spark.

Lombardi had played American football during high school, and during studies at Fordham University, before later featuring for minor league teams Wilmington Clippers and Brooklyn Eagles. By 1939 - at the age of 26 - he'd left the game behind, in search of a settled job. Instead, it had found him again.

"Once that opportunity came up, he knew it was what he was meant to do," his son, Vince Lombardi Jr, tells BBC Sport. "He loved to teach and liked coaching."

Lombardi cut short his own honeymoon to make it back in time for training camp at St Cecilia High School. The foundations of the strict, no-nonsense approach that would later become famous were already being laid, with students recalling weeks of "merciless calisthenics" and long sessions late into the evening.

"He was no different at home to how he was anywhere else," remembers Lombardi Jr. "For a coach he had two qualities: he was a perfectionist and had a short temper. For him being my father, those weren't such great qualities."

Lombardi's knack for getting the best out of his players was obvious. Under his tutelage St Cecilia went 32 games unbeaten and he led the basketball team to the state championship, despite knowing very little about the sport.

A move to Fordham, his old university, followed in 1947, before he took a job as offensive line coach with the US military's side at West Point two years later.

"I remember going to spring practice, standing on the sidelines at games watching him and realising he was the one in command," says Lombardi Jr.

Lombardi's burgeoning reputation earned him a role at the New York Giants in 1954, and then in 1959, at the age of 45, he got his big break. Head coach in the NFL with the Green Bay Packers.

Lombardi's grandparents may have emigrated to the US from Italy, but he was a born-and-bred New Yorker. It was a bold decision to move his family 1,000 miles away to Green Bay, Wisconsin.

This was Lombardi's chance to be in control, to lead his own team. It's just this team were almost broke and coming off the back of the worst season in their history.

Green Bay, perched on the edge of Lake Michigan and home to a Packers side that had not registered a winning season in 12 years, would soon be dubbed 'Titletown' thanks to Lombardi's remarkable success over the next decade.

The rookie boss insisted the Packers would be run on his terms and his impact was instant - Lombardi was named Coach of the Year in his first season, for turning the league's worst side into one that posted a winning record.

"He brought a degree of excellence to the game," Jerry Kramer, an offensive lineman pivotal to Lombardi's side, told an NFL documentary.

"He was a wonderful teacher. He believed teaching was the greatest profession. He said: 'It's not coaching, it's teaching'."

Lombardi famously commented that by chasing perfection "we can catch excellence". In return, the disciplinarian coach demanded complete dedication from his players.

Defensive tackle Henry Jordan quipped: "Lombardi treat us all the same - like dogs." But he knew which buttons to press to get the best out of each player.

Kramer recalled a story about how he missed a block and Lombardi came running across the field, stopped 10 inches from his face and screamed: "Mister! The concentration period of a college student is five minutes, for high school it's three minutes, kindergarten it's 30 seconds, and you don't have that? So where's that put you?"

Later that day Lombardi, showing the empathy that offset his strict nature, found Kramer in the locker room, ruffled his hair and told him he would be the best guard in football one day.

"From that point on, if he believed in me, I could believe in me," added Kramer, who was later inducted into the Pro Football Hall of Fame.

In Lombardi's second season, in 1960, the Packers reached the Championship Game only to fall to an agonising defeat by the Philadelphia Eagles. The boss pledged he would never lose another championship match. And he didn't.

The man dubbed 'The Pope', because he would attend mass every day, led Green Bay to their first title in 17 years in 1961 and another the following season, beating his former employers the New York Giants on both occasions.

During that success Lombardi would be pictured smoking on the touchline, something he deemed a personal weakness. Things changed after he received a letter from a concerned mother in 1963, telling him it set a bad example.

"When he got the letter he quit, just took his pack of cigarettes, crushed them up and threw them in the garbage," says Lombardi Jr.

The assistant coaches at Green Bay, expecting they would take the brunt of their boss going cold turkey, feared him ditching his habit.

"My mother was a prolific smoker, she would light one cigarette as the other goes out," says Lombardi Jr, recognising how difficult that made it for his father to stop.

"She smoked constantly around him so we said he had to quit every day. He was a chain smoker, so to just roll your pack up and throw it away took a lot of discipline."

Lombardi also had to suffer seeing the NFL title celebrated elsewhere for the next two seasons. But he and the Packers responded in 1965 by defeating defending champions the Cleveland Browns, and the following year they beat the Kansas City Chiefs to claim the first ever Super Bowl.

Green Bay then made it an unprecedented three titles in a row when they saw off the Oakland Raiders in 1967. It would prove to be Lombardi's fifth and final NFL crown, as he stepped back to take on general manager duties before leaving for the Washington Redskins in 1969.

But for many, the trophies and titles only tell part of the story. Lombardi was about more than winning.

And so to the other great legacy of Vince Lombardi, whose sporting success came at a time when Jim Crow Laws enforcing racial segregation existed in the southern United States, meaning black players could not stay in the same hotels or drink in the same bars as their white team-mates.

In Green Bay, private housing remained unavailable to a majority of black players, so when Lombardi signed defensive back Emlen Tunnell, who would become the first black player inducted into the Pro Football Hall of Fame, he put him up at the plush Hotel Northland.

That didn't mean the experienced Tunnell escaped Lombardi's brash and intense manner. He once told a reporter Lombardi was "a real brass, real arrogant", before adding: "But nobody else can cuss Lombardi out to me. In my heart, I know what he is."

Lombardi said he saw athletes as "neither black nor white but Packer green" and demanded everyone be treated equally, refusing to allow any kind of prejudice. He told players if he ever heard discriminatory language they would be "through".

"That goes back to being Italian in New York in the 1920s and '30s," says Lombardi Jr, whose father felt he had been overlooked for jobs earlier in his career because of his Italian heritage, and once got into a fight at university after someone mocked his dark complexion.

"Having experienced something like that, his antenna was up. I don't think it was all that intentional on his part, as much as if you are a good football player and you can contribute to the team that's all that matters."

The head coach increased the number of black players on the Packers roster from just one when he arrived in 1959 to almost a third of the 40-plus squad when he left nearly 10 years later, and as his status grew in Green Bay he began to assert change.

Lombardi told restaurant and bar owners that any place not accepting black players was off limits to the whole Packers squad. He demanded all his players have suitable accommodation and informed teams in the south they would not stay anywhere asking for players to be segregated.

"He slowly integrated us into the city," cornerback Herb Adderley told the Milwaukee Wisconsin Journal Sentinel in 2012. "He said: 'If the black players are going to help this team win, the city needs to understand these players need good places to live.'"

In his book Closing the Gap, former Packers defensive end Willie Davis wrote: "Nobody had more impact in creating diversity in the NFL than coach Lombardi.

"Right from the start he treated us as equals, just players competing for a spot on the team. He chose not to see colour in an era where most chose to look the other way."

Lombardi's quest for equality stretched further than race. His brother Harold was homosexual and he wanted to create an environment of acceptance within the locker room.

During his one season with the Washington Redskins, Lombardi coached running backs Ray McDonald, who was arrested a year earlier for having sex with another man in public, and Dave Kopay, who would later become the first former NFL player to announce he was gay.

"Vince Lombardi had so much humanity. I was just lucky to be around him," Kopay told ESPN in 2013. "Back then gay people were almost thought of as deviant. It really was terrible at the time."

In his biography of Lombardi, When Pride Still Mattered, author David Maraniss says the boss told staff working with McDonald that if he heard any "reference to his manhood, you'll be out of here before your ass hits the ground".

The image of a short-tempered, confrontational boss juxtaposed the caring, nurturing mentor beneath and made Lombardi easy to misread. Maraniss says President Richard Nixon once considered him as a potential running mate, only for the Republican to find out Lombardi was a Democrat with close ties to the Kennedy family and someone keen on gun control.

Lombardi's progressive attitudes came in a period when the US was at war in Vietnam and facing violent protests at home. Sadly, his own life would be cut short.

His death, when it came in 1970, was sudden. At the age of 57 he was diagnosed with an aggressive form of colon cancer, and he died 10 weeks later.

According to the Green Bay Press Gazette, President Nixon told a White House dinner party "in a time when the moral fabric of the country seems to be coming apart" Lombardi was "a man who insisted on discipline and strength".

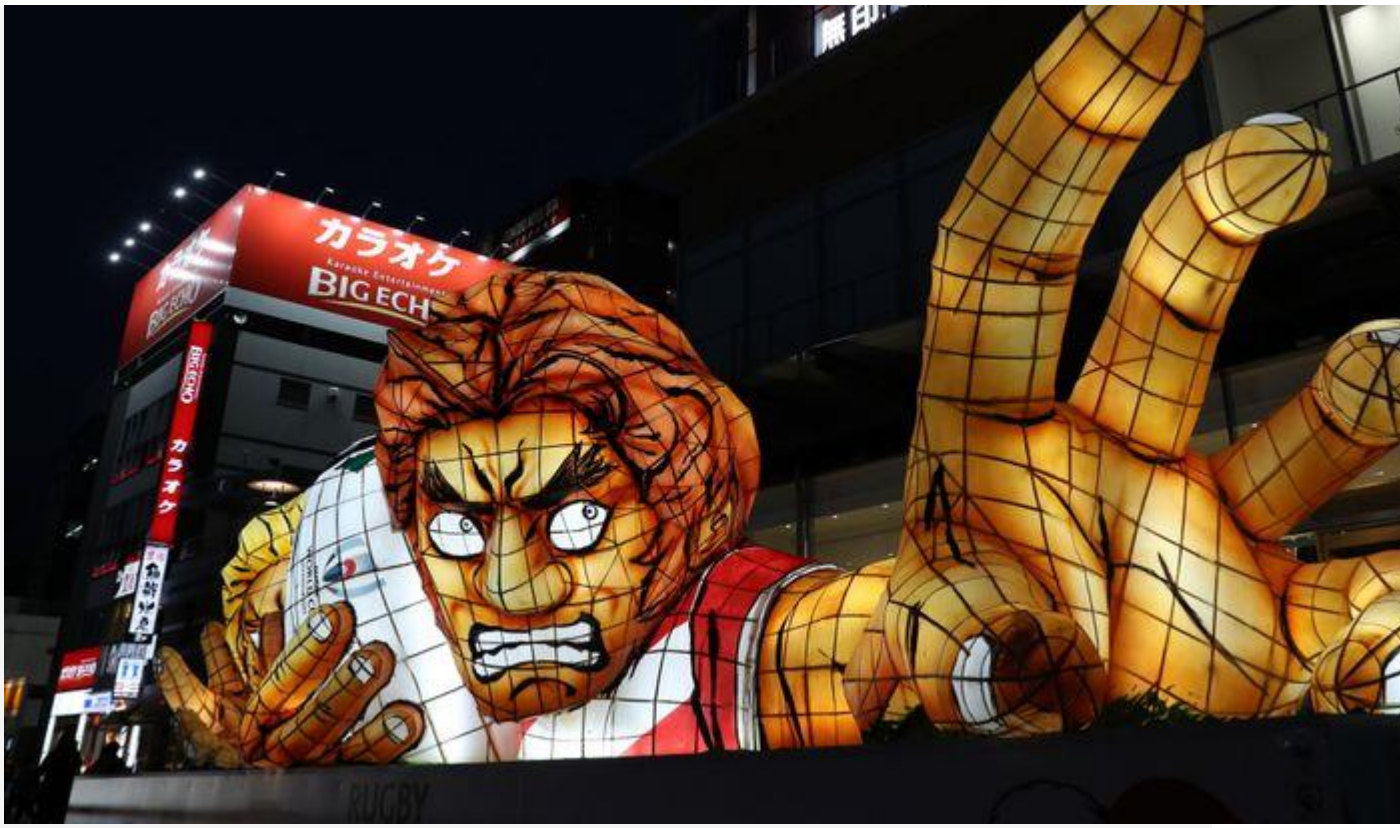
In recognition of his achievements, Lombardi was inducted into the NFL Hall of Fame and the Super Bowl prize was renamed in his honour.

"It seems so accepted," says Lombardi Jr.

"But you feel good about how his name is associated with the trophy. With all the positive things associated with what he did."

Rugby World Cup 2019: Memorable moments from this year's tournament in Japan

By Sky Sports Rugby Union
Last Updated: 04/11/19 5:30pm



This year's Rugby World Cup in Japan provided many memorable moments

The 2019 World Cup was another tournament full of thrills and spills as the best teams and players in rugby union gathered to battle it out for the Webb Ellis Cup.

Along with breaking new ground by being staged in Japan for the first time, this year's tournament proved enthralling from the first game to the last as South Africa were crowned champions for the third time.

Here, we take a look back on some of the stand-out games, star players and memorable moments from an unforgettable six weeks…

- RWC: Team of the tournament
- Stuart Barnes' RWC talking points
- Scrum savagery; a nightmare start

Games of the tournament

Right from the opening weekend, there were some thrilling spectacles at the World Cup - not least France's 23-21 victory over Argentina in the first match of Pool C.

Converted tries from Gael Fickou and Antoine Dupont, plus two penalties from Romain Ntamack, put the French 20-3 up at the break.

But the Pumas rallied to score 18 unanswered points on the back of Guido Petti Pagadizábal and Julian Montoya tries and Benjamin Urdapilleta's kicking, only for Camile Lopez to snatch victory for Les Bleus with a drop goal.

Hosts Japan chalked up some memorable results too as they enjoyed a fairy-tale run to the quarter-finals, although perhaps none more so than the 28-21 victory over Scotland in the final round of Pool A.

Prolific winger Kotaro Matsushima set the host nation on their way and then prop Keita Inagaki rumbled over to finish off a scintillating offloading move which emphasised the Brave Blossoms' attacking approach, with the win seeing them finish top of the pool and eliminating Scotland.

They were not the only to team to cause an upset, with Uruguay recording a famous and historic 30-27 victory over Fiji thanks to converted tries from Santiago Arata, Manuel Diana and Juan Manuel Cat, plus the kicking of Felipe Berchesi.

England's dominant display to dump out defending champions New Zealand in their 19-7 semi-final victory was one of the most complete

team performances of the entire tournament, while the final itself was a tense, nail-biting affair.

Owen Farrell and Handre Pollard engaged in a battle for goal-kicking supremacy, before moments of magic from wingers Makazole Mapimpi and Cheslin Kolbe secured a 32-12 victory for South Africa.

Players of the tournament

Pieter-Steph du Toit was named player of the year after an impressive World Cup campaign

A series of impressive displays as South Africa secured their third Rugby World Cup triumph helped Pieter-Steph du Toit claim World Rugby's player of the year accolade the day after the tournament concluded.

The flanker was not the only player to star for the Springboks though, with the nerveless Handre Pollard providing a steadying influence at fly-half and kicking a number of vital goals for his team to finish as the competition's top point-scorer.

Then there was fleet-footed winger Chelslin Kolbe, who showed just why he is regarded as one of the most exciting players in world rugby and capped off a series of eye-catching displays with a superb solo try in the final which put the seal on South Africa's World Cup triumph.

It was not just the Boks who saw some stars come to the fore, however. Fellow finalists England had several players who lit up the tournament, not least of in the forwards where Maro Itoje and Tom Curry shone on a regular basis.

Itoje was a monster at the breakdown, where the second row's ability to win turnovers helped get his side on the front foot. He was strong in the line-out too and underlined his status as one of the biggest talents in English rugby.

On the flank, Curry continued the impressive progress he has made since breaking into the national team on England's tour of Argentina two years ago. Not only did he put in a string of strong performances, but earned a nominated for World Rugby's player of the year award too.

Then there was Beauden Barrett, who excellent for New Zealand at full-back after being moved from fly-half to accommodate Richie Mo'unga in the number 10 shirt. Although the All Blacks could not make it three straight World Cup wins, Barrett in full flight was still a sight to behold.

Tries of the tournament

In some ways, one of the best was left until last - that being Makazole Mapimpi's try in the final for South Africa against England which opened up some daylight and saw the Springboks put one hand on the trophy.

Santiago Arata scored a stunning try in Uruguay's win over Fiji

A tight-fought contest was blown wide open in the 66th minute when the ball was quickly shifted left to the winger, followed by him kicking forward for Lukhanyo Am to chase and collect before flicking it back out wide for Mapimpi to finish.

There were some stunning scores in the pool stages as well, however, not least of all Santiago Arata's aforementioned score for Uruguay in their victory over Fiji.

Hooker German Kessler recovered a loose ball and set the scrum-half dancing through the defence from over 40 metres out to score under the posts and set Los Teros on course for their first-ever victory over a top-10 ranked nation.

The Fijians, masters of rugby sevens, are capable of produced moments of magic too and did so in their first pool match against Australia with a scintillating attack started from inside their own half and finished by Waisea Nayacalevu sending support-runner Peceli Yato over.

Peceli Yato finished off a fine move to score for Fiji against Australia

Host nation Japan lit up the tournament with their flowing, attacking style and that was emphasised in the pool stage victory over Scotland by working the ball one way then the other, and coming up with three offloads for prop Inagaki to dive over under the posts.

And who does not enjoy a prop rampaging through to score, as with Kyle Sinckler's try which kept England on course for a comfortable 40-16 victory over Australia in the quarter-finals?

Tackle of the tournament

There were some bone-rattling tackles made throughout the tournament, with England's back row duo of Curry and Sam Underhill both leaving their mark on opponents.

Curry underlined his status of man of the match in England's quarter-final win over Australia when he sat down dangerous Wallabies back Reece Hodge.

Reece Hodge felt the full force of Tom Curry's tackling in Australia's quarter-final defeat to England

Then there was fellow flanker Underhill bringing a dangerous run from Jordie Barrett to a shuddering halt as Eddie Jones' side dethroned reigning back-to-back champions New Zealand in the semis.

England players were on the receiving end of some big hits too, with Billy Vunipola being nailed by Zane Kapeli flying out of the line and put on his back in their opening match of the World Cup against Tonga.

Fellow Pacific Islander Semi Radradra was responsible for another one of the stand-out tackles in Fiji's pool clash with Wales, providing the welcoming reception for Liam Williams when the Welshman caught a high ball.

Iconic moments of the tournament

Arguably the one moment which resonated far beyond rugby was Siya Kolisi stepping up to receive the Webb Ellis Cup following South Africa's victory over England in the final.

Siya Kolisi lifts the Webb Ellis Cup after South Africa's win over England

It completed the flanker's rise from a tough upbringing in the Zwide township outside Port Elizabeth to becoming the first black player to captain the Springboks, leading a team of all creeds and backgrounds to glory in Japan.

Uruguay's shock victory over Fiji was a huge moment for South American rugby, while Japan showcased just how far they have progressed as a nation by topping their pool and reaching the knock-out stages.

After opening with a victory over Russia, the host nation showed no respect for reputation by overcoming both Ireland and Scotland in impressive style before giving the eventual champions a run for their money in the quarter-finals.

The Japanese fans fully embraced the tournament too, welcoming and showing their support to all nations, going as far as to learn the words to the various national anthems and join in singing them pre-match.

The Japanese fans embraced all nations taking part in the Rugby World Cup

It was not all plain sailing for the hosts though, with Typhoon Hagibis wreaking havoc across the nation towards the end of the pool stages. However, Canada's players pitched in to help the recovery efforts in Kamaishi after their game against Namibia was cancelled.

Quotes of the tournament

"My daughter is always angry when she is watching my games because she thinks the other players are hurting me. She even thinks my teammates are hurting me, and she says she will come to my training and get angry at my team-mates."

- Georgia hooker Jaba Bregvadze on his five-year-old daughter Elene watching him play.

"I apologise for his moustache. What a great character he is, a great person, and an example to any captain in world rugby."

Russia captain Vasily Artemyev

- Russia coach Lyn Jones on his captain Vasily Artemyev.
"When I congratulated James and said well done, his reply was, 'You have finally seen the light, have you?' I thought it was brilliant, a great response. I love a bit of banter like that."

- Wales coach Warren Gatland on giving James Davies his first Rugby World Cup start against Fiji.
"I'm not getting rid of the mullet. You can ask this every week, but it's not going. There is scientific evidence that shows it makes me faster. It was done at Harvard, I think."

- New Zealand centre Jack Goodhue on his eye-catching hairstyle.

Also See:

- 'Strange if Jones not in charge in 2023'
- Du Toit, Scarratt win world POTY awards
- Rugby on Sky
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"One day you're the best team in the world and the next a team knocks you off."

- England coach Eddie Jones after following up an amazing semi-final victory over New Zealand with defeat to South Africa in the final.

What is Healthy Active Living?

Healthy active living includes eating healthy foods, staying physically active, and getting enough rest. Developing healthy habits starts in early childhood. Eating well and being physically active helps a child continue to grow and learn.

Why Is It Important?

Research tells us that the way young children eat, move, and sleep can impact their weight now and in the future. Early childhood is an ideal time to start healthy habits before unhealthy patterns are set. It's never too early to start:

- Encouraging breastfeeding for at least the first 6 months of life
- Eating healthy meals and snacks

Young children depend on parents, caregivers, and others to provide environments that foster and shape healthy habits. Child care centers have a responsibility to promote growth and development, make healthy foods available, and provide safe spaces for active play. Staff can help children and families by encouraging and modeling healthy eating and physical activity at the center and by providing suggestions for small, healthy steps at home.

5-2-1-0 programs are helping many communities to have healthy active lives by promoting four simple strategies for families. Many states have created materials for families, child care centers, and workplaces and they are often available in multiple languages. These resources are widely available on the Internet and free for others to replicate and use. 5 Eat at least 5 fruits and vegetables a day. 2 Keep screen time (like TV, video games, computer) down to 2 hours or less per day. 1 Get 1 hour or more of physical activity every day. 0 Drink 0 sugar-sweetened drinks. Replace soda pop, sports drinks and even 100% fruit juice with milk or water. What is Healthy Active Living?

10 Things You Should Know

1 Physical health can impact a child's readiness to learn. If a child is hungry, tired, or physically uncomfortable, she may be less able to pay attention, manage her feelings, and remember what she learns.

2 Health considerations should be included in data analysis for child assessment and outcome analysis. Children who are hungry, tired, or ill might not be able to demonstrate their true skills and knowledge.

3 Children with consistent access to healthy food are more likely to develop appropriately and have the energy to learn.

4 Terms like healthy habits, healthy active living, and healthy weight can be used instead of "obese," "obesity," or "overweight," words many parents don't like to hear associated with young children.

5 Babies who are breastfed for at least 6 months are more likely to grow up with a healthy weight.

6 Many parents find it hard to set limits on sugary beverages, especially juice. Even 100% fruit juice has sugar that can damage teeth.

7 An hour of active play might seem like a lot, but it doesn't have to be all at one time. Parents and teachers can find ways to help children be active for 10–15 minutes several times each day.

8 Weather or safety can be a challenge for children to play outdoors. Parents may look to Head Start staff to provide creative ideas for safe and active indoor play.

9 Programs can share information with families about low-cost, seasonal fruits and vegetables, with ideas for how to prepare them in a healthy way.

10 Parents can strategize with each other and staff for ideas to get children to try new foods and be active at home.

Why is physical activity so important for health and wellbeing?

We know that staying active is one of the best ways to keep our bodies healthy. But did you know it can also improve your overall well-being and quality of life?

Here are just a few of the ways physical activity can help you feel better, look better and live better. Because, why not?

It's a natural mood lifter.

Regular physical activity can relieve stress, anxiety, depression and anger. You know that "feel good sensation" you get after doing something physical? Think of it as a happy pill with no side effects! Most people notice they feel better over time as physical activity becomes a regular part of their lives.

It keeps you physically fit and able.

Without regular activity, your body slowly loses its strength, stamina and ability to function properly. It's like the old saying: you don't stop moving from growing old, you grow old from stopping moving. Exercise increases muscle strength, which in turn increases your ability to do other physical activities.

It helps keep the doctor away.

Stand up when you eat your apple a day! Too much sitting and other sedentary activities can increase your risk of heart disease and stroke. One study showed that adults who watch more than 4 hours of television a day had an 80% higher risk of death from cardiovascular disease.

Being more active can help you:

- lower your blood pressure
- boost your levels of good cholesterol
- improve blood flow (circulation)
- keep your weight under control
- prevent bone loss that can lead to osteoporosis

All of this can add up to fewer medical expenses, interventions and medications later in life!

It can help you live longer.

It's true, 70 is the new 60… but only if you're healthy. People who are physically active and at a healthy weight live about seven years longer than those who are not active and are obese. And the important part is that those extra years are generally healthier years! Staying active helps delay or prevent chronic illnesses and diseases associated with aging. So active adults maintain their quality of life and independence longer as they age.

Here are some other benefits you may get with regular physical activity:

- Helps you quit smoking and stay tobacco-free.
- Boosts your energy level so you can get more done.
- Helps you manage stress and tension.
- Promotes a positive attitude and outlook.
- Helps you fall asleep faster and sleep more soundly.
- Improves your self-image and self-confidence.
- Helps you spend more time outdoors.

The American Heart Association recommends at least 150 minutes of moderate-intensity aerobic activity each week. You can knock that out in just 30 minutes a day, 5 days a week. And every minute of moderate to vigorous activity counts toward your goal.

So, this is easy! Just move more, with more intensity, and sit less. You don't have to make big life changes to see the benefits. Just start building more activity into your day, one step at a time.

Top 5 Reasons Why Physical Education is As Important As Schoolwork

In Children's Health, Counselors, Educational Strategies & Tips, Educators, Parents, Social-Emotional by Ray SamAugust 4, 2017

Many schools are now motivating students to maintain a balance between their school work and physical education. Physical education is an essential part of healthy living for people of all age groups, especially those going to school. This is because school life is full of stress and anxiety at every stage.

Researches have proved the importance of physical activities for students in a school environment. Thus, many schools are now encouraging students to take part in physical education. Scientifically these activities have been proven to be as important as doing school work.

Related Article: Does Increasing Physical Activity in School Lead to Improvements in Academic Achievement and Behavior?

Physical education teaches students to improve the quality of their life. Focusing only on school work can make their life boring and stagnant which in turn can cause depression and failure. Physical activities and exercises boost their stamina which can make them fall in love with their intelligence and abilities.

Top 5 Reasons Why Physical Education is as Important as School Work:

1. Enhances an individual's ability to concentrate and maintain focus:

Several studies show that performing physical activities helps in enlarging the basal ganglia of the brain. The Basal Ganglia is a part of the brain which is responsible to maintain an individual's capability to focus. In this current era students have several diversions in the form of technologies (Television, tablets, PCs, Mobile phones), therefore, it is difficult for them to maintain focus. By promoting physical education, school teachers can help them improve their concentration. Schools often arrange physical games and exercises which require concentration. Thus, students are promoted to take part in such activities along with their school work, so this will help in maintaining their healthy body and minds.

Related Article: Exercise Ideas to Support Children with Autism and ADHD

2. Important for healthy growth and development:

In today's world, many school children eat unhealthy foods. These may include the fries, soft drinks, pizzas and burgers. Consuming these on a regular basis can lead to childhood obesity.

Physical education at school helps in preventing obesity and high blood pressure. Physical exercise and activities will help them burn off their extra calories. If these calories are not burned off they will be stored as fat. By doing physical exercises individuals use their extra calories to gain energy.

Plus, such activities play an important role in the healthy growth and development of bones and cartilages. Bone strengthening exercises such as jumping are particularly important for school children as such activities produce a force onto the bone that helps enhance its strength and growth. While muscle strengthening exercises make muscles larger and stronger, they also help children carry more weight and aid in protecting joints against injuries.

Being physically active makes the students energetic and strong which motivates them to take interest in classroom activities. Exercises which help strengthen muscles include:

- Climbing Trees.
- Monkey bar exercises.
- Bike Riding.
- Push ups.
- Hula hooping.

A physically active student will also have a healthy heart. Any exercise which provides oxygen to the muscles is called as an aerobic exercise. Such exercises are essential for a healthy heart. Research shows that kids who perform aerobic exercises, two to three times a week for at least twenty minutes, have a healthier heart as compared to those who don't take part in physical education. Some of the healthy aerobic exercises are:

- Playing Basketball.
- Playing Soccer.
- Jumping rope.

3. Prevents sleep deprivation:

A complete night's sleep is an essential component of a happy and healthy life. Those students who take part in physical activities and exercise regularly have a tired and exhausted body which craves a good night's sleep.

Complete sleep makes kids more upright and attentive during lectures in classroom. Being attentive will help prevent them from performing careless mistakes and will provide them energy to be helpful towards teachers and their fellow students.

4. Helps in relieving stress and anxiety:

School life is hectic for every individual. Therefore, taking part in physical activities and education allows students to relieve their academic stress and anxiety. Stress might be due to a fight with a friend or a low grade despite of hard work. Stressed students are

not able to concentrate and focus on their academic performance if they are not allowed time to de-stress.

Physical activities give them an environment to breathe out their stress. By exercising and breathing deeply, we provide extra air to our lungs which in turn provides more oxygen to the brain, this makes the brain feel relaxed and stress free.

A physically active individual is more likely to be happy and healthy, which makes them a better student in the classroom. They often feel proud and happy about themselves and are good towards their fellow students.

5. Physical education makes an individual flexible and happy:

Balancing exercise and stretching, helps improve physical balance which decreases the chances of injuries. Those students who make physical education as important as their school work become more flexible in their routine life. Such activities make the body elastic and flexible. It allows an individual to manage both a physical and mental workload. Scientific research reveals the fact that physical education in school helps in improving the connections between neurons of the brain. Healthy and well-connected neurons help improve the over-all thinking ability of students. Thus, making them better students in classroom.

Many schools have made physical education an essential component of school curriculum and students are promoted to maintain a healthy balance between their education and exercise. This is due to the fact that those students who take part in physical activities have proved to be happier and healthier than those students who spend all their time doing school education work. Such activities help develop the blood circulation in an individual's body. This helps in providing more oxygen to the heart and brain and allows the body to maintain a balance between physical and mental health.

Eating a balanced diet

Eating a healthy, balanced diet is an important part of maintaining good health, and can help you feel your best.

This means eating a wide variety of foods in the right proportions, and consuming the right amount of food and drink to achieve and maintain a healthy body weight.

This page covers healthy eating advice for the general population.

People with special dietary needs or a medical condition should ask their doctor or a registered dietitian for advice.

Food groups in your diet

The Eatwell Guide shows that to have a healthy, balanced diet, people should try to:

- eat at least 5 portions of a variety of fruit and vegetables every day (see 5 A Day)
- base meals on higher fibre starchy foods like potatoes, bread, rice or pasta
- have some dairy or dairy alternatives (such as soya drinks)
- eat some beans, pulses, fish, eggs, meat and other protein
- choose unsaturated oils and spreads, and eat them in small amounts
- drink plenty of fluids (at least 6 to 8 glasses a day)

If you're having foods and drinks that are high in fat, salt and sugar, have these less often and in small amounts.

Try to choose a variety of different foods from the 5 main food groups to get a wide range of nutrients.

Most people in the UK eat and drink too many calories, too much saturated fat, sugar and salt, and not enough fruit, vegetables, oily fish or fibre.

The Eatwell Guide does not apply to children under the age of 2 because they have different nutritional needs.

Between the ages of 2 and 5 years, children should gradually move to eating the same foods as the rest of the family in the proportions shown in the Eatwell Guide.

Fruit and vegetables: are you getting your 5 A Day?

Fruit and vegetables are a good source of vitamins and minerals and fibre, and should make up just over a third of the food you eat each day.

It's recommended that you eat at least 5 portions of a variety of fruit and vegetables every day. They can be fresh, frozen, canned, dried or juiced.

There's evidence that people who eat at least 5 portions of fruit and vegetables a day have a lower risk of heart disease, stroke and some cancers.

Eating 5 portions is not as hard as it sounds.

A portion is:

- 80g of fresh, canned or frozen fruit and vegetables
- 30g of dried fruit – which should be kept to mealtimes
- 150ml glass of fruit juice or smoothie – but do not have more than 1 portion a day as these drinks are sugary and can damage teeth

Just 1 apple, banana, pear or similar-sized fruit is 1 portion each.

A slice of pineapple or melon is also 1 portion, and 3 heaped tablespoons of vegetables is another portion.

Adding a tablespoon of dried fruit, such as raisins, to your morning cereal is an easy way to get 1 portion.

You could also swap your mid-morning biscuit for a banana, and add a side salad to your lunch.

In the evening, have a portion of vegetables with dinner and fresh fruit with plain, lower fat yoghurt for dessert to reach your 5 A Day.

Find out more about what counts towards your 5 A Day

Starchy foods in your diet

Starchy foods should make up just over a third of everything you eat. This means your meals should be based on these foods.

Choose wholegrain or wholemeal varieties of starchy foods, such as brown rice, wholewheat pasta, and brown, wholemeal or higher fibre white bread.

They contain more fibre, and usually more vitamins and minerals, than white varieties.

Potatoes with the skins on are a great source of fibre and vitamins. For example, when having boiled potatoes or a jacket potato, eat the skin too.

Find out more about starchy foods

Milk and dairy foods (and alternatives)

Milk and dairy foods, such as cheese and yoghurt, are good sources of protein. They also contain calcium, which helps keep your bones healthy.

Go for lower fat and lower sugar products where possible.

Choose semi-skimmed, 1% fat or skimmed milk, as well as lower fat hard cheeses or cottage cheese, and lower fat, lower sugar yoghurt.

Dairy alternatives, such as soya drinks, are also included in this food group.

When buying alternatives, choose unsweetened, calcium-fortified versions.

Find out more about milk and dairy foods

Beans, pulses, fish, eggs, meat and other proteins

These foods are all good sources of protein, which is essential for the body to grow and repair itself.

They're also good sources of a range of vitamins and minerals.

Meat is a good source of protein, vitamins and minerals, including iron, zinc and B vitamins. It's also one of the main sources of vitamin B12.

Choose lean cuts of meat and skinless poultry whenever possible to cut down on fat. Always cook meat thoroughly.

Try to eat less red and processed meat like bacon, ham and sausages.

Find out more about meat

Eggs and fish are also good sources of protein, and contain many vitamins and minerals. Oily fish is particularly rich in omega-3 fatty acids.

Aim to eat at least 2 portions of fish a week, including 1 portion of oily fish.

You can choose from fresh, frozen or canned, but remember that canned and smoked fish can often be high in salt.

Pulses, including beans, peas and lentils, are naturally very low in fat and high in fibre, protein, vitamins and minerals.

Nuts are high in fibre, and unsalted nuts make a good snack. But they do still contain high levels of fat, so eat them in moderation.

Read more about eggs and pulses and beans.

Oils and spreads

Some fat in the diet is essential, but on average people in the UK eat too much saturated fat.

It's important to get most of your fat from unsaturated oils and spreads.

Swapping to unsaturated fats can help lower cholesterol.

Remember that all types of fat are high in energy and should be eaten in small amounts.

Find out more about the different types of fats

Eat less saturated fat, sugar and salt

Too much saturated fat can increase the amount of cholesterol in the blood, which increases your risk of developing heart disease.

Regularly consuming foods and drinks high in sugar increases your risk of obesity and tooth decay.

Eating too much salt can raise your blood pressure, which increases your risk of getting heart disease or having a stroke.

See 8 tips for healthy eating to find out more about why you need to cut down on saturated fat, sugar and salt, which foods they're found in, and how to make healthier choices.

Find out more about how to eat less saturated fat

Need to lose weight?

Most adults in England are overweight or obese. Check whether you're a healthy weight using the BMI calculator.

If you need to lose weight, you can use the NHS weight loss plan. It's a free 12-week diet and exercise plan to help you lose weight and develop healthier habits.

The plan, which has been downloaded more than 2 million times, is designed to help you lose weight safely, and keep it off.

Benefits of exercise-Exercise

Secondary navigation

- How much exercise?
- Couch to 5K
- Exercise tips
- Fitness guides

Step right up! It's the miracle cure we've all been waiting for.

It can reduce your risk of major illnesses, such as heart disease, stroke, type 2 diabetes and cancer by up to 50% and lower your risk of early death by up to 30%.

It's free, easy to take, has an immediate effect and you don't need a GP to get some. Its name? Exercise.

Click on the links below to find out if you're doing enough for your age:

- early childhood (under 5 years old)
- young people (5 to 18 years old)
- adults (19 to 64 years old)
- older adults (65 and over)

Exercise is the miracle cure we've always had, but for too long we've neglected to take our recommended dose. Our health is now suffering as a consequence.

This is no snake oil. Whatever your age, there's strong scientific evidence that being physically active can help you lead a healthier and happier life.

People who exercise regularly have a lower risk of developing many long-term (chronic) conditions, such as heart disease, type 2 diabetes, stroke, and some cancers.

Research shows that physical activity can also boost self-esteem, mood, sleep quality and energy, as well as reducing your risk of stress, depression, dementia and Alzheimer's disease.

"If exercise were a pill, it would be one of the most cost-effective drugs ever invented," says Dr Nick Cavill, a health promotion consultant.

Health benefits

Given the overwhelming evidence, it seems obvious that we should all be physically active. It's essential if you want to live a healthy and fulfilling life into old age.

It's medically proven that people who do regular physical activity have:

- up to a 35% lower risk of coronary heart disease and stroke
- up to a 50% lower risk of type 2 diabetes
- up to a 50% lower risk of colon cancer
- up to a 20% lower risk of breast cancer
- a 30% lower risk of early death
- up to an 83% lower risk of osteoarthritis
- up to a 68% lower risk of hip fracture
- a 30% lower risk of falls (among older adults)
- up to a 30% lower risk of depression
- up to a 30% lower risk of dementia

What counts?

To stay healthy, adults should try to be active every day and aim to achieve at least 150 minutes of physical activity over a week through a variety of activities.

For most people, the easiest way to get moving is to make activity part of everyday life, like walking or cycling instead of using the car to get around. However, the more you do, the better, and taking part in activities such as sports and exercise will make you even healthier.

For any type of activity to benefit your health, you need to be moving quick enough to raise your heart rate, breathe faster and feel warmer. This level of effort is called moderate intensity activity. If you're working at a moderate intensity you should still be able to talk but you won't be able to sing the words to a song.

An activity where you have to work even harder is called vigorous intensity activity. There is substantial evidence that vigorous activity can bring health benefits over and above that of moderate activity. You can tell when it's vigorous activity because you're breathing hard and fast, and your heart rate has gone up quite a bit. If you're working at this level, you won't be able to say more than a few words without pausing for a breath.

Keep healthy with 150 minutes of exercise a week

In this video people describe what exercise they do, including cycling, running and swimming. They offer their tips and tricks for keeping motivated.
Play Video

Media last reviewed: 3 August 2018
Media review due: 3 August 2021

A modern problem

People are less active nowadays, partly because technology has made our lives easier. We drive cars or take public transport. Machines wash our clothes. We entertain ourselves in front of a TV or computer screen. Fewer people are doing manual work, and most of us have jobs that involve little physical effort. Work, household chores, shopping and other necessary activities are far less demanding than for previous generations.

We move around less and burn off less energy than people used to. Research suggests that many adults spend more than 7 hours a day sitting down, at work, on transport or in their leisure time. People aged over 65 spend 10 hours or more each day sitting or lying down, making them the most sedentary age group.

Sedentary lifestyles

Inactivity is described by the Department of Health as a "silent killer". Evidence is emerging that sedentary behaviour, such as sitting or lying down for long periods, is bad for your health.

Not only should you try to raise your activity levels, but you should also reduce the amount of time you and your family spend sitting down.

Common examples of sedentary behaviour include watching TV, using a computer, using the car for short journeys and sitting down to read, talk or listen to music. This type of behaviour is thought to increase your risk of developing many chronic diseases, such as heart disease, stroke and type 2 diabetes, as well as weight gain and obesity.

"Previous generations were active more naturally through work and manual labour, but today we have to find ways of integrating activity into our daily lives," says Dr Cavill.

Whether it's limiting the time babies spend strapped in their buggies, or encouraging adults to stand up and move frequently, people of all ages need to reduce their sedentary behaviour.

"This means that each of us needs to think about increasing the types of activities that suit our lifestyle and can easily be included in our day," says Dr Cavill.

Crucially, you can hit your weekly activity target but still be at risk of ill health if you spend the rest of the time sitting or lying down. Find out how to build physical activity and exercise into your day, whatever your age or situation.

For a summary on the health benefits of being more active, check out this Department of Health infographic

The importance of sleep

19 September 2016

We spend about a third of our lives asleep. Sleep is essential - It is as important to our bodies as eating, drinking and breathing, and is vital for maintaining good mental and physical health. Sleeping helps us to recover from mental as well as physical exertion.

Sleep and health are strongly related - poor sleep can increase the risk of having poor health, and poor health can make it harder to sleep. Sleep disturbances can be one of the first signs of distress. Common mental health problems like anxiety and depression can often underpin sleep problems. We explored sleep and mental health via Mental Health Awareness Week in 2011 – undertaking one of the biggest surveys ever on sleep and its effect on mental health.

We all know about the myth of telling people to get out of bed and pull themselves together, but lethargy, tiredness, and disturbed sleep can be part of having a mental health problem or a side effect of taking medication. Addressing sleep and sleep disorders as part of mental health treatment is very important, and can be overlooked.

Sleep is especially challenging in shift based work, and in safety-critical industries like the railway, so it's even more important to make sure we get the right amount of good quality sleep.

We can all benefit from improving the quality of our sleep. For many of us, it may simply be a case of making small lifestyle or attitude adjustments in order to help us sleep better. Up to one third of the population may suffer from insomnia (lack of sleep or poor quality sleep) or other sleep problems. These can affect mood, energy and concentration levels, our relationships, and our ability to stay awake and function at work during the day.

Often basic techniques can improve your sleep. If they don't work speak to your doctor about other treatments, especially as sleep problems can indicate other health issues.

If you keep having sleep problems, it's possible there may be an underlying issue, which you should discuss with your GP. Treating sleep problems alongside mental health problems can help address both symptoms and causes, leading to quicker recovery.

There are four simple things to consider you to help HEAL a period of poor sleep:

Health

We know that poor health affects sleep and vice versa. Mental health problems like depression and anxiety often go hand in hand with sleep problems. It's important to get any health concerns addressed both for helping physical symptoms and for addressing any worries that might keep you awake.

Environment

Where you sleep is important, and the bedroom and bed should be mainly places you associate with sleep. In particular watching TV, playing with phones or screens, or eating in bed can all affect the quality of our sleep. Temperature, noise levels and light all play a part in determining our sleep. If you find yourself experiencing poor sleep, try keeping a sleep diary to see if there are patterns which can help identify a problem.

Attitude

It's easiest to get to sleep when we are able to relax, and let go of concerns. We've all had a night where we lie awake and worry. In the time before we go to bed, we should try and wind down, be less stimulated, and relax. These days this can be harder than ever, but relaxation techniques, a warm bath or mindfulness practice can all help. If you find you can't get to sleep, it is always best to get up, perhaps make a warm milky drink, and then try again when you feel sleepier. It can be tempting to turn on the TV or phone screen but this may stimulate you and make it harder to nod off.

Lifestyle

What you eat and drink can affect your sleep. Stimulants like caffeine can make it harder to sleep, and a heavy or sugary meal close to bedtime can make sleep uncomfortable. Alcohol might seem to help you get to sleep, but it reduces the quality of sleep later. Taking exercise during the day is also a good way to aid sleep, but exercise releases adrenaline so exercising during the evening may be less helpful.

Effects of Physical Exercise on Cognitive Functioning and Wellbeing: Biological and Psychological Benefits

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Much evidence shows that physical exercise (PE) is a strong gene modulator that induces structural and functional changes in the brain, determining enormous benefit on both cognitive functioning and wellbeing. PE is also a protective factor for neurodegeneration. However, it is unclear if such protection is granted through modifications to the biological mechanisms underlying neurodegeneration or through better compensation against attacks. This concise review addresses the biological and psychological positive effects of PE describing the results obtained on brain plasticity and epigenetic mechanisms in animal and human studies, in order to clarify how to maximize the positive effects of PE while avoiding negative consequences, as in the case of exercise addiction.

Introduction

Many evidences demonstrated that physical exercise (PE) affects brain plasticity, influencing cognition and wellbeing (Weinberg and Gould, 2015; for

review see Fernandes et al., 2017). In fact, experimental and clinical studies have reported that PE induces structural and functional changes in the brain, determining enormous biological, and psychological benefits.

In general, when reported PE effects, it is customary to separate the biological aspects from the psychological ones. In fact, most of the studies documented either the effects of PE on the brain (and then on the cognitive functioning) or on the wellbeing (in terms of physical and mental health). In this review, we merge both these aspects as they influence each other. In fact, behaviorally appropriate choices depend upon efficient cognitive functioning. Furthermore, emotional states influence cognitive functions through specific cerebral circuitry involving prefrontal areas and limbic structures (Barbas, 2000).

Before analyzing the benefits of PE, it is necessary to define PE precisely. Indeed, PE is a term often incorrectly used interchangeably with physical activity (PA) that is "any bodily movement produced by skeletal muscles that requires energy expenditure" (World Health Organization, 2010). Then, PA includes any motor behavior such as daily and leisure activities and it is considered a determinant lifestyle for general health status (Burkhalter and Hillman, 2011). Instead, PE is "a sub classification of PA that is planned, structured, repetitive, and has as a final or an intermediate objective the improvement or maintenance of one or more components of physical fitness" (World Health Organization, 2010). Examples of PE are aerobic and anaerobic activity, characterized by a precise frequency, duration and intensity.

In this review, we illustrate the biological and psychological benefits of PE on cognition and wellbeing both in health and diseases, reporting data from both animal and human studies. The biological basis at both molecular and supramolecular level have been largely studied. The other aim of present work is to report the actual evidence on the epigenetic mechanisms that determine or modulate the biological effects of PE on the brain. In fact, while the biologic mechanisms are sufficiently studied both at the molecular and supramolecular levels (see Lista and Sorrentino, 2010), little is

known about the epigenetic ones. Finally, the modality with which PE should be practiced to gain such advantages while avoiding negative consequences will be discussed. In Table 1 are reported the inclusion and exclusion criteria for studies discussed in this review.

TABLE 1

Table 1. Inclusion and exclusion criteria for studies included in this review.

Physical Exercise, Brain, and Cognition

Among the biological effects of PE, those linked to "neuroplasticity" are quite important.

Neuroplasticity is an important feature of the nervous system, which can modify itself in response to experience (Bavelier and Neville, 2002). For this reason, PE may be considered as an enhancer environmental factor promoting neuroplasticity.

In animal studies, the structural changes analyzed concern the cellular (neurogenesis, gliogenesis, synaptogenesis, angiogenesis) and molecular (alteration in neurotransmission systems and increasing in some neurotrophic factors) level (Gelfo et al., 2018), while the functional activity has been measured using the levels of performance in behavioral tasks, such as spatial tasks that allow to analyze the different facets of spatial cognitive functions (Mandolesi et al., 2017). In humans, indicators of structural changes correspond for example to brain volumes, measures of white matter integrity or modulation in neurotrophins levels (by correlation with trophic factors plasma levels). Such metrics can be correlated to cognitive performances, defining the functional neural efficiency (Serra et al., 2011). To this regard, it should be emphasized that any morphological change results in a modification of the functional properties of a neural circuit and vice versa any change in neuronal efficiency and functionality is based on morphological modifications (Mandolesi et al., 2017).

Experimental and clinical studies have shown that PE induces important structural and functional changes in brain functioning. In Table 2 are reported the more evident effects induced by PE.

TABLE 2

Table 2. Structural and functional effects of PE.

Animal Studies

In animals, motor activity or motor exercise are terms often used instead of PE. The effects of motor exercise are mainly studied in rodents by means of specific training on wheels or by locomotor activity analyses.

Studies on healthy animals have demonstrated that intense motor activity increases neurons and glia cells proliferation rates in the hippocampus and the neocortex (van Praag et al., 1999a,b; Brown et al., 2003; Ehninger and Kempermann, 2003; Steiner et al., 2004; Hirase and Shinohara, 2014) and induces angiogenesis in the neocortex, hippocampus, and cerebellum (Black et al., 1990; Isaacs et al., 1992; Kleim et al., 2002; Swain et al., 2003; Ekstrand et al., 2008; Gelfo et al., 2018). At the molecular level, motor activity causes changes in neurotrasmitters such as serotonin, noradrenalin, and acetylcholine (Lista and Sorrentino, 2010; for a review, see Lin and Kuo, 2013) and induces the release of the brain-derived neurotrophic factor (BDNF Vaynman et al., 2004; Lafenetre et al., 2011) and the insulin-like growth factor-1 (IGF-1; for a review, van Praag, 2009).

Animals performing motor exercise showed improvements in spatial abilities (van Praag et al., 2005; Snigdha et al., 2014) and in other cognitive domains such as executive functions (Langdon and Corbett, 2012), evidencing thus that motor exercise improve cognitive functions.

Similar structural and functional changes were evident even in older animals (Kronenberg et al., 2006) and in animal models of neurodegenerative diseases (Nithianantharajah and Hannan, 2006), suggesting that motor exercise is a potent neuroprotective factor against physiological and pathological aging (Gelfo et al., 2018). In this context, one can use transgenic

models to determine exactly when a structural alteration occurs, and then to study when the animals should undergo motor training in order to maximize its effects. To this regard, converging evidence is showing that motor activity should be performed before the development of neurodegeneration in order to exert its protective role (Richter et al., 2008; Lin et al., 2015) such as before the formation of beta amyloid plaques in Alzheimer's disease (Adlard et al., 2005). However, there are some experimental evidences showing that motor exercise performed after neurodegenerative lesions permits to improve spatial abilities, hence being also a potent therapeutic agent (Sim, 2014; Ji et al., 2015).

Interestingly, PE induces modifications that can be passed on to the offspring. In fact, positive maternal experiences can influence the offspring at both behavioral and biochemical levels (see Cutuli et al., 2017, 2018). Preclinical studies also indicated that the effects of maternal exercise during pregnancy can be passed on to offspring (Robinson et al., 2012). However, it is not clear if the possibilities of inheritance are limited to motor exercise alone. To this regard, it has been seen that pregnant rats exposed to motor exercise on wheel-running and treadmill running have offspring with improved spatial memory, and increased hippocampal BDNF level (Akhavan et al., 2008; Aksu et al., 2012). However, further studies are necessary since it remains unclear whether these beneficial effects result from physiological changes to the *in utero* environment and/or from epigenetic modifications to the developing embryo (Short et al., 2017). On the other hand, few studies, conflicting and hard to replicate, do not yet allow to explore the transgenerational effects of paternal motor exercise (Short et al., 2017).

Human Studies

Neuroplasticity phenomena following PE have been evidenced even in humans. A great number of studies demonstrated that in adults, PE determines structural changes such as increased gray matter volume in frontal and hippocampal regions (Colcombe et al., 2006; Erickson et al., 2011) and reduced damage in the gray matter (Chaddock-Heyman et al., 2014).

Moreover, PE facilitates the release of neurotrophic factors such as peripheral BDNF (Hötting et al., 2016), increases blood flow, improves cerebrovascular health and determines benefits on glucose and lipid metabolism carrying “food” to the brain (Mandolesi et al., 2017).

These effects are reflected on cognitive functioning (for a review see Hötting and Röder, 2013). In fact, the results of cross-sectional and epidemiological studies showed that PE enhances cognitive functions in young and older adults (Lista and Sorrentino, 2010; Fernandes et al., 2017), improving memory abilities, efficiency of attentional processes and executive-control processes (Kramer et al., 1999; Colcombe and Kramer, 2003; Grego et al., 2005; Pereira et al., 2007; Winter et al., 2007; Chieffi et al., 2017). Furthermore, structural changes following PE have been related to academic achievement in comparison to sedentary individuals (Lees and Hopkins, 2013; Donnelly et al., 2016). In this line, it has been also showed that children who practice regular aerobic activity performed better on verbal, perceptual and arithmetic test in comparison to sedentary ones of same age (Sibley and Etnier, 2003; Voss et al., 2011).

Numerous studies have demonstrated that PE prevents cognitive decline linked to aging (Yaffe et al., 2009; Hötting and Röder, 2013; Niemann et al., 2014), reduces the risk of developing dementia (Colberg et al., 2008; Mandolesi et al., 2017), the level of deterioration in executive functions (Hollamby et al., 2017) and improves the quality of life (Pedrinolla et al., 2017). Furthermore, positron emission tomography based studies evidenced that PE determines changes in metabolic networks that are related to cognition (Huang et al., 2016).

Recently, studies on magnetoencephalography based (MEG) functional connectivity evidenced that PE influences network topology (Foster, 2015). It is important to underlie that MEG is a much more direct measure of neural activity in comparison to fRMI, with the advantage of combining good spatial and high temporal resolution. In healthy individuals, PE was related to better intermodular integration (Douw et al., 2014) and to improvements in cognitive functions (Huang et al., 2016). Benefits of PE are evidenced even

in individuals at risk for AD (Deeny et al., 2008), thus once again suggesting a protective role of PE.

A possible explanation for these ameliorative structural and functional effects could be that PE stimulates blood circulation in the neural circuits involved in cognitive functioning (Erickson et al., 2012). Another interpretation could be found in the concept of "cerebral reserves" (Stern, 2002, 2012) a mechanisms that might explain why, in the face of neurodegenerative changes that are similar in nature and extent, individuals vary considerably in the severity of cognitive aging and clinical dementia (Petrosini et al., 2009). Two types of reserves are recognized: brain reserve and cognitive reserve. The former is based on the protective potential of anatomical features such as brain size, neuronal density and synaptic connectivity, the latter is based on the efficient connectivity among neural circuits (Stern, 2002; Mandolesi et al., 2017).

According to the reserves hypothesis and taking into account the numerous evidences described above, we could advance that PE is an environmental factor that permits to gain reserves.

However, one must underline that if on the one hand PE improves the cognitive functioning, providing reserves to be spent in the case of a brain lesion, on the other hand the modifications of the clinical expression of neurodegeneration delays the diagnosis. It has been seen that patients with higher cognitive reserve take longer to manifest the symptoms of memory loss (Zanetti et al., 2017). It has been hypothesized a neural compensation mechanism that permits to perform complex activities (Stern, 2009). Obviously, these conclusions open important reflections more for the diagnosis of neurodegenerative disease than for the practice of PE.

The effects of PE on cognitive functioning have been shown across the lifespan from childhood to the old age (Hötting and Röder, 2013). In particular, it has been evidenced that cognitive functions that are influenced the most by brain maturation, such as attention or cognitive flexibility, and the cognitive functions that depend the most upon

experiences, such as memory, are the most sensitive ones to PE (Hötting and Röder, 2013). Overall, these studies, together with those analyzing the effects of combined environmental factors, suggest that for a positive effect on cognitive function, it is necessary to maintain an "enriched lifestyle" up to middle life. In fact, the exposure to PE together to other many experiences provides a "reserve"-like advantage which supports an enduring preservation of cognitive function in old age (Chang et al., 2010; Loprinzi et al., 2018).

Physical Exercise and Wellbeing

There are consistent evidences that PE has many benefits for people of any age, improving psychological wellbeing (Zubala et al., 2017) and quality of life (Penedo and Dahn, 2005; Windle et al., 2010; Table 3).

TABLE 3

Table 3. Biological and psychological effects of PE (Adapted from Weinberg and Gould, 2015).

In children, PE is correlated with high levels of self-efficacy, tasks goal orientation, and perceived competence (Biddle et al., 2011). In youth and adulthood, most studies evidenced that PE is associated with better health outcomes, such as better mood and self-concept (Berger and Motl, 2001; Landers and Arent, 2001; Penedo and Dahn, 2005). In the aging population, PE helps maintaining independence (Stessman et al., 2009), favoring social relations and mental health.

It was now well-accepted that is the interaction between biological and psychological mechanisms linked to PE enhances the wellbeing (Penedo and Dahn, 2005). Biological mechanisms of beneficial effects of PE are mainly related to increasing in cerebral blood flow and in maximal oxygen consumption, to delivery of oxygen to cerebral tissue, to reduction in muscle tension and to increased serum concentrations of endocannabinoid receptors (Thomas et al., 1989; Dietrich and McDaniel, 2004; Querido and Sheel, 2007; Gomes da Silva et al., 2010; Ferreira-Vieira et al., 2014). Moreover, neuroplasticity phenomena such as changes in neurotransmitters are

recognized to affect wellbeing. For example, PE increases the levels of serotonin (Young, 2007; Korb et al., 2010) and the levels of beta-endorphins, such as anandamide (Fuss et al., 2015).

Among the psychological hypothesis proposed to explain how PE enhances wellbeing, it has been underlined feeling of control (Weinberg and Gould, 2015), competency and self-efficacy (Craft, 2005; Rodgers et al., 2014), improved self-concept and self-esteem (Marsh and Sonstroem, 1995; Fox, 2000; Zamani Sani et al., 2016), positive social interactions and opportunities for fun and enjoyment (Raedeke, 2007; Bartlett et al., 2011).

Psychological research evidenced that PE can even modulate the personality and the development of Self (Weinberg and Gould, 2015). Moreover, PE has been correlated with hardiness, a personality style that enables a person to withstand or cope with stressful situations (Weinberg and Gould, 2015).

In the following sections, we will focus on correlations among PE and the most common mental illnesses.

Depression and Anxiety

Depression is the most common type of mental illness and will be the second leading cause of disease by 2020 (Farioli-Vecchioli et al., 2018). Similar entity concerns anxiety disorders that are among the most prevalent mental disorders in the world population (Weinberg and Gould, 2015).

Epidemiological studies have consistently reported benefits of PE on reductions in depression (Mammen and Faulkner, 2013) and anxiety (DeBoer et al., 2012). For example, it has been seen that individuals that practice PE regularly are less depressed or anxious than those who do not (De Moor et al., 2006), suggesting the use of exercise as a treatment for these illnesses (Carek et al., 2011).

Most of the research on the relationship between PE and positive changes in mood state has evidenced positive effects, especially as a consequence of aerobic exercise, regardless of the specific type of activity (Knapen et al.,

2009), even if the correct intensity of aerobic PE to control and reduce symptoms is debated (de Souza Moura et al., 2015). For example, it has been revealed that after about 16 weeks of an aerobic exercise program, individuals with major depressive disorder (MDD), significantly reduced their depressive symptoms (Craft and Perna, 2004). However, there are evidenced that documented that even anaerobic activity has positive effects on treatment of clinical depression (Martinsen, 1990). For anxiety disorders, it has been evidenced that the positive effects of PE are visible even with short bursts of exercise, independently from the nature of the exercise (Scully et al., 1998).

A physiologic mechanism correlated to the improvement in depressed mood post-exercise PE was identified in modulation of peripheral levels of BDNF (Coelho et al., 2013). In this line, it was suggested recently that the intensity of exercise to improve mood should be prescribed on individual basis and not on the patient's preferred intensity (Meyer et al., 2016a,b). Conversely, physical inactivity correlated to worse depressive symptoms and, then, to lower peripheral levels of BDNF (Brunoni et al., 2008). Post-PE mood improvement might also be due to lower oxidative stress (Thomson et al., 2015). In this contest, it was evidenced that there is an abnormal oxidative stress in individuals with MDD or bipolar disorder (Cataldo et al., 2010; Andreazza et al., 2013) and that PE, particularly in higher intensity, decreases oxidative stress with consequent mood improvement (Urso and Clarkson, 2003).

Addictive and Unhealthy Behaviors

PE has been widely evidenced to be an effective tool for treating several addictive and unhealthy behaviors. PE tends to reduce and prevent behaviors such as smoking, alcohol, and gambling, and to regulate the impulse for hunger and satiety (Vatansever-Ozen et al., 2011; Tiryaki-Sonmez et al., 2015). In this context, several studies evidenced substance abusers benefit from regular PE, that also helps increasing healthy behaviors (Giesen et al., 2015). It has been evidenced that regular PE reduces tobacco cravings and cigarette use (Haasova et al., 2013). Although PE has positive

effects on psychological wellbeing, in this context it is right underline that in some cases PE could reveal unhealthy behaviors with negative consequence on health (Schwellnus et al., 2016). It is the case of exercise addiction, a dependence on a regular regimen of exercise that is characterized by withdrawal symptoms, after 24–36 h without exercise (Sachs, 1981), such as anxiety, irritability, guilt, muscle twitching, a bloated feeling, and nervousness (Weinberg and Gould, 2015). There is a strong correlation between exercise addiction and eating disorders (Scully et al., 1998) suggesting thus a comorbidity of these disorders and a common biological substrate. In particular, recent studies have shown that these unhealthy behaviors are associated to lower prefrontal cortex volume, activity and oxygenation, with consequent impairment in cognitive functions, such as the inhibitory control with the consequent compulsive behaviors (Asensio et al., 2016; Wang et al., 2016; Pahng et al., 2017). Also, it has been seen that a few days of PE increase oxygenation of prefrontal cortex, improving mental health (Cabral et al., 2017).

Epigenetic Mechanisms

Biological and psychological effects of PE could be partly explained through epigenetic mechanisms. The term “epigenetics,” coined by Waddington (1939), is based on a conceptual model designed to account for how genes might interact with their environment to produce the phenotype (Waddington, 1939; Fernandes et al., 2017).

In particular, epigenetics is referred to all those mechanisms, including functional modifications of the genome such as DNA methylation, post-translational histone modifications (i.e., acetylation and methylation) and microRNA expression (Deibel et al., 2015; Grazioli et al., 2017), which tend to regulate gene expression, modeling the chromatin structure but maintaining the nucleotide sequence of DNA unchanged.

The current literature clearly demonstrates that these mechanisms are strongly influenced by different biological and environmental factors, such as PE (Grazioli et al., 2017), which determine the nature and the mode of epigenetic mechanisms activation.

Epigenetics plays an essential role in neural reorganization, including those that govern the brain plasticity (Deibel et al., 2015). For example, a growing body of evidence indicates that regulates neuroplasticity and memory processes (Ieraci et al., 2015).

Several animal studies reveal how motor activity is able to improve cognitive performances acting on epigenetic mechanisms and influencing the expression of those genes involved in neuroplasticity (Fernandes et al., 2017). The main molecular processes that underlie the epigenetic mechanisms are the following: through DNA methylation, histone modifications and microRNA expression (Fernandes et al., 2017).

DNA methylation is a chemical covalent modification on the cytosine of the double stranded DNA molecule. It has been recognized that DNA methylation plays a key role in long-term memory (Deibel et al., 2015; Kim and Kaang, 2017). In particular, mechanisms related to DNA methylation relieve the repressive effects of memory-suppressor genes to favor the expression of plasticity-promoting and memory consolidation genes. Several evidences showed that PE is able to coordinate the action of the genes involved in synaptic plasticity that regulate memory consolidation (Molteni et al., 2002; Ding et al., 2006).

Histone modifications are post-translational chemical changes in histone proteins. They include histone methylation/demethylation, acetylation/deacetylation, and phosphorylation, all due to the activity of specific enzymes, which modify the chromatin structure, thereby regulating gene expression. It has been demonstrated that histone acetylation is a requisite for long-term memory (LTM) (Barrett and Wood, 2008; Fernandes et al., 2017). In animals, motor activity increases these genetic mechanisms in the hippocampus and the frontal cortex, improving memory performances in behavioral tasks (Cechinel et al., 2016). Recently, following 4 weeks of motor exercise, it has been evidenced an increasing of the activity of enzymes involved in histone acetylation/deacetylation, the epigenetic mechanisms that determine an enhancing in the expression of BDNF (Maejima et al., 2018).

MicroRNAs (miRNAs) are small, single stranded RNA molecules able to inhibit the expression of target genes. They are widely expressed in the brain, participating in epigenetic mechanisms and acting as regulators of numerous biological processes in the brain, ranging from cell proliferation, differentiation, apoptosis, synaptic plasticity, and memory consolidation (Saab and Mansuy, 2014). Recent evidences demonstrate that PE can mitigate the harmful effects of traumatic brain injury and aging on cognitive function by regulating the hippocampal expression of miR21 (Hu et al., 2015) and miR-34a (Kou et al., 2017). Furthermore, PE contributes to attenuate the effects of stress-related increase in miR-124, involved in neurogenesis and memory formation (Pan-Vazquez et al., 2015).

What Kind of Physical Exercise?

Sport psychology has suggested that the success or failure of PE programs depends on several factors such as the intensity, frequency, duration of the exercise, and whether the PE is done in group or alone (Weinberg and Gould, 2015). These aspects are important in terms of maintenance of PE practice and in order to gain benefits for brain and behavior, and they are affected by individual characteristics. Although such aspects have to be taken into account when training is proposed, scientific reports have evidenced different effects on cognitive functioning and wellbeing if PE is performed in aerobic or anaerobic modality.

Aerobic exercise allows the resynthesis of adenosine—triphosphate (ATP) by aerobic mechanisms, adjusting intensity (from low to high intensity), duration (usually long), and oxygen availability. The intensity depends on the cardiorespiratory effort with respect to the maximum heart rate (HRmax) or the maximum oxygen consumption (Vo2max), which determines an increase in oxygen consumption with respect to the rest condition. Examples of aerobic PE are jogging, running, cycling, and swimming.

On the contrary, anaerobic exercise has high intensity, short duration and unavailability of oxygen, determining the depletion of the muscles' ATP and/or phosphocreatine (PCr) reserves, shifting the production of ATP, to

anaerobic energy mechanisms, lactacid or alactacid. Examples of anaerobic exercises are weight lifting or sprint in 100 m.

Robust literature demonstrated that chronic aerobic exercise is associated with potent structural and functional neuroplastic changes, with an improvement in cognitive functions (Colcombe et al., 2006; Hillman et al., 2008; Erickson et al., 2009; Mandolesi et al., 2017) and increased feeling of general wellbeing (Berger and Tobar, 2011; Biddle et al., 2011) (Table 4).

TABLE 4

Table 4. Effects of physical aerobic exercise on cognitive functioning and wellbeing.

Recently, growing evidence showed that acute aerobic exercise, defined as a single bout of exercise, relates to improved cognitive functions, especially prefrontal cortex-dependent cognition (Tomporowski, 2003; Lambourne and Tomporowski, 2010; Chang et al., 2011; Ludyga et al., 2016; Basso and Suzuki, 2017). However, the effects of a single session of exercise on cognitive functioning are generally small (Chang et al., 2012). In this line, it was evidenced that even a single bout of moderate-intensity aerobic exercise enhances, mood and emotional states and improves the wellbeing in MDD individuals (Bartholomew et al., 2005; Basso and Suzuki, 2017) (Table 4).

Beside frequency and duration over time, even the intensity is a parameter to be considered when evaluating the PE effects. It has been showed that moderate intensity exercise is related to increased performance in working memory and cognitive flexibility, whereas high-intensity exercise improves the speed of information processing (Chang and Etnier, 2009). In this context, it has been reported that peripheral BDNF was significantly increased after high intensity exercise, but not after low-intensity exercise (Hötting et al., 2016). In fact, it is evidenced that high-intensity exercise provides greater benefit to cognitive functions than low-intensity exercise in the elderly (Brown et al., 2012).

With regard to the psychological beneficial effects related to PE, research has evidenced that major benefits in reduction of anxiety and depression are determined by longer training program (several months), as compared to shorter ones (some days) for training session lasting over 30 min. Moreover, anxiety and depression reduction after aerobic exercise may be achieved with exercise intensity between 30 and 70% of maximal heart rate (Weinberg and Gould, 2015). To achieve positive mood changes, an important role is played even by anaerobic activity, such as yoga, or in all PEs in which there is rhythmic abdominal breathing, enjoyment, rhythmic, and repetitive movements and relative absence of interpersonal competition (Berger and Motl, 2001).

Conclusion

PE determines positive biological and psychological effects that affect the brain and the cognitive functioning and promote a condition of wellbeing. PE plays an important role in counteract normal and pathological aging. Recent evidences have shown that PE triggers potent neuroplastic phenomena, partly mediated by epigenetic mechanisms. In fact, PE cause profound alterations in gene expression and its protein products in the form of epigenomic manifestations (Fernandes et al., 2017).

A growing body of literature indicates that both chronic and aerobic PE can achieve similar benefits.

These results should lead to reflect on beneficial effects of PE and to promote its use as a modifiable factor for prevention, to improve cognitive abilities and to enhance mood.

Despite all these positive effects, it must be underlined that PE should be tailored to the individual. In fact, even PE, when excessive, can have a dark side, when PE becomes compulsive and facilitates addictive behaviors.

Physical Education is just as important as any other school subject

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Authors

Physical Education (PE) is often viewed as a marginal subject within the curriculum. And many secondary schools actively reduce PE time to make way for what are deemed more "serious" or "important" subjects.

Research from the Youth Sport Trust shows that 38% of English secondary schools have cut timetabled PE for 14- to 16-year-olds. One of the main reasons for this is the increased pressure to produce exam results. Much of the time pupils would usually spend in PE lessons is now spent receiving extra tutoring on topics other than PE.

Despite these cuts, however, PE is still championed for its potential to promote health and encourage lifelong physical activity. This is an important issue given that over 30% of year six pupils are classed as "overweight" or "obese" according to the latest government figures.

PE is also praised for its contribution to improved psychological health, for helping to nurture social and moral development – as well as supporting cognitive and academic performance.

The Association for Physical Education maintains that high quality PE fosters the physical, moral, social, emotional, cultural and intellectual development of pupils. But the many aims for PE – such as health promotion, skills development as well as a focus on social and moral issues – has resulted in confusion about the subject and has done little to further the educational experiences in practice. In fact, it has been argued that PE offers more entertainment than education.

Not intellectual enough

A waste of time and a bit of entertainment, or vitally important to the education and development of a child – which is it?

Part of the problem seems to be that PE is often viewed as an opportunity for pupils to be active and to enjoy themselves. Or in some cases, as a form of stress relief and to serve as a break from traditional learning.

Clearly, these areas are valuable for pupils' general well-being and there is a growing evidence base to suggest that physical activity has the potential to support learning more broadly. But the role of PE is not merely to prop up and support pupils' learning in other subjects. Instead, it should provide meaningful learning experiences within the subject itself.

The health and well-being of future generations of young people can be shaped by school PE lessons. Shutterstock

What PE seemingly lacks in comparison to all other subjects is a platform on which pupils' learning can be communicated and evidenced with clarity and rigour. And while PE is often marginalised to make way for more valuable or academic subjects, it seems the intellectual and academic value of PE itself is largely overlooked.

The potential of PE

PE, sport and physical culture each offer a unique platform on which to explore a multitude of holistic learning opportunities. For instance, the ethical or moral controversies in sport can give teachers a range of educational stimuli for debate, reasoning and critical thinking.

The Sports Monograph is a recent project we worked on, which invited learners to collaborate and share their opinions and experiences about sport and what it means to them. The project included primary and secondary school pupils, as well as undergraduate and postgraduate students, who were all supported by their teachers and lecturers.

As part of the project, not only were the pupils recognised for their written contributions at school awards evenings, but unlike in traditional PE, their work left a trail of learning evidence and intellectual engagement – which the schools recognised and celebrated. PE was effectively standing shoulder to shoulder with other subjects in the curriculum as a valuable educational endeavour, with written evidence to support the claim. These pupils now have publications that are being used to teach undergraduate students at the University of Central Lancashire.

Future health

The spiralling downtrend of PE time in secondary schools is a major cause for concern and it would seem that PE is in urgent need of an overhaul. But while the future of PE may be uncertain, there are certainly many opportunities for cross-curricular links and integrative learning in PE.

Importance of Physical Education in High School

There are many benefits students receive from high school physical education classes that contribute to students becoming responsible adults who are aware of the importance of a healthy lifestyle. High school students retain a higher level of knowledge related to overall health that help them make educated decisions regarding their own health, safety and well-being.

Regular Fitness Activity
Physical fitness is an important component to leading a healthy lifestyle. The inclusion of regular fitness activity helps students maintain fitness, develop muscular strength and improve cardiovascular health. A regular fitness activity improves the absorption of nutrients by the body, improves digestive processes and increases physiological processes.

Builds Self-Confidence
The participation in physical education in high school provides a positive influence on a student's personality, character and self-esteem. In addition, the team-building process enhances communication skills, and the skills required to get along and cooperate with students of varying ethnic backgrounds and personalities.

Develops Motor Skills
Physical education in high school is essential to the development of motor skills and the enhancement of reflexes. Hand-eye coordination is improved, as well as good body movements, which helps in the development of a healthy body posture.

Health and Nutrition
Physical education teaches students the importance of physical health. High school is an age where students misinterpret the meaning of "overweight" and eating disorders prevail. Physical health and education informs students on sound eating practices and the essential guidelines for nutrition.

Relieves Stress
High school students have substantial amounts of stress due to curriculum, homework, families and peer pressures. Involvement in sports, recreational activities or other forms of physical fitness offer a method of stress relief.

Considerations
Special considerations may be necessary regarding physical activities for some students with health issues, and those students should proceed under the direction of a doctor.