Relational Schema:

Person(pid, fname, lname, DOB)

Audience(pid, email) pid foreign key referencing Person(pid)

Referee(pid, country, YOE) pid foreign key referencing Person(pid)

Player(pid, shirtNum, genPos) pid foreign key referencing Person(pid)

Coach(pid, role) pid foreign key referencing Person(pid)

PlayerGameInfo(mid,pid,y1,y2,r,pos) pid foreign key referencing Player(pid), mid foreign key referencing Match(mid)

Substitution(pid1, pid2, time, mid) pid1 foreign key referencing Player(pid), pid2 foreign key referencing Player(pid), mid foreign key referencing Match(mid)

RefereeGameInfo(pid, role, mid) pid foreign key referencing Referee(pid), mid foreign key referencing Match(mid)

Team(country, officialName, URL, group, groupPoints)

GoalInfo(mid, time, forTeam, player, penalty) mid foreign key referencing Match(mid), forTeam foreign key referencing Team(country), player foreign key referencing Player(pid)

Stadium(name, location, maxCapacity)

Match(mid, LOM, startTime, date, stadium, team1, team2) stadium foreign key referencing Stadium(name), team1 foreign key referencing Team(country), team2 foreign key referencing Team(country)

Ticket(tid, price, section, range, seat, mid, stadium) mid foreign key referencing Match(mid), stadium foreign key referencing Stadium(name)

Sales(pid, tid) pid foreign key referencing Person(pid), tid foreign key referencing Ticket(tid)

PlayerTeam(pid, team) pid foreign key referencing Player(pid) team foreign key referencing Team(country)

CoachTeam(pid, team) pid foreign key referencing Coach(pid) team foreign key referencing Team(country)

Pending constraints:

From ER diagram to the ER schema:

1) A person can be both a player, a coach and a referee, which shouldn't happen according to our ER Diagram.

Things that can be added as check constraints:

1) Yellow 1 should be true before yellow 2 card.
2) The group can only be of one of the valid options
3) The general positions of the managers, players, and coaches should be from a specific list of options
4) The match times in the same place on the same day need to have a bit of difference in time between them (couple of hours) for the match and for people to go in and out of the stadium and for cleanup
5) The times for the goals should be during the match
6) The time for the match should be between some specific time range example no more matches start after 12 am.
7) The number of tickets sold should be less or equal to the maximum capacity of the stadium.
8) The date of birth accepted should be have certain limit example not children born on the same day of the match and no person above for example 100 years old.
9) No person with more years of experience than their age or close to it.
10) Team 1 and team 2 in a match should be different.
11) The location and the stadium should exist.
12) Player substitution can only happen once (once a player is substituted out then can't come back in).

SQL Queries:

a)
```
with A as ( select MID
        from GOALINFO G
        where G.PLAYER = (
          select p.PID
          from PLAYER p
          intersect
          select p.pid
          from PERSON p
          where p.FNAME = 'Christine' and p.LNAME = 'Sinclair'
        )
)
SELECT S.NAME,S.LOCATION,M.DATE
from MATCH M
      join STADIUM S on M.STADIUM = S.NAME
      join A on A.MID =  M.MID;
```

Table A returns the match id of the goals that are scored by the players called "Christine Sinclair" this is done by getting all the people called "Christine Sinclair" then checking if their id is in the Players table. For the full query, we select the stadium name from the stadium table, stadium location from the stadium table, and match date from match date from the match table. This information is obtained by joining the match table with the stadium table on the

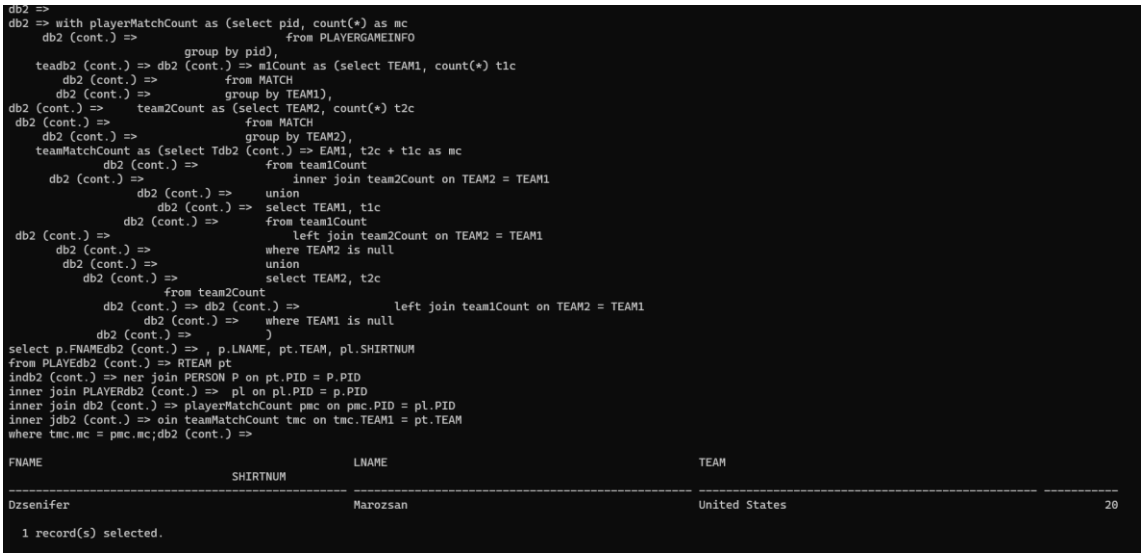
same stadium name and then further joining the resulting table with table A on the match id to finally get all the games that the player “Christine Sinclair” has played in and scored at least one goal.

```
db2 => with A as ( select MID
           from GOdb2 (cont.) => ALINFO G
           whedb2 (cont.) => re G.PLAYER = (
db2 (cont.) =>                 select p.PID
        db2 (cont.) =>         from PLAYER p
    db2 (cont.) =>             intersect
  db2 (cont.) =>               select p.pid
     db2 (cont.) =>            from PERSON p
 db2 (cont.) =>                where p.FNAME = 'Christine' and p.LNAME = 'Sinclair'
           )
)db2 (cont.) => db2 (cont.) =>
SELECT S.NAME,S.LOCATION,M.DATdb2 (cont.) => E
from db2 (cont.) => MATCH M
         join STdb2 (cont.) => ADIUM S on M.STADIUM = S.NAME
         join A on A.db2 (cont.) => MID =  M.MID;

NAME                                               LOCATION                                           DATE
-------------------------------------------------- -------------------------------------------------- ----------
Santiago Bernabeu                                  Madrid, Spain                                      04/01/2024
Signal Iduna Park                                  Dortmund, Germany                                  09/12/2024

  2 record(s) selected.
```

b)
```
with playerMatchCount as (select pid, count(*) as mc
                  from PLAYERGAMEINFO
                  group by pid),
  team1Count as (select TEAM1, count(*) t1c
          from MATCH
          group by TEAM1),
  team2Count as (select TEAM2, count(*) t2c
            from MATCH
            group by TEAM2),
  teamMatchCount as (select TEAM1, t2c + t1c as mc
              from team1Count
                 inner join team2Count on TEAM2 = TEAM1
              union
              select TEAM1, t1c
              from team1Count
                 left join team2Count on TEAM2 = TEAM1
              where TEAM2 is null
              union
              select TEAM2, t2c
              from team2Count
                 left join team1Count on TEAM2 = TEAM1
              where TEAM1 is null
              )
select p.FNAME, p.LNAME, pt.TEAM, pl.SHIRTNUM
from PLAYERTEAM pt
inner join PERSON P on pt.PID = P.PID
inner join PLAYER pl on pl.PID = p.PID
inner join playerMatchCount pmc on pmc.PID = pl.PID
```

inner join teamMatchCount tmc on tmc.TEAM1 = pt.TEAM
where tmc.mc = pmc.mc;

Table team1Count returns the number of matches a team in position team1 in the match table has participated in. Table team2Count returns the same thing but in position of team2. Table teamMatchCount returns the union of the 2 previous tables with the counts added when a team is in both positions team1 and team2 in the match table. The Table playerMatchCount returns the number of times a player has participated in matches. Then for the full query we selected the first name, last name from the person table, team from the team table, and shirt number form the player table. This is done by joining the Player team table with the person table on the player id then joining it to the player table on the player id. After that the resultant table was joined with playerMatchCount table on the player id then finally joining it to the teamMatchCount on the team value. Finally only the rows where the counts of the number of times the player has participate in games and the number of times the team has player, were selected.



c)
```
SELECT COUNTRY,COALESCE(T1+T2,0) AS TOTALMATCH,COALESCE(TOTALGOAL,0) AS
TOTALGOAL
FROM TEAM
      LEFT OUTER JOIN (SELECT FORTEAM,COUNT(*) AS TOTALGOAL
                  FROM GOALINFO
                  WHERE PENALTY = false
                  GROUP BY FORTEAM) AS GOAL ON GOAL.FORTEAM = TEAM.COUNTRY,
   (SELECT TEAM1,COUNT(*) AS T1
    FROM MATCH
    GROUP BY TEAM1),
   (SELECT TEAM2,COUNT(*) AS T2
    FROM MATCH
    GROUP BY TEAM2)
WHERE TEAM1 = TEAM.COUNTRY AND TEAM2 = TEAM.COUNTRY;
```

For the match information we counted how many times a team occur as team1 or team2 and add the number up. For the goal information, we counted how many goal a team made not including penalties and then joined this information with the team table to get the result.

```
db2 => SELECT COUNTRY,COALESCE(T1+T2,0) AS TOTALMATCH,COALESCE(TOTALGOAL,0) AS TOTALGOAL
FROM TEAM
        LEFT OUTER JOIN (SELEdb2 (cont.) => db2 (cont.) => CT FORTEAM,COUNT(*) AS TOTALGOAL
   db2 (cont.) =>                          FROM GOALINFO
                    db2 (cont.) =>         WHERE PENALTY = false
          db2 (cont.) =>                   GROUP BY FORTEAM) AS GOAL ON GOAL.FORTEAM = TEAM.COUNTRY,
     (SELECTdb2 (cont.) =>  TEAM1,COUNT(*) AS T1
      FROM MATCH
      Gdb2 (cont.) => db2 (cont.) => ROUP BY TEAM1),
     (SELECT Tdb2 (cont.) => EAM2,COUNT(*) AS T2
      FROM MATCH
      GROUP Bdb2 (cont.) => Y TEAM2)
Wdb2 (cont.) => db2 (cont.) => HERE TEAM1 = TEAM.COUNTRY AND TEAM2 = TEAM.COUNTRY;

COUNTRY                                            TOTALMATCH  TOTALGOAL
-------------------------------------------------- ----------- -----------
Brazil                                                       7           3
Germany                                                      4           1
Portugal                                                     7           6
United States                                                2           4
England                                                      6           0
Netherlands                                                  6           0
France                                                      11           0
Japan                                                        6           0
Argentina                                                   10           0
Italy                                                        8           0
Mexico                                                      13           0
Spain                                                        8           0

  12 record(s) selected.
```

d) SELECT NAME AS STADIUMNAME, TEAM1, TEAM2, DATE,TICKETSSOLD,(MAXCAPACITY - TICKETSSOLD) AS TICKETSLEFT,AVGPRICESOLD, TOTALREVENUE
FROM STADIUM,MATCH,(SELECT TICKET.MID,COUNT(TICKET.TID) AS TICKETSSOLD,AVG(PRICE) AS AVGPRICESOLD, SUM(PRICE) AS TOTALREVENUE
FROM TICKET,MATCH,SALES
WHERE MATCH.MID = TICKET.MID AND SALES.TID = TICKET.TID
GROUP BY TICKET.MID) AS TICKINFO
WHERE NAME = MATCH.STADIUM AND TICKINFO.MID = MATCH.MID
ORDER BY TICKETSSOLD DESC;

For the ticket information we listed the stadium name,team1, team2, date, sold ticket , the left ticket and the average price of the tickets that are sold for every match with the total amount of revenue (price of all the tickets sold). First we selected the match id, the number of ticket id, and the average price from the ticket and match table grouped by the match id to get the sold ticket number, average price for each match, and the total revenue. Then using the above query as a subquery join with stadium and match table to get the stadium name, team 1, team 2, date of match, tickets sold, left seats using the maximum capacity minus the sold tickets, and finally the total revenue ordered by the number of tickets sold. This might give us insight into which matches were most popular and if location ie stadium had any effect on the number of tickets sold and many other things.

```
db2 => SELECT NAME AS STADIUMNAME, TEAM1, TEAM2, DATE,TICKETSSOLD,(MAXCAPACITY - TICKETSSOLD) AS TICKETSLEFT,AVGPRICESOLD, TOTALREVENUE
FROM STADIUM,MATCH,(SELECT TICKET.MID,COUNT(TICKEdb2 (cont.) => T.TID) AS TICKETSSOLD,AVG(PRICE) AS AVGPRICESOLD, SUM(PRICE) AS TOTALREVENUE
                    FROM TICKET,MATCH,SAdb2 (cont.) => LES
        db2 (cont.) =>              WHERE MATCH.MID = TICKET.MID AND SALES.TID = TICKET.TID
   db2 (cont.) =>                   GROUP BY TICKET.MID) AS TICKINFO
WHERE NAME = MATdb2 (cont.) => CH.STADIUM AND TICKINFO.MID = MATCH.MID
ORDER BY TICKETSSOLD DdDb2 (cont.) => ESC
;db2 (cont.) =>

STADIUMNAME                                TEAM1                                              TEAM2                                              DATE       TICKETSSOLD TICKETSLEFT AVGPRICESOLD                    TOTALREVENUE
------------------------------------------ -------------------------------------------------- -------------------------------------------------- ---------- ----------- ----------- ------------------------------ ------------------------------
San Siro                                   England                                            Argentina                                          08/28/2024           4        1825 5466.500000000000000000000000          21866.00
Santiago Bernabeu                          Japan                                              Spain                                              04/01/2024           3        2258 4919.666666666666666666666666          14759.00
Anfield                                    Japan                                              Mexico                                             02/19/2024           3        7581 7746.000000000000000000000000          23238.00
Old Trafford                               Japan                                              France                                             12/13/2024           3        2613 3690.000000000000000000000000          11070.00
Emirates Stadium                           England                                            Brazil                                             11/07/2024           3        5087 3906.666666666666666666666666          11720.00
Anfield                                    Netherlands                                        Argentina                                          08/20/2024           2        7582 5064.500000000000000000000000          10129.00
Allianz Arena                              Japan                                              Spain                                              02/29/2024           2         121 8287.000000000000000000000000          16574.00
Old Trafford                               Mexico                                             Portugal                                           04/04/2024           2        2614 3284.500000000000000000000000           6569.00
Anfield                                    Argentina                                          France                                             11/03/2024           2        7582 6346.000000000000000000000000          12692.00
San Siro                                   United States                                      Italy                                              08/19/2024           2        1827 6764.000000000000000000000000          13528.00
Santiago Bernabeu                          Mexico                                             Netherlands                                        02/16/2024           2        2259 8585.500000000000000000000000          17171.00
Camp Nou                                   Argentina                                          Brazil                                             05/14/2024           2        3725 2742.000000000000000000000000           5484.00
Old Trafford                               Mexico                                             France                                             06/23/2024           2        2614 5078.500000000000000000000000          10157.00
San Siro                                   France                                             Spain                                              06/14/2024           2        1827 1675.500000000000000000000000           3351.00
Santiago Bernabeu                          Spain                                              Mexico                                             09/20/2024           2        2259 3056.500000000000000000000000           6113.00
Old Trafford                               Mexico                                             England                                            12/27/2024           2        2614 3155.000000000000000000000000           6310.00
Anfield                                    Italy                                              Japan                                              10/05/2024           1        7583 9485.000000000000000000000000           9485.00
Santiago Bernabeu                          Brazil                                             Mexico                                             11/17/2024           1        2260 8999.000000000000000000000000           8999.00
Allianz Arena                              Spain                                              Italy                                              12/14/2024           1         122 7876.000000000000000000000000           7876.00
Signal Iduna Park                          Japan                                              France                                             09/12/2024           1         883 9014.000000000000000000000000           9014.00
Old Trafford                               Portugal                                           Argentina                                          10/17/2024           1        2615 4417.000000000000000000000000           4417.00
Emirates Stadium                           Netherlands                                        Spain                                              04/03/2024           1        5089 6937.000000000000000000000000           6937.00
Stamford Bridge                            England                                            France                                             01/25/2024           1        3264 7661.000000000000000000000000           7661.00
Old Trafford                               France                                             Mexico                                             07/07/2024           1        2615 3295.000000000000000000000000           3295.00
Santiago Bernabeu                          Brazil                                             France                                             12/03/2024           1        2260 3493.000000000000000000000000           3493.00
Etihad Stadium                             Brazil                                             Portugal                                           02/17/2024           1        4960 3369.000000000000000000000000           3369.00
Stamford Bridge                            France                                             Italy                                              07/07/2024           1        3264 1301.000000000000000000000000           1301.00
Camp Nou                                   Mexico                                             England                                            10/29/2024           1        3726 1786.000000000000000000000000           1786.00

  28 record(s) selected.
```

e) SELECT FNAME,LNAME,PERSON.PID,COALESCE(TOTALGOAL,0) AS TOTALGOAL,COALESCE(TOTALYELLOWCARD,0) AS TOTALYELLOWCARD,COALESCE(TOTALREDCARD,0) AS TOTALREDCARD
FROM PERSON
LEFT OUTER JOIN (SELECT PID,SUM(Y1 + Y2) AS TOTALYELLOWCARD,SUM(R) AS TOTALREDCARD
FROM PLAYERGAMEINFO
GROUP BY PID) AS CARD ON CARD.PID = PERSON.PID
LEFT OUTER JOIN (SELECT GOALINFO.PLAYER, COUNT(*) AS TOTALGOAL
FROM GOALINFO
GROUP BY GOALINFO.PLAYER) AS GOAL ON PLAYER = PERSON.PID
ORDER BY TOTALGOAL DESC;

We decided to make a player summary to see all player performance in this world cup. this query will show the first and last name of the player, player id, total goal they made, total number of yellow cards and red cards they received. The yellow card and red card information was obtained from the playerGameInfo table and the goal information from goalInfo table. After that, the person table was joined (left outer join) with these two query to get our desire information.

```
db2 => SELECT FNAME,LNAME,PERSON.PID,COALESCE(TOTALGOAL,0) AS TOTALGOAL,COALESCE(TOTALYELLOWCARD,0) AS TOTALYELLOWCARD,COALESCE(TOTALREDCARD,0) AS TOTALREDC
ARD
FROM PERSON
        LEFT OUTER JOIN (SELECTdb2 (cont.) => db2 (cont.) =>  PID,SUM(Y1 + Y2) AS TOTALYELLOWCARD,SUM(R) AS TOTALREDCARD
           db2 (cont.) =>              FROM PLAYERGAMEINFO
                    db2 (cont.) =>       GROUP BY PID) AS CARD ON CARD.PID = PERSON.PID
        LEFT OUTdb2 (cont.) => ER JOIN (SELECT GOALINFO.PLAYER, COUNT(*) AS TOTALGOAL
   db2 (cont.) =>                       FROM GOALINFO
       db2 (cont.) =>                   GROUP BY GOALINFO.PLAYER) AS GOAL ON PLAYER = PERSON.PID
ORDER BY TOTALGOAL DEdb2 (cont.) => SC
LIMIT 10
;db2 (cont.) => db2 (cont.) =>

FNAME                                              LNAME                                              PID         TOTALGOAL   TOTALYELLOWCARD TOTALREDCARD
-------------------------------------------------- -------------------------------------------------- ----------- ----------- --------------- -------------
Megan                                              Campbell                                                93           3               0             0
Tony                                               Adams                                                   32           2               2             1
Christine                                          Sinclair                                                 0           2               0             0
Thomas                                             Tuchel                                                  53           2               0             0
Elisabeth                                          Leidinge                                                82           2               0             1
Paul                                               Pogba                                                   61           2               1             1
Wayne                                              Rooney                                                  27           1               4             0
Dzsenifer                                          Marozsan                                                76           1               3             2
Tobias                                             Linderoth                                               55           1               1             0
Amandine                                           Henry                                                   54           1               1             1

  10 record(s) selected.
```

Player Information:

SQL ->

```
CREATE VIEW playerinfo AS

SELECT p.fname, p.lname, pl.shirtNum, p.DOB, t.country, t.officialName as association, t."group"

FROM Person p

    JOIN Player pl ON p.pid = pl.pid

    JOIN PlayerTeam pt ON pl.pid = pt.pid

    JOIN Team t ON pt.team = t.country;
```

a) The create view returns the first name, last name from the person table, the shirt number of the player from the player table, then the date of birth from the person table, the country and the official name of the association and the group from the team table. This is done by joining the player table and the person table on the person id and then further joining it with the teamplayer table on the player id then finally joining the team table on the resultant table on the country of the team.

b)

```
db2 => CREATE VIEW playerinfo AS
SELECdb2 (cont.) => T p.fname, p.lname, pl.shirtNum, p.DOB, t.country, t.officialName as association, t."group"
FROM Person p
 db2 (cont.) => db2 (cont.) =>         JOIN Player pl ON p.pid = pl.pid
db2 (cont.) =>          JOIN PlayerTeam pt ON pl.pid = pt.pid
 db2 (cont.) =>         JOIN Team t ON pt.team = t.country;
DB20000I  The SQL command completed successfully.
```

c)

```
db2 => SELECT * FROM playerinfo LIMIT 5;

FNAME                                     LNAME                                     SHIRTNUM    DOB        COUNTRY
      ASSOCIATION                               group
----------------------------------------- ----------------------------------------- ----------- ---------- ----------------------------------------
----- --------------------------------------------------- --------------------------------------------------
Carli                                     Lloyd                                              2 08/26/1952 Argentina
      Argentine Football Association            D
Jurgen                                    Klopp                                             24 05/10/1969 Spain
      Royal Spanish Football Federation         E
Thierry                                   Henry                                              7 02/02/2015 Spain
      Royal Spanish Football Federation         E
Zinedine                                  Zidane                                             2 02/04/1996 Portugal
      Portuguese Football Federation            E
Pep                                       Guardiola                                         21 03/21/1942 Japan
      Japan Football Association                E

  5 record(s) selected.
```

d) This is a picture where we replaced Group A with just A to account for the difference of the data Stored.

```
db2 => select * from playerinfo where "group" = 'A' limit 5;

FNAME                                     LNAME                                     SHIRTNUM    DOB        COUNTRY
      ASSOCIATION                               group
----------------------------------------- ----------------------------------------- ----------- ---------- ----------------------------------------
----- --------------------------------------------------- --------------------------------------------------
Cheryl                                    Salisbury                                          4 11/09/2021 United States
      United States Soccer Federation           A
Rudi                                      Voller                                             9 02/03/1971 United States
      United States Soccer Federation           A
Dzsenifer                                 Marozsan                                          20 02/11/2005 United States
      United States Soccer Federation           A
Claudio                                   Ranieri                                           14 07/29/1997 United States
      United States Soccer Federation           A
Vicky                                     Losada                                            12 09/27/1998 United States
      United States Soccer Federation           A

  5 record(s) selected.
```

Here is another picture of the requested query

```
db2 => select * from playerinfo where "group" = 'Group A' limit 5;

FNAME                                    LNAME                                              SHIRTNUM    DOB        COUNTRY
      ASSOCIATION                              group
---------------------------------------- -------------------------------------------------- ----------- ---------- ----------------------------------------
----- ----------------------------------------------- --------------------------------------------------

  0 record(s) selected.
```

e)

```
db2 => insert into playerinfo values ('Daniel', 'Lee', 23, '2000-01-01', 'Spain', 'Royal Spanish Football Federation', 'E');
DB21034E  The command was processed as an SQL statement because it was not a
valid Command Line Processor command.  During SQL processing it returned:
SQL0150N  The target fullselect, view, typed table, materialized query table,
range-clustered table, or staging table in the INSERT, DELETE, UPDATE, MERGE,
or TRUNCATE statement is a target for which the requested operation is not
permitted.  SQLSTATE=42807
```

This happened because a view is a virtual table that is created on a base query on one or more base tables. The data is not stored directly but rather derived. This is why we can't store values into the table. If we want to insert values it has to be through the base tables when then would get reflected in the view table.

Check Constraints:

The check constraint that we chose is to make the input of an invalid position of the player throw and error making this makes sure that only valid positions are entered. This screenshot shows both the creation of the table with the check constraint and the creation of a new record that fails.

```
db2 => CREATE TABLE Player (
db2 (cont.) => pid INT NOT NULL,
db2 (cont.) => shirtNum INT NOT NULL,
db2 (cont.) => genPos VARCHAR(50) NOT NULL CONSTRAINT NotAValidPosition CHECK ( genPos in ('Forward', 'Striker', 'Winger', 'Attacking Midfielder', 'Central
Midfielder', 'Defensive Midfielder', 'Full-back', 'Centre-back', 'Sweeper', 'Goalkeeper') ),
db2 (cont.) => PRIMARY KEY (pid),
db2 (cont.) => FOREIGN KEY (pid) REFERENCES Person(pid)
db2 (cont.) => );
DB20000I  The SQL command completed successfully.
db2 => INSERT INTO Person (pid, fname, lname, DOB) VALUES
(0, 'Christine', 'Sinclair', '1964-03-24')db2 (cont.) => ;
DB20000I  The SQL command completed successfully.
db2 => insert into player (pid, shirtNum, genPos) values (0, 7, 'Attacker');
DB21034E  The command was processed as an SQL statement because it was not a
valid Command Line Processor command.  During SQL processing it returned:
SQL0545N  The requested operation is not allowed because a row does not
satisfy the check constraint "CS421G202.PLAYER.NOTAVALIDPOSITION".
SQLSTATE=23513
```